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STATE OF MICHIGAN

IN THE SUPREME COURT

NAWAL DAHER and MOHAMAD JOMAA, as Co-Personal Representatives for the ESTATE OF JAWAD JUMAA, a/k/a JAWAD JOMAA, Deceased,

Plaintiffs-Appellees,

v

PRIME HEALTHCARE SERVICES-GARDEN CITY, LLC, d/b/a GARDEN CITY HOSPITAL, a foreign limited liability company, KELLY W. WELSH, D.O., and MEGAN SHADY, D.O., Jointly and severally,

Defendants-Appellants.
_____/

MSC No. 165377

COA No. 358209

L.C. Case No. 20-004169-NH
(Wayne Circuit Court)

APPENDIX TO PLAINTIFFS-APPELLEES' BRIEF ON APPEAL

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APPENDIX/EXHIBITS TO PLAINTIFFS-APPELLEES' BRIEF ON APPEAL

Exhibit #	Description	Apx Page(s)
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EXHIBIT 1

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Due to technical limitations of the conversion process, the original graphic elements for this report are not available online. The report contains blank space instead of the graphics of the original report. We apologize in advance for this inconvenience. Please press the PageDown key TWICE to begin viewing the report, which begins on page two.

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NATIONAL CENTER FOR EDUCATION STATISTICS

Statistical Analysis Report January 1995

High School and Beyond: 1992 Descriptive Summary of 1980 High School Sophomores 12 Years Later

With an Essay on:
Educational Attainment of 1980 High School Sophomores by 1992

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Paul Planchon and Jeff Owings at the National Center for Education Statistics (NCES) reviewed early drafts of the report, and offered many suggestions for its improvement. The authors would especially like to thank the members of the adjudication panel for their careful reading and thoughtful comments. Panel members from NCES were Robert Burton from the Statistical Standards and Methodology Division, Andrew Kolstad from the National Assessment of Educational Progress (NAEP) Division, and Nabeel Alsalam from the Data Development Division. Other panel members were Daniel Madzellan from the Office of Postsecondary Education in the U.S. Department of Education, and Carol Fuller from the National Institute of Independent Colleges and Universities.

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Foreword

The National Education Longitudinal Studies (NELS) program of the National Center for Education Statistics (NCES) was established to study the educational, vocational, and personal development of young people beginning with their elementary or high school years, and following them over time as they begin to take on adult roles and responsibilities. Thus far, the NELS program consists of three major studies: the National Longitudinal Study of the High School Class of 1972 (NLS-72), High School and Beyond (HS&B), and the National Education Longitudinal Study of 1988 (NELS:88).

NLS-72 followed the 1972 cohort of high school seniors through 1986, or fourteen years after most of this cohort completed high school. The HS&B survey included two cohorts: the 1980 senior class, and the 1980 sophomore class. Both cohorts were surveyed every two years through 1986, and the 1980 sophomore class was also surveyed again in 1992. NELS:88 started with the cohort of students who were in the eighth grade in 1988, and these students have been surveyed every two years since that time.

This descriptive report describes the educational attainment, employment outcomes, and family formation of the 1980 sophomore class in 1992, ten years after most of the students in that cohort graduated from high school. The report begins with an essay that explores in some detail the relationships between characteristics of the 1980 sophomores, their patterns of enrollment in postsecondary education, their postsecondary expectations, and their patterns of educational attainment in 1992. The compendium of tables that follows this essay provides summary data on the family status, employment outcomes, voting behavior, and activities of the 1980 sophomore class in 1992, as well as additional information about their educational experiences not included in the essay. Each of the four sections of the compendium is prefaced by a series of bullets that highlight the findings of the section. This format was chosen because it illustrates both the level of detail that can be achieved in an analysis that uses the HS&B Fourth Follow-up data as well as the broad scope of the information in these files.

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Educational Attainment of 1980 High School Sophomores by 1992

In 1992, the National Center for Education Statistics resurveyed the 1980 high school sophomores who participated in the earlier rounds of High School and Beyond (HS&B). Ten years had passed since these students were scheduled to graduate from high school, and most were now 28 or 29 years old. This 1992 survey, the fourth followup of this cohort since the first data collection in 1980, examined many aspects of these students' early adult years—enrollment in postsecondary education, experience in the labor market, marriage and childrearing, and voting behavior, to name a few. Thus, the HS&B Fourth Followup is a rich source of information on young adults in the late 1980s and early 1990s.

For many of these young people, pursuing further education was a major activity during this stage of life, and examining patterns of enrollment and participation in postsecondary education would be of value for this reason alone. But in addition to being a major activity for many of the 1980 high school sophomores, postsecondary education was also the key to many of their subsequent transitions and achievements, including entry into the labor market, the establishment of career goals and opportunities, and family formation. Among the most important consequences of the decision to pursue a postsecondary education were the different economic outcomes stemming from it. For example, those who earned a postsecondary degree were more likely to be employed and tended to have higher earnings than did those 1980 sophomores who did not earn a postsecondary degree, and earnings generally increased along with educational attainment.[1] For all these reasons, then, it is important to understand how different decisions about postsecondary participation and enrollment are related to attainment.

The cohort's experiences and accomplishments in postsecondary education varied greatly. By 1992, two-thirds of the 1980 high school sophomores had enrolled in some form of postsecondary education. This proportion was up from 60 percent of the cohort in 1986 (the year of the third followup), indicating that some students delayed initial entry into postsecondary education until well into their mid or late twenties.[2] Of those who did enroll by 1992, 43 percent enrolled first in a 4-year institution, 37 percent in a public 2-year institution, and the remainder in some other type of postsecondary institution, most typically a private for-profit or proprietary institution. Given these general patterns of postsecondary enrollment, what levels of education did the 1980 high school sophomores attain by 1992, and how did attainment vary among different types of students? The answers to these questions have many facets. However, at least one pattern stands out. The 1980 sophomores were much more likely to earn a postsecondary credential if they enrolled in postsecondary education immediately after high school than if they delayed their entry.

---

[1]See tables in Section 3 of the table compendium following this essay for elaboration of these patterns.

[2]Data for 1986 adapted from Eva Eagle, Robert Fitzgerald, Antionette Gifford, and John Tuma, *High School and Beyond: A Descriptive Summary of 1980 High School Sophomores: Six Years Later* (Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics, June 1988), appendix tables C1.1 and C1.2.

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This essay briefly examines the educational attainment of the 1980 high school sophomores. It not only looks at what they had accomplished approximately 10 years after high school but also describes some of the ways in which attainment varied within the cohort. Of particular interest are such issues as time of entry into postsecondary education, the relationship between attainment and postsecondary expectations at the end of high school, differences between full-time and part-time students, the amount of time taken to obtain a postsecondary credential, and the number of institutions attended during the course of postsecondary attendance. There are some interesting findings that should stimulate researchers to delve more deeply into the information provided by the HS&B Fourth Followup.

Highest Degree Attained by 1992

For many 1980 high school sophomores, the highest degree attained was not postsecondary (figure 1). As of 1992, the highest degree earned by about one-half of the cohort—including almost 36 percent of those students who had enrolled in a postsecondary institution at some time between 1982 and 1992—was a high school diploma. Moreover, by 1992, 6 percent of the 1980 sophomores still did not have a high school diploma, down from about 8 percent of the cohort in 1986.[3] Therefore, some 1980 sophomores who had not finished high school by 1986 did continue to pursue their high school studies and obtained a diploma by 1992; however, three-quarters of those who had not earned a high school diploma or its equivalent by 1986 still had not done so 6 years later. In short, by 1992, for 57 percent of those who were high school sophomores in 1980, degree attainment was limited to a high school diploma or no degree at all. While 75 percent of these students aspired to some form of postsecondary education as sophomores in high school, the majority had not completed a postsecondary credential 12 years later.[4] Indeed, one-third had not enrolled in any form of postsecondary education at all.

By 1992, 43 percent of the 1980 high school sophomores had attained some type of postsecondary credential. For 19 percent of the cohort, the highest degree attained was prebaccalaureate: 11 percent earned a vocational certificate (usually representing the equivalent of 1 full-time year of postsecondary education), and 8 percent attained an associate's degree. Twenty-four percent of the sophomores—or more than half of those earning any type of postsecondary credential—attained a bachelor's degree or higher, including 1 percent who earned a professional degree or doctorate. Given that the median time from completion of a bachelor's degree to completion of a doctorate ranged from 7.5 years in the physical sciences to more than 12 years in the humanities in 1990–91, it is not surprising that so few members of this cohort had attained a professional degree or doctorate.[5] A larger percentage of the 1980 high school sophomores should attain this status as they move into their early thirties.[6]

---

[3]Ibid., table C1.1.

[4]National Center for Education Statistics, High School & Beyond Fourth Followup Data Analysis System, 1980–1992.

[5]National Center for Education Statistics, *Digest of Education Statistics, 1993*, tables 290–95.

[6]About 3 percent of the 1980 sophomore class claimed that taking graduate or professional courses was their major activity in 1992 (table 1.3 in the Compendium).

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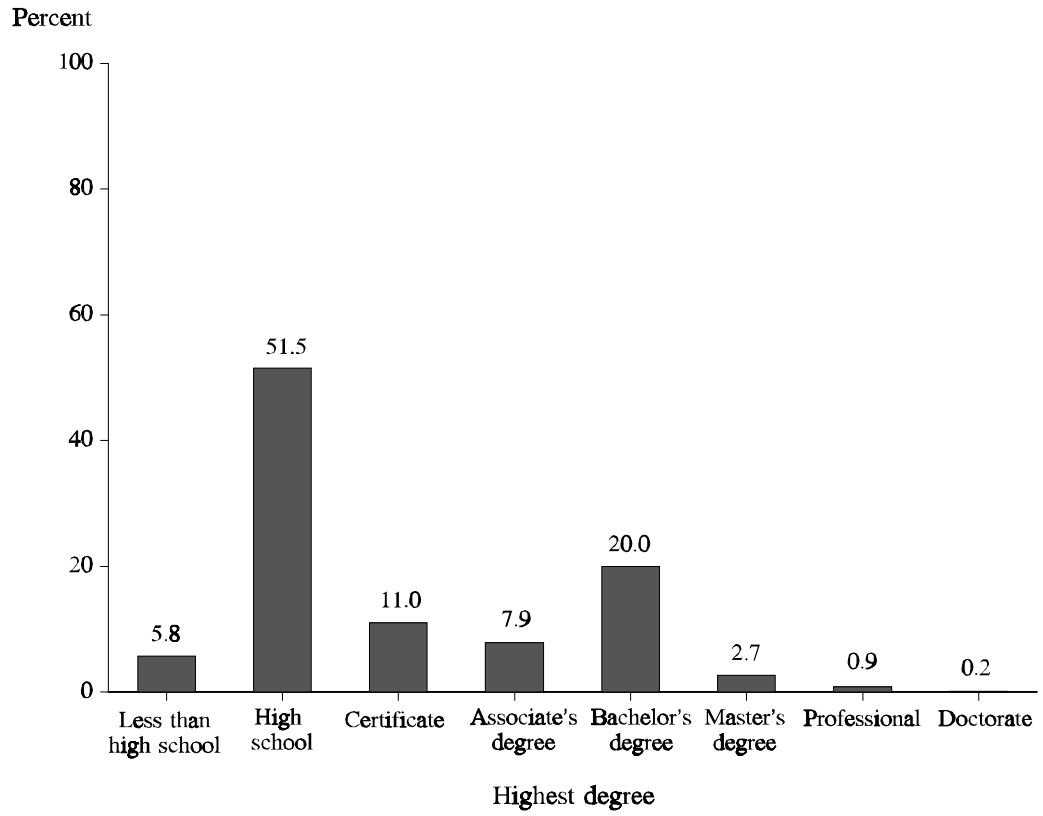
Figure 1
Percentage of 1980 high school sophomores by highest degree attained through 1992



SOURCE: National Center for Education Statistics, High School and Beyond: 1980 Sophomore Cohort, 1980–1992.

In brief, despite the emphasis in the teenage years on preparation for college, only one in four of the 1980 high school sophomores attained a bachelor's degree in the 10 years following high school. Another 20 percent or so earned some other type of postsecondary credential. For the majority of this cohort, as with the majority of students in earlier cohorts, the high school diploma was the only degree attained.

Postsecondary Attainment and Expectations as High School Seniors

Were these postsecondary outcomes consistent with the expectations of these students while in high school? In one respect, they were (table 1). Seventy-one percent of the 1980 high school sophomores who said in 1982 that they did not expect to attain any postsecondary credential attained no more than a high school diploma, and 16 percent still were not high school graduates. Of those who expected to obtain a bachelor's degree, 64 percent had earned some type of postsecondary credential by 1992. In general, postsecondary attainment rose on average with each

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successively higher level of educational expectations. From this perspective, therefore, the postsecondary attainment of the 1980 sophomores mirrored their expectations about postsecondary education while in high school.[7]

Table 1
Percentage of 1980 high school sophomores by highest degree attained through 1992, by postsecondary expectations in 1982

Student characteristics	Highest degree through 1992							
	Less than high school graduate	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Total	5.8	51.5	11.0	7.9	20.0	2.7	0.9	0.2
Postsecondary expectations in 1982								
None	15.5	71.1	9.3	3.0	1.0	0.1	0.0	0.1
Vocational-technical	4.6	61.6	19.8	10.7	3.3	0.1	0.0	0.0
Less than four-year degree	1.6	53.2	13.3	15.6	15.0	1.1	0.2	0.0
College degree	0.9	35.3	6.8	6.3	44.9	5.0	0.8	0.1
Advanced degree	0.8	28.9	5.2	5.7	45.1	9.0	4.4	0.8

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

From another perspective, however, there was a large gap between what these young people aimed for as high school students and what they actually accomplished in postsecondary education during the ensuing 10 years. Among those who expected to achieve some level of postsecondary degree completion, less than half had actually attained their goals as of June 1992. For example, among those who in 1982 expected to complete a 4-year college degree, 51 percent had attained a bachelor's degree or higher by 1992, and this rate of attainment was typical of all students,

[7]This essay focuses on the relationship between postsecondary expectations when the 1980 high school sophomores were seniors in 1982 and their subsequent postsecondary attainment. However, for many students, postsecondary expectations were set much earlier. Data presented in tables 2.1 and 2.2 the table compendium following this essay show that students who planned to go to college while in the sixth grade were much more likely to enroll in a 4-year institution and to enroll immediately after high school than were students who planned not to go, were not sure, or had not thought about college attendance while in the sixth grade. Since it seems unlikely that students would independently reach conclusions about their eventual level of educational attainment at such a young age, these data suggest that parental encouragement from an early age has a substantial impact on the postsecondary attainment of their children.

regardless of their different levels of postsecondary expectations.[8] Thus, many students tended to

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[8]The percentage of students who had attained an advanced degree by 1992 was much smaller than half, but part of this outcome can be explained by the relatively limited amount of time that students had to achieve their educational goals.

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underachieve relative to their educational expectations, and a relatively small percentage of students attained degrees that exceeded their expectations.[9]

It is possible, of course, that some of these students will still realize their postsecondary expectations at a later date. However, the preliminary evidence on this prospect, which is presented next, is not encouraging. Delaying entry into postsecondary education appears to carry with it a rather low likelihood of completion, at least during the first 10 years after high school. Barring a marked reversal in this trend, it is likely that many of the 1980 sophomores who expected to pursue postsecondary education but delayed their entry will never realize the postsecondary goals they held at the end of high school.

Postsecondary Attainment and Immediate Versus Delayed Entry

Rates of postsecondary attainment varied greatly among the 1980 high school sophomores, and one of the factors most strongly associated with these differences was the timing of entry into postsecondary education. Students who delayed their entry into postsecondary education (defined as entry after October 1982) were significantly less likely than those who entered immediately (by October 1982) to earn a bachelor's degree or higher (table 2). Forty percent of all 1980 sophomores who entered postsecondary education immediately after high school had earned a bachelor's degree by 1992, and another 7.9 percent had attained an advanced degree. By contrast, 9 percent of those who delayed entry had attained a bachelor's degree by 1992, with another 1 percent having attained an advanced degree. Overall, immediate entrants into postsecondary

Table 2
Percentage of 1980 high school sophomores by highest degree attained through 1992, by immediate versus delayed entry

	Highest degree through 1992				
Entry status	High school	Certificate	Associate's	Bachelor's	Advanced degree
Immediate entrants	29.6	9.9	12.1	40.3	7.9
Delayed entrants	53.7	24.2	11.7	9.2	1.0

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

[9]This relationship between expectations and attainment has been consistent over the last two decades at least. In his comparison of the high school classes of 1972 and 1980, Grubb concluded that expectations appear to set an upper limit to attainment and that goals are more frequently revised downward than upward. W. Norton Grubb, *Access, Achievement, Completion, and "Milling Around" in Postsecondary Vocational Education* (Berkeley, CA: MPR Associates, Inc., April 1989), 25–26.

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education were much less likely to be noncompleters at the postsecondary level than were those who delayed their entry. While 30 percent of immediate entrants had still not attained any type of postsecondary degree or certificate as of June 1992, almost 54 percent of delayed entrants had not earned any type of postsecondary degree or certificate by that date.

The general patterns of differential attainment between immediate and delayed entrants persisted when educational expectations were held constant (table 3). Among those who expected in 1982 to earn some type of postsecondary degree or certificate, a larger percentage of those who delayed entry into postsecondary education than of those who entered immediately had attained only a high school degree as of 1992, regardless of the level they expected to attain. Additionally, average levels of attainment were higher among immediate than delayed entrants who had comparable postsecondary education goals.

Table 3
Percentage of 1980 high school sophomores by highest degree attained through 1992, by postsecondary expectations in 1982 among immediate versus delayed entrants

Postsecondary expectations in 1982	Highest degree through 1992				
	High school	Certi-ficate	Assoc-iate's	Bachelor's	Advanced degree
Immediate entrants					
None	49.0	29.0	15.3	6.5	0.0
Vocational-technical	39.1	29.9	23.5	7.0	0.3
Less than four-year degree	36.7	13.2	23.9	23.9	2.1
College degree	26.6	5.1	6.5	54.3	7.3
Advanced degree	22.3	3.5	5.4	52.0	16.7
Delayed entrants					
None	57.9	27.3	11.1	2.9	0.6
Vocational-technical	50.2	32.0	13.8	3.9	0.0
Less than four-year degree	57.8	18.4	12.4	10.5	0.7
College degree	54.6	15.4	8.7	19.9	1.1
Advanced degree	43.7	16.5	10.2	23.8	5.6

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Postsecondary Attainment and Full-Time Versus Part-Time Enrollment

The 1980 high school sophomores not only were more likely to attain a postsecondary credential if they enrolled in postsecondary education immediately after high school but they were also more likely to earn a degree if they enrolled immediately and full time (table 4). At the 4-year institutions, for example, almost 58 percent of 1980 sophomores who enrolled full time in fall 1982 had earned a bachelor's degree by 1992, compared with about one-fourth of those who enrolled part time. Similarly, students who enrolled immediately and full time at 2-year institutions had higher rates of postsecondary attainment: one-fourth of students who enrolled in a 2-year public institution full time in fall 1982 had earned a bachelor's degree by 1992, compared with 14 percent of those who enrolled part time. Likewise, 24 percent of those who enrolled immediately and full time in a 2-year public institution had earned an associate's degree by 1992, while 9 percent of those who enrolled part time in fall 1982 had attained an associate's degree.

Table 4
Percentage of 1980 high school sophomores by highest degree attained through 1992, by timing and intensity of initial postsecondary enrollment

Type of start in postsecondary education	Highest degree through 1992							
	Less than high school graduate	High school	Certi-ficate	Assoc-iate's	Bachelor's	Master's	Profes-sional	Doctorate
Total	5.8	51.5	11.0	7.9	20.0	2.7	0.9	0.16
4-year institution								
Full-time fall 1982	*	21.2	3.5	4.6	57.8	9.0	3.4	0.5
Part-time fall 1982	0.0	52.2	6.7	10.0	27.2	3.5	0.1	0.4
Delayed entry	0.4	55.6	8.1	7.4	24.0	3.7	0.4	0.4
2-year public institution								
Full-time fall 1982	0.3	36.5	11.9	24.4	24.6	2.1	0.2	0.0
Part-time fall 1982	1.6	59.5	13.4	9.4	14.4	0.9	0.8	*
Delayed entry	1.7	63.0	16.9	12.0	6.2	0.2	0.0	0.0
Other institution								
Fall 1982	0.2	23.0	34.3	24.5	15.7	1.9	0.4	0.0
Delayed entry	1.9	31.4	48.4	14.4	3.8	0.1	0.1	0.0
Other enrollment	0.0	0.0	86.5	5.1	6.0	1.1	0.4	0.8
No enrollment	16.1	83.9	0.0	0.0	0.0	0.0	0.0	0.0

* Indicates less than 0.1 percent.
NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Interestingly, the rate at which students attained some type of postsecondary degree was about the same among immediate part-time entrants to postsecondary education as among those who delayed entry. At 4-year institutions, for example, 27 percent of immediate part-time entrants had attained a bachelor's degree by 1992, compared with 24 percent of those who delayed entry. Students who enrolled part time in 2-year institutions in fall 1982 were more likely than delayed entrants to earn a bachelor's degree, but rates of completion were about the same for both groups with regard to associate's degrees and vocational certificates.

These patterns suggest that differences in attainment may not be as much due to differences in the timing of entry as they are due to differences in the intensity of students' initial enrollment. There are many plausible reasons why one might find differences in attainment between those who enroll immediately full time and those who do not. One possibility is that those who enroll full time right after high school are more committed to postsecondary education than are other students, and therefore are more likely to complete a degree and attain their goals. Alternatively, the timing and intensity of students' initial enrollments may reflect other characteristics, such as financial capacity or the presence of outside distractions (such as family obligations, work demands, or the proximity of noncollege-bound friends), that affect students' inclination and opportunity to complete a degree and attain their goals.

Length of Initial Delay

The fact that students who delayed entry into postsecondary education were less likely to attain a credential may, in part, reflect the length of time they delayed their entry rather than delay per se. Long delays after high school would allow less time for completing longer term degrees within the 10-year period covered by the fourth followup. Although the data are somewhat ambiguous on this point, they do not appear to support this interpretation. Longer delays were associated with lower levels of attainment, and this was true whether the student's initial enrollment was in a 4-year or a 2-year public institution (table 5). Furthermore, the average length of delay, controlling for attainment, was the same regardless of the type of institution in which the student initially enrolled. These results suggest that long delays adversely affect attainment. It is still possible that students who delayed their enrollment did not have time to finish their degree within the 10-year period, but other data on length of delay also are not consistent with this interpretation.[10]

[10]The effects of “time censoring”—that is, arbitrarily limiting the period of educational attainment to the 10-year time frame of the fourth followup—cannot wholly be ruled out, but it does not appear to explain the lower levels of attainment among those who delayed their entry into postsecondary education. Only about 5 percent of the 1980 sophomores entered postsecondary education after June 1986 (see table 2.2 in the Compendium), so most postsecondary activity among this cohort took place before then. Nonetheless, about 5 percent of the sophomores did claim that their major activity in 1992 was taking undergraduate courses, and another 2 percent claimed to be enrolled in vocational/technical courses (see table 1.3 in the Compendium). It is possible that the findings with regard to the effects of delayed entry could be altered by the educational outcomes for these groups, but the relatively small number of students involved makes this unlikely.

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Table 5
Average length of initial delay (in months) among 1980 high school sophomores who delayed entry into postsecondary education, by highest degree attained through 1992 and type of institution

Type of institution	Average length of delay (months)	Average length of delay in months by highest degree through 1992				
		High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	13.9	18.9	22.7	12.4	5.5	4.9
4-year	28.8	33.3	28.8	29.4	19.4	—
2-year public	33.9	36.5	30.8	30.6	20.6	—

—Sample size is too small for a reliable estimate.

NOTE: The total line includes both immediate entrants and delayed entrants.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

The length of delay before initial entry into postsecondary education was strongly associated with students' postsecondary expectations while still in high school. Students with lower postsecondary expectations in 1982 delayed their entry longer than those who had higher aspirations (table 6). Students who in 1982 had no plans to pursue postsecondary education

Table 6
Average length of initial delay before entering postsecondary education (in months) among 1980 high school sophomores, by highest degree attained through 1992 and postsecondary expectations

Postsecondary expectations (1982)	Average length of delay (months)	Average length of delay in months by highest degree through 1992				
		High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	13.9	18.9	22.7	12.4	5.5	4.9
None	37.6	38.4	39.1	32.1	—	—
Vocational-technical	20.5	22.4	23.0	14.3	11.9	—
Less than four-year degree	13.2	17.4	16.1	8.2	6.6	5.8
College degree	8.2	12.1	17.6	9.0	4.7	4.3
Advanced degree	6.7	9.6	8.71	0.6	5.0	4.8

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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waited an average of 38 months before enrolling in a postsecondary institution, compared with an average of 13 months for those who intended to obtain a less-than-4-year degree or 8 months for those who planned to pursue a bachelor's degree.

Length of delay was also associated in expected ways with students' socioeconomic status (SES) and academic achievement in high school (table 7). Low SES students tended to delay their entry into postsecondary education longer than those in the middle two quartiles, and those in the middle two quartiles tended to delay longer than did high SES students. Furthermore, this pattern was evident at each level of postsecondary attainment. Similarly, students with lower achievement test scores in high school delayed entry into postsecondary education considerably longer than did students with high test scores.

Table 7
Average length of initial delay before entering postsecondary education (in months) among 1980 high school sophomores, by highest degree attained through 1992, socioeconomic status quartile, and test score quartile

Student characteristic	Average length of delay (months)	Average length of delay in months by highest degree through 1992				
		High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	13.9	18.9	22.7	12.4	5.5	4.9
Socioeconomic status						
Low quartile	21.5	23.8	29.2	15.2	7.7	—
Middle two quartiles	14.3	19.8	20.2	11.5	5.6	4.5
High quartile	7.9	11.8	15.2	9.5	4.9	4.9
Test score composite (1982)						
Low quartile	24.6	24.6	31.4	17.0	8.2	—
Middle two quartiles	14.2	17.8	19.7	11.3	6.0	4.9
High quartile	7.3	12.7	16.7	7.6	4.8	4.2

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

It should be noted that within each SES and test score quartile, lower levels of attainment were strongly associated with longer delays. In other words, although length of delay is likely to be greater among students with lower SES and achievement, there is still a very strong independent association between delay and attainment. This finding is important because it suggests that realizing improvements in rates of postsecondary attainment may depend on strategies for decreasing delay of entry, regardless of other variables (such as student demographics) that are strongly associated with attainment.

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Time to Degree

Another critical variable in understanding variation in the levels of postsecondary attainment among the 1980 high school sophomores is the time students took to complete a credential once they enrolled in some type of postsecondary institution. As one would expect, the time to degree attainment from first postsecondary enrollment to completion of a degree varied by the type of degree earned (table 8). For example, the average time needed to complete a vocational certificate was 30 months, the average time to complete an associate's degree was just over 36 months, and the average time to a bachelor's degree was 56 months.

Table 8
Average number of months between first enrollment and attainment of degrees, by type of degree, postsecondary expectations, and timing and intensity of initial postsecondary enrollment

Postsecondary education characteristics	Certificate	Associate's	Bachelor's
Total	29.6	36.8	55.7
Postsecondary expectations			
None	18.6	30.7	—
Vocational-technical	20.0	29.9	60.8
Less than 4-year degree	36.4	36.3	61.6
College degree	44.2	39.8	55.7
Advanced degree	44.8	43.5	53.5
Type of start in postsecondary education			
4-year institution			
Full-time fall 1982	57.2	47.0	53.1
Part-time fall 1982	—	—	71.1
Delayed entry	36.4	41.1	48.9
2-year institution			
Full-time fall 1982	43.4	34.6	66.5
Part-time fall 1982	37.6	55.7	67.6
Delayed entry	32.5	38.0	66.9
Other institution			
Fall 1982	19.4	27.8	58.5
Delayed entry	16.5	28.7	—

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

The time to complete a degree, holding degree types constant, varied by postsecondary expectations. In general, students whose first enrollment was in an institution that offered the type of degree that they expected to earn took less time to complete their degree than did those who changed their plans. While this finding may seem obvious, the effects of changing plans were

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more pronounced among students who expected to earn a bachelor's or advanced degree but ultimately completed a vocational certificate or associate's degree, than among students who completed a degree that was higher than what they had expected to earn while in high school.[11]

For example, students who earned a vocational certificate when their postsecondary goal was a bachelor's degree took, on average, 24 months longer from first enrollment to completion than those who started out with a vocational degree as their objective. However, there was no significant difference in the time required to earn a bachelor's degree between those who planned to earn a vocational certificate and those who set to earn a bachelor's degree. Most likely, students who initially enrolled in a 4-year or public 2-year institution pursued a bachelor's or associate's degree for some time before realizing that their interests or abilities lay elsewhere; thus, the total amount of time enrolled was considerably greater than the amount of time typically required to earn the vocational certificate or associate's degree they eventually received.[12] This finding is important because it underscores the fact that changing one's postsecondary course of study can involve a considerable loss of time. Hence, strategies that help students better hone their postsecondary objectives and that help students to achieve these objectives may have significant payoffs.

Not surprisingly, time to completion was closely associated with whether or not students enrolled full time or part time. Students who enrolled full time in 4-year institutions completed a bachelor's degree in 53 months, compared with 71 months for those enrolled part time. Full-time students in 2-year institutions finished an associate's degree in 35 months on average, while part-time students took an average of 56 months . However, when students enrolled initially in a 2-year institution and subsequently completed a bachelor's degree, there were no differences among full-time, part-time, or delayed-entry students in the average time to completion. For all three groups, completing a bachelor's degree took about 67 months. Immediate, full-time entrants to the public 2-year institutions were more likely to earn a bachelor's degree than were those who entered immediately part time or who delayed their entry, but it took all of these students about the same amount of time to attain a bachelor's degree if they succeeded in completing one.

Attainment and Number of Institutions Attended

On average, students who completed a bachelor's degree (excluding advanced degree recipients) attended more institutions than did those who earned an associate's degree or a vocational certificate (table 9). But these differences were due more to the relatively large number of students who transferred from a public 2-year or other institution to a 4-year institution than to

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[11]The degree attainment categories used here are not mutually exclusive, and the certificate earned by those who planned to get an associate's degree or higher may not be either the first or the highest degree they attained.

[12]The disparity in the amount of time taken to earn a vocational certificate between those who start out expecting to earn a bachelor's or advanced degree and those who start with a vocational objective is consistent with the literature on “reverse transfer” students, those students who transfer from a 4-year to a 2-year-or-less institution. Based on an analysis of the high school classes of 1972 and 1980, Grubb concludes that “. . . reverse transfer is not an especially successful route to completing credentials, even compared to the experiences of those students starting in 2-year institutions.” Four years after high school, reverse transfer students tended to have low completion rates compared with students in 2-year public institutions, presumably because they were still enrolled, and a large percentage of them (almost 40 percent) left higher education without completing a credential of any type. See W. Norton Grubb, *Access, Achievement, Completion, and “Milling Around” in Postsecondary Vocational Education* (Berkeley, CA: MPR Associates, Inc., April 1989), 33.

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the behavior of students who initially enrolled in a 4-year institution. The average number of institutions attended by bachelor's degree recipients whose initial enrollment was in a 4-year institution (either immediate or delayed) was consistently less than the number of institutions attended by bachelor's degree recipients who started in a public 2-year or other institution. Likewise, students whose initial enrollment was in a 4-year institution full time in fall 1982 and who earned a vocational certificate or associate's degree generally attended more institutions than did those whose degree more closely paralleled their initial enrollment.

Table 9
Average number of postsecondary institutions attended by highest degree attained through 1992, by timing and intensity of initial postsecondary enrollment

Type of start in postsecondary education	Certificate	Associate's	Bachelor's
Total	1.5	1.4	1.7
4-year institution			
Full-time fall 1982	2.3	2.0	1.5
Part-time fall 1982	—	—	2.2
Delayed entry	1.9	1.6	1.4
2-year institution			
Full-time fall 1982	1.7	1.3	2.3
Part-time fall 1982	1.7	1.6	2.4
Delayed entry	1.6	1.3	2.3
Other institution			
Fall 1982	1.2	1.3	2.1
Delayed entry	1.1	1.3	—

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

Findings and Conclusions

Members of the 1980 sophomore class who set high goals in high school tended to have higher average levels of educational attainment 10 years after leaving high school than did those who had lower postsecondary expectations. In addition, a key finding was that the odds of earning a bachelor's degree or higher change when entry into postsecondary education is delayed. Those who entered postsecondary education immediately full time were much more likely to earn a bachelor's degree or higher than were students who entered part time in fall 1982 or who delayed their entry into postsecondary education. This was true regardless of students' level of SES or their performance on standardized tests. Furthermore, the longer students delayed their entry into postsecondary education, the lower their average levels of

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educational attainment. Among those students who delayed entry for longer than about 1 year after high school, only one in ten attained a bachelor's degree or higher by 1992.

The length of delay in entering postsecondary education and the time needed to complete a degree influence the differences in rates of attainment between those who enter postsecondary education and those who wait. Nevertheless, the mere act of delay appears to be strongly associated with the lower likelihood of completing a postsecondary credential, especially a bachelor's degree or higher. Thus, while a future followup of this cohort would probably show an increase in attainment among those who delayed entry simply because more time would have passed, it is very unlikely that future rates would ever approach those who began postsecondary education immediately after high school, especially if they enrolled full time.

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Table Compendium

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Section 1

Where Did They Start And Where Are They Now?

Descriptive Characteristics of the 1980 Sophomore Class in 1992

- Educational aspirations of the 1980 sophomores in 1982 (when most of them were high school seniors) were related to their socioeconomic status (SES). Those in the lowest SES quartile were far more likely to expect no postsecondary education than were those in the middle two and highest quartiles. On the other hand, students in the highest quartile were much more likely than the other groups to expect college or graduate school (table 1.1).

- The 1980 sophomores' high school grades were positively associated with their SES: as grades increased, so too did sophomores' average SES. Test scores were positively associated with 1980 family income, high school grades, and parents' educational attainment (table 1.2).

Major Activities of the 1980 Sophomore Class in 1992

- Seventy-nine percent of 1980 high school sophomores reported that working was their primary activity during the week before they were surveyed in 1992. About 1 in 10 were enrolled in either a training or an academic educational program, and around 1 in 20 reported being laid off, looking for work, or both (table 1.3).

- Respondents whose mothers worked were neither more nor less likely to be working themselves than those whose mothers did not work. Moreover, the employment rates of 1980 high school sophomores did not vary by the intensity of their mothers' employment (full- or part-time) or by the timing of their mothers' employment (before elementary school, during elementary school, or during high school) (table 1.3).

- Employment rates varied by race–ethnicity. More than twice the percentage of blacks (8 percent) than of whites (3 percent) reported that they were looking for work the week before they were surveyed, and a larger percentage of whites than of blacks reported that they were working during that week. Among Hispanics, the percentages of those who were working and of those who were looking for work the week before they were surveyed did not differ significantly from those of whites (table 1.3).

Volunteer Activities of the 1980 Sophomore Class

- The percentage of 1980 high school sophomores who reported spending time engaged in volunteer work in 1992 was small. Even if one assumes that no respondents reported

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spending time in more than one activity, almost two-thirds (65 percent) of the cohort did not participate in any volunteer activities (table 1.4).

- Participation in voluntary activities varied by gender. Women reported involvement in church and education groups at a higher rate than did, while males were more likely than females to report spending time in sports groups (table 1.4).

- For married respondents, another factor affecting participation in volunteer activities was the presence of children in the family. Married 1980 sophomores with children were more likely to participate in education groups, youth clubs, or both than those without children. The presence of children was not significantly related to participation in these groups among unmarried respondents (table 1.4).

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Table 1.1—Percentage distribution of 1980 high school sophomores, by educational aspirations in 1982 and selected characteristics

Student characteristics	Educational aspirations				
	High school	Vocational/ technical	Some college	College degree	Advanced degree
Total	24.4	20.6	18.0	20.6	16.6
High school diploma status in 1982					
Regular diploma	18.9	20.3	18.7	23.3	18.7
Diploma returned	35.0	28.2	18.5	10.9	7.4
Returned no diploma	46.8	27.4	16.7	3.5	5.7
No return	65.3	18.8	7.7	3.3	4.8
Father's 1982 after-high-school aspirations for children					
Go to college	6.0	10.3	21.4	34.2	28.1
Full-time job	56.7	26.4	10.2	3.5	3.2
Trade school	19.6	65.8	9.4	2.8	2.4
Military service	36.0	29.5	14.3	12.3	7.9
Mother's 1982 after-high-school aspirations for children					
Go to college	6.6	10.9	22.4	33.2	26.9
Full-time job	60.9	24.4	9.4	2.9	2.4
Trade school	19.7	70.4	6.6	1.9	1.4
Military service	40.6	28.6	12.8	11.3	6.8
Occupational aspiration for age 30 in 1982					
Clerical	33.2	32.9	24.3	7.5	2.2
Craftsman	44.0	45.2	7.5	2.6	0.7
Farmer	42.7	24.7	13.7	14.5	4.4
Homemaker	58.0	17.6	12.6	8.6	3.2
Laborer	69.5	17.6	9.5	2.3	1.1
Manager	12.8	16.7	24.0	29.6	16.8
Military	41.8	24.0	9.6	16.5	8.2
Operative	59.8	27.5	8.9	2.6	1.2
Professional	8.7	11.7	19.7	35.5	24.3
Professional/doctor	5.5	4.2	6.3	18.1	65.9
Proprietor/owner	29.2	28.7	21.9	14.4	5.9
Protective service	29.1	17.4	33.0	14.8	5.7
Sales	25.7	18.4	19.6	30.9	5.5
School teacher	7.4	3.3	15.6	48.9	24.8
Service	36.5	42.1	12.0	5.7	3.8
Technical	9.8	23.8	28.6	24.4	13.4
Time watching TV (weekdays) in 1982					
No TV weekdays	22.4	19.2	15.9	20.2	22.3
Less than 1 hour	17.2	20.3	15.2	24.2	23.1
1–2 hours	19.8	20.2	18.8	21.7	19.5
2–3 hours	22.2	21.2	18.4	21.6	16.6
3–4 hours	24.5	20.6	17.7	23.4	13.8
4–5 hours	31.7	21.1	17.0	18.1	12.2
5 hours or more	35.8	21.1	17.3	15.0	10.8
Socioeconomic status (1980)					
Low quartile	40.7	26.6	15.2	11.3	6.1
Middle two quartiles	22.3	22.6	20.2	21.0	13.8
High quartile	7.4	9.7	16.2	32.2	34.5

NOTE: Percentages may not sum to 100 percent due to rounding.
SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 1.2—Average percentile rank of 1980 high school sophomores on specified composite scales, by selected characteristics

Student characteristics	Socio-economic status (1980)	Test scores (1982)	Self-concept (1982)	Locus of control (1982)	Community orientation (1982)
Total	50.7	49.6	50.1	49.1	48.2
Sex					
Male	52.5	50.4	50.2	48.6	50.8
Female	48.9	48.8	50.1	49.7	45.7
Race–ethnicity					
Native American/Alaska Native	40.3	35.1	51.1	42.0	54.3
Asian/Pacific Islander	53.8	54.1	53.2	50.3	55.8
Black	35.6	26.7	49.3	46.5	60.7
White	54.4	54.7	49.3	49.5	44.2
Hispanic-Mexican	32.2	32.8	52.1	42.5	55.9
Hispanic-Cuban	48.3	45.7	51.4	50.3	50.6
Hispanic-Puerto Rican	29.9	28.2	47.9	41.8	56.6
Hispanic-other	42.4	33.0	51.5	42.9	54.4
Family income in 1980					
Less than $8,000	24.7	31.9	53.6	44.5	54.0
$8,000–$14,999	33.9	43.4	49.3	43.9	47.4
$15,000–$19,999	42.0	48.9	47.5	46.1	45.8
$20,000–$24,999	48.7	53.1	48.3	47.7	46.0
$25,000–$29,999	54.8	55.1	47.4	50.2	43.9
$30,000–$39,999	62.0	58.1	46.1	50.3	43.0
$40,000–$49,999	69.1	61.2	45.1	51.6	43.1
$50,000 or more	78.9	63.7	43.6	53.6	45.4
Father's occupation in 1980					
Technical	69.8	57.7	45.5	49.7	45.9
Clerical	62.2	51.1	49.8	46.6	46.4
Craftsman	39.4	45.8	50.2	47.1	46.3
Farmer	40.1	45.8	49.9	43.3	43.9
Laborer	25.7	43.8	49.1	46.9	48.8
Manager	74.6	61.5	47.2	52.8	44.8
Military	53.0	48.1	43.5	50.2	51.5
Operative	32.6	43.5	51.5	46.8	46.9
Professional	78.4	63.0	47.5	55.4	45.3
Professional/doctor	89.9	74.8	43.8	57.4	46.9
Proprietor/owner	65.1	55.3	48.7	55.6	48.1
Protective service	56.2	54.8	50.2	51.0	48.7
Sales	69.9	61.1	45.4	53.0	45.0
School teacher	81.2	66.6	43.5	59.2	46.1
Service	31.7	44.5	50.7	49.2	52.0
Program in high school					
General	45.4	41.7	54.1	46.1	47.9
Academic	60.8	64.2	44.3	55.0	46.9
Vocational	39.7	34.2	52.8	42.0	48.5
Urbanicity of high school area					
Urban	45.8	43.3	50.9	48.4	53.4
Suburban	55.9	53.1	49.8	50.6	47.0
Rural	45.8	48.1	50.2	47.3	46.5

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Table 1.2—Average percentile rank of 1980 high school sophomores on specified composite scales, by selected characteristics—Continued

Student characteristics	Socio-economic status (1980)	Test scores (1982)	Self-concept (1982)	Locus of control (1982)	Community orientation (1982)
Community lived in Feb. 1982					
Rural/farm	43.3	47.8	47.7	42.5	42.4
Small city	51.6	52.2	46.0	45.2	42.6
Medium city	52.3	49.7	44.9	43.6	43.3
Suburb medium city	58.1	52.0	44.8	45.9	42.1
Large city	48.8	47.2	44.3	44.1	46.4
Suburb large city	65.4	63.3	44.5	48.3	40.2
Huge city	49.7	50.8	40.9	45.2	49.0
Suburb huge city	67.1	66.0	39.9	51.7	42.3
Military base	46.4	47.0	41.6	41.5	49.7
Religious background in 1980					
Baptist	42.3	41.7	48.2	47.2	51.6
Methodist	56.2	54.3	47.2	51.4	46.9
Lutheran	57.3	58.9	46.3	49.6	42.9
Presbyterian	60.8	56.6	46.3	51.9	45.8
Episcopalian	71.1	65.3	43.2	50.9	45.7
Other protestant	55.1	61.6	51.2	54.3	45.7
Catholic	53.5	54.8	49.1	49.5	45.3
Other Christian	49.2	48.4	52.3	50.3	48.5
Jewish	76.3	71.2	43.0	56.6	50.0
Other religion	41.2	39.6	48.7	46.5	46.9
None	44.2	44.9	53.4	45.4	45.1
Political beliefs in 1980					
Conservative	56.5	56.8	44.8	51.7	49.1
Moderate	55.5	57.8	45.5	52.4	47.6
Liberal	56.4	59.1	47.0	53.5	48.6
Radical	50.9	48.1	47.2	47.4	48.9
None	45.1	43.8	53.3	45.7	45.6
Grades in high school					
Mostly A 90–100	64.6	81.5	40.5	62.2	44.6
Half A/B 85–89	60.6	72.1	44.0	58.7	45.3
Mostly B 80–84	55.3	60.7	47.2	52.5	45.4
Half B/C 75–79	49.3	46.1	50.0	48.4	47.7
Mostly C 70–74	44.7	35.7	53.7	44.1	50.2
Half C/D 65–69	40.5	27.3	54.4	40.8	51.0
Mostly D 60–64	35.7	21.7	62.5	43.0	57.4
Parents' educational attainment in 1980					
High school	37.4	43.7	51.5	45.6	46.9
Vocational/technical	51.4	52.1	47.8	50.2	46.8
Some college	68.3	59.4	47.4	53.3	46.8
Bachelor's degree	82.2	66.2	44.3	55.7	44.5
Advanced degree	88.0	68.1	43.1	53.6	45.9

SOURCE: National Center for Eduction Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 1.3—Percentage distribution of 1980 high school sophomores who reported the following as their major activity or activities in 1992, by selected characteristics

Student characteristics	Working	Layoff	Looking for work	Taking break	Training program	Vocational/ technical courses	Undergraduate academic courses	Graduate/ professional courses	Active duty/armed forces
Total	79.3	1.3	3.9	2.9	0.2	2.0	5.4	3.3	0.8
Language spoken at home in 1982									
Single non-English language	78.7	0.5	5.1	4.1	0.4	2.5	5.2	4.7	1.9
Non-English language dominant	80.0	1.3	2.3	4.0	1.2	2.2	3.5	2.4	0.9
Combination of languages	78.9	1.1	3.9	2.7	0.4	1.9	7.8	4.6	0.3
English is the dominant language	80.4	1.0	3.5	2.8	0.1	1.8	5.5	3.1	0.9
Marital status in 1992									
Married	78.1	1.2	1.6	2.8	0.3	2.0	4.5	2.3	0.8
Separated	68.6	4.0	6.4	0.6	0.0	4.8	5.0	2.2	0.5
Divorced	79.9	1.5	6.7	1.9	0.6	2.4	7.6	3.6	1.2
Widowed	—	—	—	—	—	—	—	—	—
Never married	81.2	1.2	6.2	3.3	0.1	1.9	6.5	4.6	0.7
Living in a marriage-like relationship	86.8	0.5	6.5	1.6	0.0	0.7	1.0	1.7	0.0
Before elementary school mother worked									
Did not work	80.4	1.1	3.1	3.2	0.2	1.3	5.1	3.9	0.9
Part-time work	83.5	0.6	3.0	1.6	0.2	2.2	7.6	3.4	0.9
Full-time work	80.8	0.9	3.8	2.9	0.3	2.7	5.8	2.8	0.5
In elementary school mother worked									
Did not work	80.4	1.0	2.9	3.1	0.2	1.2	5.3	3.9	0.8
Part-time work	82.3	1.1	3.5	2.7	0.2	1.7	5.7	3.2	1.2
Full-time work	79.8	0.9	3.6	2.8	0.2	2.6	6.1	2.8	0.7
In high school mother worked									
Did not work	79.3	1.0	3.1	3.2	0.3	1.3	5.4	3.4	0.6
Part-time work	80.9	1.0	4.0	2.8	0.0	1.6	5.4	4.1	0.9
Full-time work	81.1	0.9	3.3	2.5	0.3	2.3	6.0	2.9	1.0
Race–ethnicity									
Native American/Alaska Native	77.0	1.6	7.1	2.2	0.0	1.2	4.7	3.4	0.2
Asian/Pacific Islander	75.7	0.3	3.1	7.3	0.8	2.0	5.4	6.3	1.1
Black	73.3	1.2	7.6	3.9	0.7	2.4	6.0	1.6	1.5
Hispanic	77.4	1.8	4.6	2.5	0.2	2.0	5.3	1.4	0.9
White	80.6	1.2	3.0	2.8	0.2	1.9	5.5	3.8	0.7

—Sample size is too small for a reliable estimate.

NOTES: Activities reported for week prior to survey in 1992. The percentage of students who reported working or looking for work differs from table 3.1.A due to a difference in timing (table 3.1.A refers to February 1992) and patterns of missing data. Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 1.4—Percentage of 1980 high school sophomores who reported spending time in various unpaid activities in 1992, by selected characteristics

Student characteristics	Church groups	Education groups	Organized volunteer	Political groups	Service clubs	Sports groups	Union trade professional	Youth clubs
Total	11.1	5.7	4.3	1.1	4.0	2.6	1.1	5.3
Sex								
Male	9.5	3.1	3.5	1.1	4.4	3.4	1.3	5.6
Female	12.7	8.1	5.0	1.2	3.7	1.8	1.0	5.0
Marital and parental status in 1992								
Married no children	12.0	4.0	3.9	1.5	5.1	2.6	1.7	3.8
Married with children	14.9	7.7	3.6	0.6	3.1	2.5	0.9	6.8
Divorced/sep/widow no children	7.4	2.1	7.6	0.2	3.7	0.7	0.2	2.5
Divorced/sep/widow with children	8.1	7.9	3.3	0.7	2.8	3.0	0.2	6.5
Never married no children	7.6	3.8	5.5	1.8	4.9	3.0	1.5	4.2
Never married with children	9.0	7.4	3.1	1.3	3.6	1.9	0.7	6.0
Living together no children	1.2	0.1	3.4	0.0	0.0	3.4	0.0	1.0
Living together with children	11.3	5.4	0.0	0.0	2.3	7.1	4.4	8.5
Highest degree earned by 1992								
Less than high school	6.0	5.4	1.4	0.9	2.5	4.4	1.9	4.3
High school	9.8	5.5	3.2	0.8	3.5	2.2	0.7	5.2
Certificate	13.0	5.5	5.0	1.0	3.1	2.3	0.9	5.6
Associate's	13.3	4.5	6.2	1.0	3.1	1.8	1.3	4.6
Bachelor's	14.1	5.5	6.4	2.1	5.7	3.1	1.9	5.6
Master's	12.5	13.9	7.0	2.8	9.2	4.4	2.8	5.0
Professional	9.7	7.3	4.6	3.3	8.1	3.9	2.0	10.0
Doctorate	—	—	—	—	—	—	—	—
Locus of control (1982)								
Low quartile	8.7	5.2	3.6	0.8	3.5	2.3	0.7	4.9
Middle two quartiles	12.1	5.6	4.5	1.2	4.2	2.6	1.3	5.7
High quartile	11.6	6.2	4.5	1.5	4.2	2.9	1.2	5.0

—Sample size is too small for a reliable estimate.

NOTE: The activity categories are not exclusive.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Section 2

Educational Experiences of the 1980 Sophomore Class

Differences in Attainment

- Educational expectations in high school were clearly related to educational attainment 10 years later, but sophomores' expectations may be set well before they get to high school. Differences in attainment were related to expectations that were set as early as the sixth grade. A greater percentage of those who had decided to attend college in sixth grade enrolled in a 4-year institution after high school than of those who had decided against college, were not sure, or had not thought about it (table 2.1).

- Females were more likely to enroll immediately in either a 4- or 2-year college, and were more likely to have enrolled in some type of postsecondary institution before 1992 than were males (table 2.3). However, males and females were equally likely to have attained a bachelor's, master's, or doctoral degree by 1992. Males were more likely than females to have earned a professional degree (table 2.4.A).

- Nearly three out of four 1980 high school sophomores in the lowest SES quartile had no postsecondary degrees by 1992, and this group was significantly less likely to graduate from high school or to attain a bachelor's degree or higher than 1980 sophomores in the middle two and upper SES quartiles. Those in the middle two SES quartiles were less likely to attain a bachelor's degree or higher than those in the highest quartile (table 2.4.A).

- The same patterns of attainment that were apparent by SES appear when the sample is divided by test score quartiles.[11] Those in the lowest quartile were less likely to finish high school or attain a degree beyond high school than those in the middle two or highest. Respondents in the highest quartile were more likely to have earned bachelor's degrees or higher than those in the middle two quartiles (table 2.4.A).

- The timing of 1980 sophomores' entry into postsecondary education was significantly related to their levels of educational attainment. Those who entered a postsecondary institution after October 1982 were more likely to have attained only a high school diploma or vocational certificate by 1992 than were those who entered immediately; however, those who entered immediately were more likely to have attained a bachelor's or advanced degree by 1992 (tables 2.4.B & 2.4.C).

[11]The similarity of the relationship between attainment and SES and attainment and test scores is due to the high correlation between SES and test scores. The Pearson correlation between these two variables is 0.775.

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- The intensity of initial attendance at a postsecondary institution was related to degree attainment. Respondents who attended either a 4-year or public 2-year school immediately after high school were more likely to attain bachelor's degrees if they enrolled full time than if they enrolled part time. By contrast, those who enrolled part time were more likely to have no credential beyond a high school diploma than those who enrolled full time (table 2.4.A).

Graduate School Admissions

- While about two-thirds (68 percent) of bachelor's degree recipients took graduate or professional admissions exams, fewer than half (31 percent) actually applied to a graduate or professional institution. The small number of respondents who applied to graduate schools and the large number who were accepted at the school of their choice implies a strong degree of self-selection throughout the graduate school application process (table 2.9).

- Bachelor's degree recipients who borrowed money for their undergraduate education were three times as likely to take graduate or professional admissions exams as were those who had not borrowed. However, those who had borrowed money applied to graduate school at only one-third the rate of those who had not borrowed. Of those who applied, those who borrowed money and those who did not were equally likely to be accepted at their first-choice institution. Among those who borrowed, the amount borrowed did not affect the rate of participation in graduate admissions tests, the application rate, or the rate of acceptance into a graduate program (table 2.9).

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Table 2.1—Percentage distribution of 1980 high school sophomores by type of postsecondary institution in which they first enrolled, by selected characteristics

Student characteristics	Never enrolled	Private for-profit	Private not-for-profit less-than-4-year	Public less-than-2-year	Public 2-year	Public 4-year	Private not-for-profit 4-year
Total	33.6	6.1	1.4	3.5	26.7	19.5	9.3
College expectations in sixth grade							
Decided to go	16.6	4.9	1.5	2.8	25.8	32.5	15.9
Planned not to go	52.3	7.2	1.4	4.2	24.3	7.7	2.9
Not sure	34.3	6.8	1.7	3.8	29.0	17.9	6.5
Hadn't thought about it	28.5	6.5	1.5	4.8	30.6	19.5	8.7
Postsecondary expectations in 1982							
None	73.1	4.5	0.5	2.7	15.6	2.6	1.0
Vocational/technical	41.1	14.0	2.0	7.2	29.5	4.8	1.4
Less-than-4-year degree	21.4	6.2	2.3	2.2	45.3	16.5	6.1
College degree	8.0	2.8	1.2	2.8	26.7	40.6	17.9
Advanced degree	6.6	1.8	1.4	2.7	20.6	42.6	24.4
First institution start date							
Never enrolled	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Before November 1982	0.0	5.5	2.2	3.8	33.0	37.3	18.2
Nov. 1982–May 1983	0.0	17.6	1.6	8.2	54.6	11.9	6.1
June 1983–May 1984	0.0	14.8	3.3	7.3	47.9	19.1	7.6
June 1984–May 1986	0.0	21.8	2.4	10.7	46.6	13.4	5.1
June 1986 or later	0.0	18.3	1.7	8.8	53.9	12.6	4.6
Number of applications to college in 1982							
Did not apply	53.6	7.5	0.9	4.4	25.9	5.8	2.0
1 college	8.9	5.2	1.7	2.6	32.7	37.1	11.8
2–3 colleges	4.7	3.0	2.4	3.1	22.2	42.7	21.8
4 or more colleges	4.1	1.6	1.5	1.6	11.2	37.4	42.7
Accepted at 1982 first-choice college							
No applications	59.8	6.7	0.8	3.5	24.1	3.8	1.3
Attended first choice	0.0	5.6	2.5	3.5	29.8	40.3	18.5
Accepted but did not attend	21.4	5.9	1.1	4.5	36.4	21.0	9.7
Was not accepted at first choice	11.3	4.5	1.5	2.6	25.8	28.5	25.9

NOTES: Institution types are defined by degree offerings (less-than-2-year, 2- to 3-year, 4-year or more) and control (public, private not-for-profit, and private for-profit). Percentages may not sum to 100 percent due to rounding.
SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

Table 2.2—Percentage distribution of 1980 high school sophomores by the timing of their first postsecondary enrollment, by selected characteristics

Student characteristics	Never enrolled	Before November 1982	November 1982–May 1983	June 1983–May 1984	June 1984–May 1985	June 1985–May 1986	June 1986–May 1987	June 1987–May 1988	June 1988–May 1989	June 1989–May 1990	June 1990–May 1991	June 1991 or later
Total	35.5	44.1	3.5	6.5	2.7	2.4	1.3	1.1	0.9	1.0	0.6	0.5
College expectations in sixth grade												
Decided to go	18.0	64.4	3.4	6.1	2.1	2.3	1.2	0.7	0.8	0.5	0.3	0.2
Planned not to go	54.4	24.6	3.3	6.4	2.6	2.6	1.4	1.4	0.9	1.0	0.9	0.6
Not sure	35.9	43.7	4.3	6.5	2.6	2.0	1.5	1.0	0.4	1.3	0.6	0.3
Hadn't thought about it	30.6	46.3	4.2	6.4	3.7	2.8	1.4	1.1	1.3	1.2	0.5	0.5
Postsecondary expectations in 1982												
None	75.7	4.7	1.8	4.5	2.5	3.0	1.5	1.6	1.3	1.5	1.0	0.9
Vocational/technical	43.6	27.1	5.5	8.7	4.2	3.6	1.8	1.6	1.6	1.1	0.7	0.5
Less-than-4-year degree	23.5	51.8	5.2	8.8	2.9	2.9	1.3	1.0	0.6	1.0	0.4	0.7
College degree	9.0	76.7	3.1	5.0	2.2	1.4	1.3	0.4	0.6	0.3	0.1	0.1
Advanced degree	7.3	80.4	2.5	5.5	1.5	1.2	0.4	0.4	0.2	0.4	0.2	0.0
First postsecondary institution type												
Never enrolled	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Private for-profit	0.0	39.6	10.1	15.8	10.7	7.8	3.6	4.1	1.1	3.9	2.3	1.0
Private not-for-profit less-than-4-year	0.0	66.2	3.8	15.0	5.9	2.7	0.3	0.3	2.4	2.7	0.9	0.0
Public less-than-2-year	0.0	48.5	8.3	13.6	8.8	7.2	4.7	2.6	0.7	3.5	1.6	0.4
Public 2-year	0.0	58.6	7.7	12.5	4.5	5.2	2.4	2.2	2.5	1.8	1.3	1.2
Public 4-year	0.0	84.5	2.2	6.4	2.2	1.3	1.2	0.5	0.8	0.4	0.4	0.2
Private not-for-profit 4-year	0.0	86.9	2.3	5.3	1.7	1.2	0.9	0.7	0.3	0.2	0.1	0.5
Number of applications to college in 1982												
Did not apply	56.3	17.9	3.7	7.8	3.4	3.5	1.8	1.6	1.3	1.3	0.9	0.6
1 college	9.9	77.0	3.8	4.6	1.6	1.1	0.6	0.3	0.3	0.3	0.3	0.2
2–3 colleges	5.6	82.7	2.8	3.9	2.3	1.0	0.7	0.2	0.5	0.3	0.0	0.1
4 or more colleges	5.0	89.9	0.7	3.2	0.3	0.8	0.0	0.1	0.0	0.0	0.1	0.0

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Table 2.2—Percentage distribution of 1980 high school sophomores by the timing of their first postsecondary enrollment, by selected characteristics—Continued

Student characteristics	Never enrolled	Before November 1982	November 1982–May 1983	June 1983–May 1984	June 1984–May 1985	June 1985–May 1986	June 1986–May 1987	June 1987–May 1988	June 1988–May 1989	June 1989–May 1990	June 1990–May 1991	June 1991 or later
Accepted at 1982 first choice college												
No applications	62.4	10.2	3.3	7.1	4.0	4.1	2.1	1.9	1.7	1.4	1.1	0.9
Attended first choice	0.0	89.7	3.8	5.0	0.8	0.3	0.2	0.1	0.0	0.1	0.1	0.0
Accepted but did not attend	23.3	51.0	5.3	8.2	4.3	2.3	1.8	1.2	1.0	0.9	0.4	0.3
Was not accepted at first choice	12.8	73.1	2.7	7.1	1.9	1.0	0.4	0.1	0.4	0.0	0.5	0.0

NOTES: Percentages may not sum to 100 percent due to rounding. The percentage of students in the "never enrolled" category does not match the percentages in other tables due to a different pattern of missing data in the variables used to specify the timing of first enrollment.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.3—Percentage distribution of 1980 high school sophomores by the timing, intensity, and institution type of their initial enrollment in postsecondary education, by selected characteristics

Student characteristics	Fall 1982 full-time 4-year	Fall 1982 full-time public 2-year	Fall 1982 part-time 4-year	Fall 1982 part-time public 2-year	Fall 1982 other	Delay 4-year	Delay public 2-year	Delay other	Other enrollment	No enrollment
Total	23.4	10.5	1.1	4.1	5.0	4.2	10.3	5.9	1.9	33.6
Sex										
Male	22.0	9.3	1.0	3.4	4.3	4.7	10.3	5.0	1.9	38.1
Female	24.8	11.6	1.2	4.8	5.8	3.8	10.2	6.8	1.9	29.3
High school diploma status in 1982										
Regular diploma	28.2	12.2	1.3	4.6	5.8	4.5	10.1	5.3	1.6	26.3
Returned for diploma	1.9	6.1	0.8	4.9	3.0	3.8	17.6	11.3	1.7	48.7
Returned but no diploma	0.0	3.0	0.1	0.9	1.1	4.1	7.9	15.6	7.7	59.7
Never returned	1.0	1.3	0.0	0.4	0.9	1.5	7.3	6.5	2.7	78.4
Postsecondary expectations 1982										
None	0.7	1.3	0.1	1.2	1.4	2.9	10.5	6.3	2.6	73.1
Vocational/technical	1.9	9.1	0.5	4.1	11.6	3.9	14.0	11.5	2.4	41.1
Less-than-4-year degree	15.8	21.3	1.7	7.1	5.9	5.0	14.9	4.8	2.1	21.4
College degree	51.3	14.1	1.9	5.5	3.9	5.4	6.1	2.9	1.0	8.0
Advanced degree	60.1	11.0	1.8	3.8	3.7	5.0	5.1	2.2	0.7	6.6
Socioeconomic status (1980)										
Low quartile	8.7	7.9	0.6	2.3	4.3	4.0	9.3	8.3	2.7	52.0
Middle two quartiles	21.5	11.9	1.4	5.2	6.1	4.1	11.8	5.7	1.4	31.0
High quartile	48.4	12.3	1.3	4.9	5.1	5.4	6.6	3.0	1.4	11.7
Test score composite (1982)										
Low quartile	5.2	5.6	0.2	2.8	3.9	3.1	9.5	8.1	2.8	58.8
Middle two quartiles	17.7	13.6	1.4	5.1	6.2	4.4	11.9	6.4	1.8	31.6
High quartile	60.4	10.0	1.8	3.2	4.3	4.7	6.2	2.5	0.5	6.4
Race–ethnicity										
Native American/Alaska Native	8.4	6.1	0.2	2.8	3.0	9.2	16.6	5.2	2.5	46.0
Asian/Pacific Islander	40.6	16.1	2.1	7.0	2.8	3.7	11.1	3.3	0.8	12.5
Black	18.9	8.8	0.7	2.8	4.3	5.1	9.7	8.6	2.5	38.7
Hispanic	11.1	9.5	1.4	3.8	4.6	3.8	10.7	6.1	2.1	46.9
White	25.6	11.0	1.1	4.4	5.3	4.1	10.1	5.5	1.7	31.2

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Table 2.3—Percentage distribution of 1980 high school sophomores by the timing, intensity, and institution type of their initial enrollment in postsecondary education, by selected characteristics—Continued

Student characteristics	Fall 1982 full-time 4-year	Fall 1982 full-time public 2-year	Fall 1982 part-time 4-year	Fall 1982 part-time public 2-year	Fall 1982 other	Delay 4-year	Delay public 2-year	Delay other	Other enrollment	No enrollment
Parents' educational attainment in 1980										
No high school diploma	12.9	9.8	1.0	3.3	5.3	3.8	11.6	7.2	2.2	42.9
High school graduate	18.9	8.1	0.7	4.3	5.7	3.7	16.0	8.4	1.5	32.7
Vocational/technical	22.9	12.5	1.3	4.5	6.2	3.9	11.5	7.4	2.2	27.7
Some college	35.5	14.1	1.3	6.2	4.8	5.5	9.2	4.3	1.1	18.1
Bachelor's degree	50.6	13.0	1.6	4.9	3.6	3.7	6.6	3.0	1.6	11.6
Advanced degree	52.9	7.5	1.0	3.3	5.7	7.2	6.8	2.8	0.9	12.0

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

Table 2.4.A—Percentage distribution of 1980 high school sophomores by highest degree earned through 1992, by selected characteristics

Student characteristics	Less than high school	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Total	5.8	51.5	11.0	7.9	20.0	2.7	0.9	0.2
Sex								
Male	6.5	53.5	9.7	6.7	19.5	2.6	1.3	0.2
Female	5.0	49.5	12.4	9.1	20.5	2.8	0.5	0.1
High school diploma status in 1982								
Regular diploma	0.3	51.9	10.8	8.7	23.9	3.2	1.1	0.2
Returned for diploma	6.8	68.3	14.4	7.0	3.4	0.1	0.1	0.0
Returned but no diploma	27.1	47.7	19.9	3.4	1.9	0.0	0.0	0.0
Never returned	51.5	35.7	9.5	2.1	0.9	0.3	0.0	0.0
Postsecondary expectations in 1982								
None	15.5	71.1	9.3	3.0	1.0	0.1	0.0	0.1
Vocational/technical	4.6	61.6	19.8	10.7	3.3	0.1	0.0	0.0
Less-than-4-year degree	1.6	53.2	13.3	15.6	15.0	1.1	0.2	0.0
College degree	0.9	35.3	6.8	6.3	44.9	5.0	0.8	0.1
Advanced degree	0.8	28.9	5.2	5.7	45.1	9.0	4.4	0.8
Socioeconomic status (1980)								
Low quartile	9.0	64.6	12.3	6.9	6.4	0.7	0.1	0.0
Middle two quartiles	3.9	53.8	11.5	9.1	19.0	2.0	0.5	0.1
High quartile	1.4	32.7	7.0	7.6	41.2	6.9	2.7	0.5
Test score composite (1982)								
Low quartile	15.6	64.0	13.0	4.1	3.0	0.2	0.0	0.1
Middle two quartiles	3.1	56.2	12.8	10.1	16.1	1.5	0.3	0.0
High quartile	0.1	26.5	4.8	7.2	49.2	8.7	3.0	0.6
Type of start in postsecondary education								
Fall 1982 full-time 4-year	0.0	21.2	3.5	4.6	57.8	9.0	3.4	0.5
Fall 1982 full-time public 2-year	0.3	36.5	11.9	24.4	24.6	2.1	0.2	0.0
Fall 1982 part-time 4-year	0.0	52.2	6.7	10.0	27.2	3.5	0.1	0.4
Fall 1982 part-time public 2-year	1.6	59.5	13.4	9.4	14.4	0.9	0.8	0.0
Fall 1982 other	0.2	23.0	34.3	24.5	15.7	1.9	0.4	0.0
Delay 4-year	0.4	55.6	8.1	7.4	24.0	3.7	0.4	0.4
Delay public 2-year	1.7	63.0	16.9	12.0	6.2	0.2	0.0	0.0
Delay other	1.9	31.4	48.4	14.4	3.8	0.1	0.1	0.0
Other enrollment	0.0	0.0	86.5	5.1	6.0	1.1	0.4	0.8
No enrollment	16.1	83.9	0.0	0.0	0.0	0.0	0.0	0.0

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Table 2.4.A—Percentage distribution of 1980 high school sophomores by highest degree earned through 1992, by selected characteristics—Continued

Student characteristics	Less than high school	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Race–ethnicity								
Native American/Alaska Native	17.8	58.2	11.8	5.0	6.7	0.5	0.0	0.0
Asian/Pacific Islander	0.6	40.9	6.9	6.2	32.7	4.7	7.5	0.7
Black	6.9	59.6	16.3	5.2	10.0	1.5	0.5	0.2
Hispanic	11.9	59.6	11.2	7.3	9.0	0.6	0.3	0.0
White	4.9	49.1	10.1	8.4	23.1	3.2	1.0	0.2
Parents' educational attainment in 1980								
No high school diploma	6.5	59.8	12.8	8.6	10.8	1.2	0.3	0.1
High school graduate	5.2	59.1	12.4	6.0	16.6	0.3	0.4	0.0
Vocational/technical	3.0	49.2	15.4	10.2	19.1	2.4	0.5	0.1
Some college	2.1	43.7	8.4	8.4	32.0	4.3	1.0	0.2
Bachelor's degree	1.4	32.6	4.9	8.1	42.4	6.9	3.1	0.5
Advanced degree	3.5	23.9	8.6	4.9	44.1	10.0	4.3	0.7

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.4.B—Percentage distribution of 1980 high school sophomores who enrolled in postsecondary education immediately after high school by highest degree attained through 1992, by selected characteristics

Student characteristics	High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	29.6	10.0	12.2	40.3	7.9
Sex					
Male	29.5	8.6	10.1	42.3	9.5
Female	29.7	11.1	13.9	38.7	6.7
High school diploma status in 1982					
Regular diploma	29.0	9.6	11.9	41.3	8.2
Returned for diploma	51.0	20.4	20.3	7.6	0.7
Returned but no diploma	—	—	—	—	—
Never returned	45.0	25.4	13.1	16.5	0.0
Postsecondary expectations in 1982					
None	49.0	29.1	15.3	6.5	0.0
Vocational/technical	39.2	29.9	23.5	7.1	0.3
Less-than-4-year degree	36.7	13.3	23.9	23.9	2.2
College degree	26.6	5.2	6.6	54.3	7.4
Advanced degree	22.3	3.6	5.4	52.0	16.7
Socioeconomic status (1980)					
Low quartile	38.5	18.1	18.2	22.0	3.2
Middle two quartiles	33.2	11.0	14.1	36.4	5.4
High quartile	21.9	5.0	7.6	52.5	13.1
Test score composite (1982)					
Low quartile	48.5	23.4	13.7	13.3	1.1
Middle two quartiles	35.5	12.5	16.1	32.1	3.9
High quartile	17.9	2.9	7.1	57.2	14.9
Race–ethnicity					
Native American/Alaska Native	38.0	23.1	10.1	26.3	2.6
Asian/Pacific Islander	23.6	5.9	6.5	45.3	18.6
Black	43.8	19.4	8.6	23.3	4.9
Hispanic-Mexican	43.1	11.4	16.0	26.5	2.9
White	27.0	8.7	12.4	43.5	8.5
Parents' educational attainment in 1980					
No high school diploma	35.5	13.3	18.1	28.6	4.4
High school graduate	36.1	13.9	7.5	40.9	1.6
Vocational/technical	30.3	12.0	14.4	37.0	6.3
Some college	27.8	7.5	9.8	46.5	8.4
Bachelor's degree	22.2	2.7	8.5	53.7	12.9
Advanced degree	15.4	6.8	5.2	53.0	19.6

—Sample size is too small for a reliable estimate.

NOTES: Students who enrolled in postsecondary education before November 1982 were defined as immediate entrants. Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.4.C—Percentage distribution of 1980 high school sophomores who delayed entry into postsecondary education by highest degree attained through 1992, by selected characteristics

Student characteristics	High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	53.8	24.2	11.8	9.2	1.1
Sex					
Male	53.1	22.7	12.4	10.8	1.0
Female	54.4	25.6	11.2	7.7	1.2
High school diploma status in 1982					
Regular diploma	54.2	22.4	12.0	10.5	0.9
Diploma returned	54.8	28.3	10.8	5.8	0.3
Returned no diploma	42.9	40.8	9.3	7.0	0.0
Had not returned	51.9	35.7	9.5	1.2	1.7
Postsecondary expectations in 1982					
None	57.9	27.4	11.2	3.0	0.6
Vocational/technical	50.3	32.0	13.8	3.9	0.0
Less-than-4-year degree	57.9	18.5	12.4	10.5	0.8
College degree	54.6	15.5	8.8	20.0	1.2
Advanced degree	43.7	16.6	10.3	23.8	5.6
Socioeconomic status (1980)					
Low quartile	57.3	25.8	11.5	5.3	0.1
Middle two quartiles	54.4	24.5	11.8	8.7	0.7
High quartile	45.5	16.7	14.3	19.9	3.7
Test score composite (1982)					
Low quartile	61.0	28.4	7.8	2.8	0.0
Middle two quartiles	53.2	25.7	12.7	7.9	0.6
High quartile	44.6	17.2	10.7	24.5	3.0
Race–ethnicity					
Native American/Alaska Native	72.2	15.0	8.8	4.0	0.0
Asian/Pacific Islander	72.1	11.5	9.2	7.3	0.0
Black	54.8	29.7	8.3	6.6	0.6
Hispanic	57.6	27.9	10.4	3.9	0.2
White	52.6	23.1	12.3	10.7	1.4
Parents' educational attainment in 1980					
No high school diploma	54.3	28.0	11.3	6.0	0.3
High school graduate	64.1	20.5	11.0	4.4	0.0
Vocational/technical	46.8	33.1	14.0	5.8	0.4
Some college	56.4	15.6	11.9	15.1	1.0
Bachelor's degree	46.1	15.2	14.3	17.3	7.1
Advanced degree	29.7	19.9	7.4	35.9	7.1

NOTES: Percentages may not sum to 100 percent due to rounding. Students who enrolled in postsecondary education after November 1982 were defined as delayed entrants.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.5—Average length of initial delay in months prior to entry into postsecondary education among 1980 high school sophomores, by highest degree attained through 1992 and selected characteristics

	High school	Certificate	Associate's	Bachelor's	Advanced degree	Average, all degrees
Total	19.0	22.8	12.5	5.6	5.0	14.0
Sex						
Male	20.2	25.6	13.8	6.2	4.8	14.9
Female	18.0	20.7	11.6	5.0	5.2	13.3
High school diploma status in 1982						
Regular diploma	17.9	21.3	11.3	5.5	4.8	12.9
Diploma returned	30.3	37.8	29.4	—	—	30.9
Returned no diploma	—	—	—	—	—	21.9
Had not returned	24.2	32.9	—	—	—	26.2
Postsecondary expectations in 1982						
None	38.4	39.2	32.2	—	—	37.6
Vocational/technical	22.5	23.1	14.4	11.9	—	20.6
Less-than-4-year degree	17.4	16.1	8.2	6.7	5.9	13.2
College degree	12.1	17.6	9.0	4.7	4.4	8.2
Advanced degree	9.6	8.7	10.7	5.1	4.9	6.7
Type of start in postsecondary education						
Full-time fall 1982 4-year	4.0	3.9	4.0	4.0	3.9	4.0
Full-time fall 1982 public 2-year	4.0	4.5	4.0	3.9	3.4	4.0
Part-time fall 1982 4-year	4.6	—	—	3.5	—	4.1
Part-time fall 1982 public 2-year	4.1	13.7	4.2	3.9	—	5.2
Delay 4-year	33.3	28.9	29.5	19.4	—	28.9
Delay public 2-year	36.6	30.8	30.6	20.6	—	33.9
Fall 1982 other	4.0	3.8	3.6	4.2	—	3.9
Delay other	25.4	35.0	32.9	—	—	30.9
Other	—	44.2	—	—	—	41.0
Socioeconomic status						
Low quartile	23.8	29.2	15.2	7.8	—	21.5
Middle two quartiles	19.9	20.2	11.6	5.7	4.5	14.4
High quartile	11.9	15.2	9.5	4.9	4.9	7.9
Test score composite in 1982						
Low quartile	24.7	31.5	17.1	8.3	—	24.6
Middle two quartiles	17.9	19.8	11.3	6.1	4.9	14.2
High quartile	12.7	16.7	7.7	4.9	4.3	7.3
Race–ethnicity						
Native American/Alaska Native	31.2	23.0	—	—	—	25.7
Asian/Pacific Islander	11.9	—	—	4.3	3.8	8.3
Black	20.7	20.8	14.1	6.3	7.6	17.4
Hispanic	20.1	28.2	13.0	5.8	4.1	17.8
White	18.5	22.9	11.8	5.5	4.9	13.1
Parents educational attainment by 1980						
No high school diploma	22.4	28.3	13.3	6.4	4.4	18.9
High school graduate	22.3	23.5	16.3	5.4	—	17.8
Vocational/technical	19.7	20.4	12.0	5.1	4.2	14.2
Some college	15.0	15.5	12.3	5.4	4.6	10.3
Bachelor's degree	9.1	18.7	6.9	4.8	5.3	7.0
Advanced degree	10.9	16.7	6.3	5.8	5.1	7.6

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.6.A—Percentage of 1980 high school sophomores attaining degrees and average number of months between first enrollment and attainment of degrees, by type of degree and selected characteristics

Student characteristics	Percentage who attained certificate	Average months to certificate	Percentage who attained associate's	Average months to associate's	Percentage who attained bachelor's	Average months to bachelor's
Total	12.1	29.7	9.4	36.8	22.4	55.7
Sex						
Male	10.3	30.3	8.2	37.7	22.2	56.4
Female	13.8	29.3	10.6	36.1	22.6	55.1
Postsecondary expectations in 1982						
None	8.5	18.6	3.1	30.8	0.9	—
Vocational/technical	20.3	20.0	10.6	30.0	3.0	61.0
Less-than-4-year degree	14.4	36.4	17.4	36.3	15.4	61.6
College degree	8.9	44.2	10.2	39.8	48.9	55.8
Advanced degree	7.8	44.8	8.8	43.6	56.9	53.6
Type of start in postsecondary education						
Full-time fall 1982 4-year	6.4	57.2	6.0	47.0	68.6	53.1
Full-time fall 1982 public 2-year	15.0	43.4	34.4	34.6	25.5	66.5
Part-time fall 1982 4-year	8.8	—	11.8	—	30.7	71.2
Part-time fall 1982 public 2-year	14.6	37.7	9.6	55.7	14.9	67.7
Delay 4-year	9.7	36.5	7.2	41.1	26.4	49.0
Delay public 2-year	18.1	32.6	13.1	38.1	5.8	66.9
Fall 1982 other	35.5	19.5	27.0	27.8	16.9	58.5
Delay other	47.9	16.5	14.8	28.7	3.9	—
Other	85.0	15.1	5.0	—	5.6	—
Socioeconomic status (1980)						
Low quartile	12.8	23.9	7.0	36.9	6.6	55.9
Middle two quartiles	12.5	29.9	11.2	34.9	20.3	56.8
High quartile	9.3	38.0	10.4	38.9	49.2	54.4
Test score composite (1982)						
Low quartile	13.0	24.1	4.0	29.8	2.8	62.8
Middle two quartiles	14.1	29.3	12.0	35.9	17.1	57.9
High quartile	6.8	45.8	10.0	39.9	59.0	53.6
Race–ethnicity						
Native American/Alaska Native	12.2	33.0	5.2	—	6.4	—
Asian/Pacific Islander	7.4	—	8.1	40.5	42.5	59.0
Black	17.0	31.5	5.2	40.2	11.1	57.3
Hispanic	12.2	28.7	7.9	45.3	9.3	60.0
White	11.1	29.5	10.4	35.3	25.9	55.3
Parents' educational attainment in 1980						
No high school diploma	12.8	24.3	9.3	33.0	11.2	57.2
High school graduate	12.7	29.3	6.6	36.2	16.4	53.1
Vocational/technical	16.6	29.6	12.1	34.7	21.5	57.8
Some college	10.3	34.0	11.6	42.0	35.5	56.1
Bachelor's degree	7.0	45.5	11.7	36.4	50.5	54.9
Advanced degree	11.5	46.9	6.0	35.5	57.3	52.5

—Sample size is too small for a reliable estimate.

NOTE: The percentage of students at each attainment level does not necessarily match the percentage distributions by highest degree because students can have earned degrees other than their highest degree.
SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.6.B—Percentage of 1980 high school sophomores who entered postsecondary education before November 1982 attaining degrees and average number of months between first enrollment and attainment of degrees, by type of degree and selected characteristics

Student characteristics	Percentage who attained certificate	Average months to certificate	Percentage who attained associate's	Average months to associate's	Percentage who attained bachelor's	Average months to bachelor's
Total	12.6	38.9	15.6	37.4	46.5	55.8
Sex						
Male	10.5	42.9	13.7	38.1	50.0	56.7
Female	14.2	36.4	17.2	36.9	43.6	55.0
Postsecondary expectations in 1982						
None	28.1	28.0	15.6	—	6.1	—
Vocational/technical	33.4	23.6	24.3	28.3	7.0	68.3
Less-than-4-year degree	15.2	41.2	27.1	36.7	24.8	62.1
College degree	7.8	50.2	11.3	40.4	59.8	55.5
Advanced degree	6.4	54.6	9.1	44.1	66.5	53.9
Type of start in postsecondary education						
Full-time fall 1982 4-year	6.4	57.2	6.0	47.0	68.6	53.1
Full-time fall 1982 public 2-year	15.0	43.4	34.4	34.6	25.5	66.5
Part-time fall 1982 4-year	8.8	—	11.8	—	30.7	71.2
Part-time fall 1982 public 2-year	14.6	37.7	9.6	55.7	14.9	67.7
Fall 1982 other	35.5	19.5	27.0	27.8	16.9	58.5
Socioeconomic status (1980)						
Low quartile	20.6	34.0	18.6	36.8	23.9	57.0
Middle two quartiles	13.1	38.5	18.6	35.3	40.0	56.8
High quartile	8.2	44.9	11.2	40.8	63.5	54.7
Test score composite (1982)						
Low quartile	26.3	32.8	14.1	30.1	13.2	63.9
Middle two quartiles	15.6	37.1	20.4	36.6	34.8	58.5
High quartile	5.2	52.3	10.4	40.2	69.8	53.5
Race–ethnicity						
Native American/Alaska Native	24.3	—	15.0	—	25.9	—
Asian/Pacific Islander	7.2	—	8.8	38.3	60.7	58.2
Black	22.1	42.7	9.0	43.2	26.9	59.0
Hispanic	15.9	41.6	18.0	46.1	28.5	60.4
White	11.1	38.1	16.5	36.2	50.1	55.3
Parents' educational attainment by 1980						
No high school diploma	15.3	33.7	20.5	34.0	30.8	57.6
High school graduate	15.0	36.8	9.6	33.0	41.0	53.3
Vocational/technical	14.9	38.2	19.0	34.5	42.5	57.9
Some college	10.4	42.6	14.6	43.0	52.9	56.1
Bachelor's degree	5.7	55.3	12.9	38.4	64.4	54.8
Advanced degree	9.1	47.7	5.8	36.1	71.0	52.2

—Sample size is too small for a reliable estimate.

NOTE: The percentage of students at each attainment level does not necessarily match the percentage distributions by highest degree because students can have earned degrees other than their highest degree.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.6.C—Percentage of 1980 high school sophomores who entered postsecondary education after October 1982 attaining degrees and average number of months between first enrollment and attainment of degrees, by type of degree and selected characteristics

Student characteristics	Percentage who attained certificate	Average months to certificate	Percentage who attained associate's	Average months to associate's	Percentage who attained bachelor's	Average months to bachelor's
Total	25.0	24.0	12.4	35.2	9.5	54.3
Sex						
Male	23.5	22.9	13.3	37.1	11.0	52.3
Female	26.4	24.9	11.5	33.1	8.0	56.9
Postsecondary expectations 1982						
None	25.9	17.5	11.9	29.1	2.6	—
Vocational/technical	31.8	18.4	13.5	32.8	3.9	—
Less-than-4-year degree	20.5	36.2	13.3	34.1	10.7	59.7
College degree	16.5	35.6	10.6	37.2	20.1	59.2
Advanced degree	19.4	24.8	11.2	41.4	27.6	48.2
Type of start in postsecondary education						
Delay 4-year	9.7	36.5	7.2	41.1	26.4	49.0
Delay public 2-year	18.1	32.6	13.1	38.1	5.8	66.9
Delay other	47.9	16.5	14.8	28.7	3.9	—
Socioeconomic status (1980)						
Low quartile	26.8	19.6	12.2	36.4	4.9	49.7
Middle two quartiles	24.6	23.1	11.9	33.7	8.6	56.5
High quartile	17.2	28.3	15.4	32.2	21.9	50.9
Test score composite (1982)						
Low quartile	28.6	22.1	7.3	29.4	2.4	—
Middle two quartiles	26.3	22.9	13.3	33.9	8.0	53.4
High quartile	18.8	36.3	12.7	38.3	25.1	55.8
Race–ethnicity						
Native American/Alaska Native	15.7	—	6.7	—	3.4	—
Asian/Pacific Islander	11.5	—	11.5	—	7.3	—
Black	30.7	25.1	8.1	36.4	6.9	47.8
Hispanic	27.2	23.8	10.6	41.7	3.1	55.9
White	23.6	23.0	13.2	32.5	11.1	54.6
Parents' educational attainment 1980						
No high school diploma	27.1	19.7	11.9	30.8	5.9	53.4
High school graduate	20.1	22.0	10.7	—	4.4	—
Vocational/technical	34.5	24.7	13.3	35.6	5.9	57.0
Some college	16.2	21.9	13.4	38.9	14.5	54.5
Bachelor's degree	15.7	—	15.8	—	21.0	53.3
Advanced degree	27.8	—	11.6	—	41.7	55.7

—Sample size is too small for a reliable estimate.

NOTE: The percentage of students at each attainment level does not necessarily match the percentage distributions by highest degree because students can have earned degrees other than their highest degree.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.7.A—Average number of postsecondary institutions attended prior to degree attainment by 1980 high school sophomores, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.5	1.5	1.7
Sex			
Male	1.5	1.5	1.7
Female	1.5	1.5	1.8
Postsecondary expectations 1982			
None	1.2	1.2	1.8
Vocational/technical	1.2	1.3	1.9
Less-than-4-year degree	1.6	1.4	1.9
College degree	2.0	1.7	1.7
Advanced degree	2.1	1.7	1.7
Type of start in postsecondary education			
Full-time fall 1982 4-year	2.4	2.1	1.6
Full-time fall 1982 public 2-year	1.8	1.3	2.3
Part-time fall 1982 4-year	—	—	2.3
Part-time fall 1982 public 2-year	1.8	1.6	2.5
Delay 4-year	1.9	1.6	1.5
Delay public 2-year	1.6	1.4	2.3
Fall 1982 other	1.2	1.4	2.1
Delay other	1.2	1.3	—
Other	1.1	—	—
Socioeconomic status (1980)			
Low quartile	1.3	1.4	1.6
Middle two quartiles	1.5	1.4	1.7
High quartile	1.8	1.6	1.8
Test score composite (1982)			
Low quartile	1.4	1.3	1.7
Middle two quartiles	1.5	1.4	1.8
High quartile	1.9	1.7	1.7
Race–ethnicity			
Native American/Alaska Native	1.4	—	—
Asian/Pacific Islander	1.6	1.7	1.9
Black	1.6	1.5	1.6
Hispanic	1.6	1.6	1.8
White	1.5	1.5	1.8
Parents' educational attainment 1980			
No high school diploma	1.4	1.3	1.7
High school graduate	1.5	1.1	1.6
Vocational/technical	1.5	1.5	1.8
Some college	1.7	1.6	1.8
Bachelor's degree	2.0	1.6	1.9
Advanced degree	1.9	1.6	1.7

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.7.B—Average number of postsecondary institutions attended prior to degree attainment by 1980 high school sophomores who first enrolled before November 1982, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.7	1.5	1.7
Sex			
Male	1.7	1.6	1.7
Female	1.7	1.5	1.8
Postsecondary expectations 1982			
None	1.3	—	—
Vocational/technical	1.3	1.3	2.0
Less-than-4-year degree	1.7	1.5	1.9
College degree	2.2	1.7	1.7
Advanced degree	2.4	1.7	1.8
Type of start in postsecondary education			
Full-time fall 1982 4-year	2.4	2.1	1.6
Full-time fall 1982 public 2-year	1.8	1.3	2.3
Part-time fall 1982 4-year	—	—	2.3
Part-time fall 1982 public 2-year	1.8	1.6	2.5
Fall 1982 other	1.2	1.4	2.1
Socioeconomic status (1980)			
Low quartile	1.5	1.5	1.6
Middle two quartiles	1.6	1.5	1.7
High quartile	2.1	1.7	1.8
Test score composite (1982)			
Low quartile	1.5	1.4	1.7
Middle two quartiles	1.7	1.5	1.8
High quartile	2.1	1.7	1.7
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	—	1.7	1.9
Black	1.8	1.6	1.6
Hispanic	2.0	1.7	1.8
White	1.7	1.5	1.7
Parents' educational attainment 1980			
No high school diploma	1.6	1.4	1.7
High school graduate	1.7	1.2	1.5
Vocational/technical	1.7	1.5	1.8
Some college	1.9	1.7	1.8
Bachelor's degree	2.4	1.7	1.9
Advanced degree	2.0	1.6	1.7

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.7.C—Average number of postsecondary institutions attended prior to degree attainment by 1980 high school sophomores who first enrolled after October 1982, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.4	1.4	1.8
Sex			
Male	1.4	1.4	1.8
Female	1.4	1.4	1.8
Postsecondary expectations in 1982			
None	1.2	1.2	—
Vocational/technical	1.2	1.3	—
Less-than-4-year degree	1.7	1.3	1.8
College degree	1.7	1.7	2.1
Advanced degree	1.6	1.6	1.6
Type of start in postsecondary education			
Delay 4-year	1.9	1.6	1.5
Delay public 2-year	1.6	1.4	2.3
Delay other	1.2	1.3	—
Socioeconomic status (1980)			
Low quartile	1.3	1.4	1.8
Middle two quartiles	1.4	1.3	1.9
High quartile	1.5	1.5	1.6
Test score composite (1982)			
Low quartile	1.3	1.3	—
Middle two quartiles	1.4	1.3	1.7
High quartile	1.6	1.5	1.9
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	—	—	—
Black	1.6	1.5	1.7
Hispanic	1.5	1.4	2.0
White	1.3	1.3	1.8
Parents' educational attainment in 1980			
No high school diploma	1.4	1.2	1.7
High school graduate	1.3	—	—
Vocational/technical	1.4	1.4	1.9
Some college	1.5	1.5	1.7
Bachelor's degree	1.6	—	1.7
Advanced degree	—	—	1.8

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.7.D—Percentage distribution of 1980 high school sophomores who first enrolled before November 1982, by average number of postsecondary institutions attended prior to bachelor's degree attainment and selected characteristics

Student characteristics	One	Two	Three or more
Total	50.4	31.8	17.8
Sex			
Male	50.5	32.3	17.2
Female	50.3	31.4	18.3
Postsecondary expectations in 1982			
None	—	—	—
Vocational/technical	33.2	34.0	32.8
Less-than-4-year degree	40.0	37.3	22.7
College degree	53.4	31.1	15.5
Advanced degree	50.5	31.3	18.2
Type of start in postsecondary education			
Full-time fall 1982 4-year	60.8	25.0	14.2
Full-time fall 1982 public 2-year	7.9	62.0	30.2
Part-time fall 1982 4-year	37.5	27.4	35.1
Part-time fall 1982 public 2-year	7.8	54.6	37.6
Fall 1982 other	26.5	49.7	23.8
Socioeconomic status (1980)			
Low quartile	55.3	34.3	10.4
Middle two quartiles	52.3	31.0	16.7
High quartile	47.8	33.8	18.4
Test score composite (1982)			
Low quartile	48.9	37.0	14.1
Middle two quartiles	44.2	34.4	21.4
High quartile	54.4	30.2	15.5
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	37.9	40.4	21.7
Black	58.4	29.1	12.6
Hispanic	51.5	28.8	19.7
White	50.1	31.9	18.0
Parents' educational attainment in 1980			
No high school diploma	53.7	30.0	16.3
High school graduate	59.4	30.6	10.0
Vocational/technical	48.2	31.8	19.9
Some college	47.3	34.9	17.9
Bachelor's degree	46.6	30.8	22.7
Advanced degree	56.4	28.7	15.0

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.8.A—Average number of periods of enrollment prior to degree attainment among 1980 high school sophomores, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.3	1.3	1.2
Sex			
Male	1.3	1.3	1.3
Female	1.3	1.2	1.2
Postsecondary expectations in 1982			
None	1.2	1.2	1.2
Vocational/technical	1.2	1.2	1.6
Less-than-4-year degree	1.4	1.2	1.4
College degree	1.6	1.3	1.2
Advanced degree	1.5	1.3	1.2
Type of start in postsecondary education			
Full-time fall 1982 4-year	1.8	1.5	1.2
Full-time fall 1982 public 2-year	1.5	1.2	1.5
Part-time fall 1982 4-year	—	—	1.5
Part-time fall 1982 public 2-year	1.4	1.4	1.4
Delay 4-year	1.6	1.4	1.2
Delay public 2-year	1.5	1.3	1.6
Fall 1982 other	1.1	1.2	1.4
Delay other	1.1	1.2	—
Other	1.0	—	—
Socioeconomic status (1980)			
Low quartile	1.2	1.2	1.2
Middle two quartiles	1.3	1.2	1.3
High quartile	1.5	1.3	1.2
Test score composite (1982)			
Low quartile	1.3	1.2	1.3
Middle two quartiles	1.3	1.2	1.3
High quartile	1.5	1.3	1.2
Race–ethnicity			
Native American/Alaska Native	1.3	—	—
Asian/Pacific Islander	1.4	1.2	1.3
Black	1.4	1.3	1.2
Hispanic	1.3	1.3	1.3
White	1.3	1.2	1.3
Parents' educational attainment in 1980			
No high school diploma	1.3	1.2	1.3
High school graduate	1.3	1.1	1.2
Vocational/technical	1.3	1.2	1.2
Some college	1.3	1.3	1.3
Bachelor's degree	1.6	1.3	1.2
Advanced degree	1.6	1.4	1.2

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.8.B—Average number of periods of enrollment prior to degree attainment among 1980 high school sophomores who first enrolled before November 1982, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.4	1.3	1.2
Sex			
Male	1.4	1.3	1.2
Female	1.4	1.2	1.2
Postsecondary expectations in 1982			
None	1.3	—	—
Vocational/technical	1.2	1.2	1.7
Less-than-4-year degree	1.4	1.2	1.3
College degree	1.6	1.3	1.2
Advanced degree	1.6	1.3	1.2
Type of start in postsecondary education			
Full-time fall 1982 4-year	1.8	1.5	1.2
Full-time fall 1982 public 2-year	1.5	1.2	1.5
Part-time fall 1982 4-year	—	—	1.5
Part-time fall 1982 public 2-year	1.4	1.4	1.4
Fall 1982 other	1.1	1.2	1.4
Socioeconomic status (1980)			
Low quartile	1.3	1.3	1.2
Middle two quartiles	1.4	1.2	1.2
High quartile	1.6	1.3	1.2
Test score composite (1982)			
Low quartile	1.4	1.2	1.2
Middle two quartiles	1.4	1.2	1.3
High quartile	1.6	1.3	1.2
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	—	1.2	1.3
Black	1.6	1.4	1.2
Hispanic	1.4	1.3	1.3
White	1.4	1.2	1.2
Parents' educational attainment in 1980			
No high school diploma	1.3	1.2	1.3
High school graduate	1.4	1.1	1.1
Vocational/technical	1.3	1.2	1.2
Some college	1.5	1.3	1.3
Bachelor's degree	1.9	1.3	1.2
Advanced degree	1.5	1.3	1.2

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.8.C—Average number of periods of enrollment prior to degree attainment among 1980 high school sophomores who first enrolled after October 1982, by type of degree and selected characteristics

Student characteristics	Certificate	Associate's	Bachelor's
Total	1.3	1.3	1.4
Sex			
Male	1.3	1.3	1.4
Female	1.3	1.2	1.4
Postsecondary expectations in 1982			
None	1.2	1.2	—
Vocational/technical	1.2	1.2	—
Less-than-4-year degree	1.5	1.2	1.4
College degree	1.6	1.3	1.4
Advanced degree	1.4	1.3	1.3
Type of start in postsecondary education			
Delay 4-year	1.6	1.4	1.2
Delay public 2-year	1.5	1.3	1.6
Delay other	1.1	1.2	—
Socioeconomic status (1980)			
Low quartile	1.2	1.2	1.3
Middle two quartiles	1.3	1.2	1.4
High quartile	1.3	1.3	1.3
Test score composite (1982)			
Low quartile	1.3	1.1	—
Middle two quartiles	1.3	1.2	1.2
High quartile	1.5	1.2	1.5
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	—	—	—
Black	1.4	1.3	1.3
Hispanic	1.3	1.4	1.3
White	1.3	1.2	1.4
Parents' educational attainment in 1980			
No high school diploma	1.3	1.1	1.3
High school graduate	1.2	—	—
Vocational/technical	1.3	1.3	1.4
Some college	1.2	1.3	1.4
Bachelor's degree	1.3	—	1.2
Advanced degree	—	—	1.5

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.8.D—Percentage distribution of 1980 high school sophomores who first enrolled before November 1982, by average number of periods of enrollment prior to bachelor's degree attainment and selected characteristics

Student characteristics	One	Two	Three or more
Total	80.7	15.9	3.5
Sex			
Male	80.0	16.8	3.2
Female	81.3	15.1	3.7
Postsecondary expectations in 1982			
None	—	—	—
Vocational/technical	55.0	26.8	18.2
Less-than-4-year degree	70.5	24.5	5.0
College degree	81.8	14.1	4.0
Advanced degree	82.9	15.3	1.9
Type of start in postsecondary education			
Full-time fall 1982 4-year	85.2	12.6	2.3
Full-time fall 1982 public 2-year	63.6	29.0	7.4
Part-time fall 1982 4-year	63.4	27.2	9.5
Part-time fall 1982 public 2-year	67.7	23.3	9.1
Fall 1982 other	67.0	26.2	6.8
Socioeconomic status (1980)			
Low quartile	81.3	17.3	1.4
Middle two quartiles	80.4	16.1	3.5
High quartile	81.6	14.6	3.7
Test score composite (1982)			
Low quartile	81.2	16.2	2.6
Middle two quartiles	76.5	19.6	4.0
High quartile	83.0	14.1	2.9
Race–ethnicity			
Native American/Alaska Native	—	—	—
Asian/Pacific Islander	72.9	26.9	0.2
Black	84.3	13.4	2.3
Hispanic	75.7	21.2	3.1
White	80.7	15.6	3.7
Parents' educational attainment in 1980			
No high school diploma	78.9	17.1	4.0
High school graduate	88.0	12.0	0.1
Vocational/technical	79.4	18.2	2.4
Some college	79.3	16.3	4.5
Bachelor's degree	79.6	17.3	3.2
Advanced degree	85.9	11.3	2.9

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 2.9—Application to and acceptance by graduate and first professional programs among 1980 high school sophomores who had earned a bachelor's degree by 1992, by selected characteristics

Student characteristics	Took graduate/professional admission exams (%)	Applied to graduate or professional institution (%)	Accepted at first choice (%)	Number of applications
Total	68.1	30.8	82.4	2.6
Sex				
Male	66.9	30.8	77.9	2.9
Female	69.3	30.8	86.8	2.4
Postsecondary expectations in 1982				
None	77.3	25.9	—	—
Vocational/technical	91.7	16.5	—	—
Less-than-4-year degree	83.9	18.2	88.2	1.9
College degree	73.4	25.0	89.9	1.8
Advanced degree	55.8	41.7	76.7	3.3
Amount borrowed for undergraduate education				
None	21.5	90.0	79.4	3.5
Less than $5,000	67.3	32.3	79.3	2.7
$5,000 or more	66.9	28.8	81.6	2.8
Type of institution that granted bachelor's degree				
Private not-for-profit	61.6	37.2	78.8	3.3
Public	70.5	28.4	84.5	2.2
Race–ethnicity				
Native American/Alaska Native	—	—	—	—
Asian/Pacific Islander	56.1	42.2	74.5	3.5
Black	73.2	28.5	85.6	1.9
Hispanic	69.7	33.3	93.1	1.9
White	67.9	30.6	82.0	2.7
Undergraduate major				
Agriculture/home economics	68.0	36.3	—	—
Business	76.8	18.9	79.1	2.0
Journalism/communications	78.4	21.6	83.8	1.9
Education	73.5	35.9	100.0	1.4
Math/computers/engineer	69.4	31.3	92.2	1.8
Health	68.6	19.8	—	—
Sciences (biology, chemistry)	37.6	59.5	78.4	5.2
Sciences (psychology, economics)	54.2	38.9	83.1	3.1
Art/music	77.0	28.9	90.2	1.8
Letters/languages/history	51.1	41.8	75.9	3.3
Other	60.1	40.7	71.5	2.3

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Section 3

Labor Market Outcomes of the 1980 Sophomore Class

Labor Force Participation

- Employment rates in February 1992 were higher among 1980 high school sophomores who had earned an associate's, bachelor's, or master's degree or higher than among those with lower levels of educational attainment. Moreover, the employment rates of those with a high school diploma were higher than the rates of those who had not attained a high school. However, there were no significant differences in the percentages of 1980 sophomores who were working among those with associate's, bachelor's, and master's degrees (table 3.1.A).[12]

- Both gender and race–ethnicity appeared to be related to labor force participation. More male respondents than female respondents reported that they were working, and more females than males reported that they were out of the labor force in February 1992. Blacks were less likely than whites to be working, and were more likely than whites to be in the labor force but unemployed and not receiving benefits. However, there were no other significant differences in the rates of employment among the various racial–ethnic groups (table 3.1.A).

- Rates of employment and participation in the labor force among 1980 high school sophomores were not related to their parents' level of educational attainment (table 3.1.A).

- The 1980 high school sophomores who were in the lowest SES and test quartiles were less likely to be working in February 1992 than were those in the middle two or highest quartiles of each measure (table 3.1.A). Among respondents with bachelor's degrees, however, there were no significant differences in employment rates by SES or test scores in high school.[13] Thus, lower rates of employment among sophomores with lower SES or test scores apparently reflected their lower average levels of educational attainment because employment rates in February 1992 were the same for all sophomores with bachelor's degrees, regardless of their SES or test quartile in high school.

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[12]The percentages of respondents working in the total, marital status, and race–ethnicity categories in table 3.1.A are inconsistent with those shown in table 1.3 because the timing of events reported differs. Table 1.3 reports on the activities of respondents during the week before they were surveyed, while table 3.1.A reports on respondents' activities during the entire month of February 1992.

[13]The total row in table 3.1.B is inconsistent with the bachelor's degree attained row in table 3.1.A because the patterns of missing data for the samples used to generate the two tables are different.

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- Males and females in the 1980 sophomore class tended to work in different industries and occupations (table 3.2 and table 3.3). For example, women were more likely to be employed in clerical and service occupations, while men were more likely to be working as technicians.

Annual Earnings

- Earnings were significantly related to the 1980 sophomores' level of educational attainment in 1992. For example, with each successively higher level of educational attainment, the percentage of 1980 sophomores who earned less than $15,000 in 1991 declined (table 3.4).

- Members of the 1980 sophomore class who were married in 1992 had higher average earnings in 1991 than those who were never married or divorced (table 3.5).

- Respondents who had earned bachelor's degrees in the fields of health, math, computers, or engineering had significantly higher average earnings in their first year after degree attainment than did those who studied business, arts, or music (table 3.6.A).

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Table 3.1.A—Percentage distribution of 1980 high school sophomores by type of labor force participation in February 1992, by selected characteristics

Student characteristics	Working	Unemployed, receiving benefits	Unemployed, not receiving benefits	Out of labor force
Total	83.1	2.4	4.8	9.7
Highest degree earned by 1992				
Less than high school	69.0	3.8	12.9	14.3
High school	81.9	2.6	5.0	10.5
Certificate	81.3	2.3	5.9	10.5
Associate's	89.7	1.5	2.6	6.1
Bachelor's	89.1	1.8	2.4	6.7
Master's	89.5	1.7	1.1	7.7
Professional	81.1	0.0	1.5	17.4
Doctorate	—	—	—	—
Marital status in 1992				
Married	82.1	1.9	4.0	12.0
Separated	75.2	1.8	10.6	12.4
Divorced	84.6	2.2	4.7	8.5
Widowed	—	—	—	—
Never married	84.8	3.3	5.5	6.4
Living in a marriage-like relationship	89.3	1.1	6.6	3.0
Sex				
Male	90.1	3.0	2.9	4.0
Female	76.3	1.8	6.7	15.2
Socioeconomic status (1980)				
Low quartile	78.6	3.6	6.8	11.0
Middle two quartiles	85.7	1.8	3.6	8.9
High quartile	86.8	1.8	3.0	8.4
Test score composite (1982)				
Low quartile	74.9	3.6	9.1	12.5
Middle two quartiles	85.4	2.4	3.8	8.5
High quartile	88.3	1.2	2.0	8.6
Race–ethnicity				
Native American/Alaska Native	81.6	2.1	4.9	11.5
Asian/Pacific Islander	83.4	1.0	2.0	13.7
Black	77.7	4.2	9.6	8.6
Hispanic	80.5	3.7	5.0	10.9
White	84.5	1.9	4.0	9.6
Parents' educational attainment in 1980				
No high school diploma	83.8	2.5	5.1	8.6
High school graduate	86.5	1.6	4.0	8.0
Vocational/technical	84.7	1.6	4.2	9.5
Some college	85.8	2.1	3.8	8.3
Bachelor's degree	84.9	1.9	3.5	9.7
Advanced degree	83.9	2.9	2.8	10.4

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.1.B—Percentage distribution of 1980 high school sophomores who had earned bachelor's degrees by 1992, by type of labor force participation in February 1992 and selected characteristics

Student characteristics	Working	Unemployed, receiving benefits	Unemployed, not receiving benefits	Out of labor force
Total	88.9	1.7	2.3	7.2
Marital status in 1992				
Married	88.9	1.0	2.2	7.9
Separated	—	—	—	—
Divorced	94.1	2.9	2.2	0.9
Widowed	—	—	—	—
Never married	88.4	2.5	2.1	6.9
Living in a marriage-like relationship	—	—	—	—
Sex				
Male	91.6	1.8	1.7	4.9
Female	86.3	1.7	2.8	9.3
Socioeconomic status (1980)				
Low quartile	87.5	4.0	3.1	5.4
Middle two quartiles	91.1	1.5	1.9	5.6
High quartile	88.1	1.5	2.4	8.0
Test score composite (1982)				
Low quartile	85.1	0.2	8.8	6.0
Middle two quartiles	89.2	2.7	1.7	6.4
High quartile	88.5	1.3	2.4	7.8
Race–ethnicity				
Native American/Alaska Native	86.7	0.0	3.7	9.6
Asian/Pacific Islander	82.3	0.0	0.6	17.1
Black	86.2	3.2	5.0	5.6
Hispanic	89.4	0.9	1.8	8.0
White	89.2	1.7	2.1	7.0
Parents' educational attainment in 1980				
No high school diploma	91.4	1.9	2.6	4.1
High school graduate	90.6	3.9	0.3	5.3
Vocational/technical	90.9	1.0	2.4	5.7
Some college	89.0	1.6	2.9	6.5
Bachelor's degree	87.7	1.5	1.1	9.8
Advanced degree	84.1	2.2	1.6	12.1

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.2—Percentage distribution of 1980 high school sophomores, by industry of employment in 1992 and selected characteristics

Student characteristics	Agriculture	Mining	Construction	Manufacture durable goods	Manufacture nondurables	Public utilities	Wholesale trade	Retail trade	Finance	Business services	Personal services	Recreation services	Professional service	Public administration
Total	2.0	0.3	6.4	8.7	4.5	6.0	2.8	13.4	8.2	7.1	13.3	2.2	16.5	8.5
Occupation														
Clerical-secretarial	0.7	0.0	3.3	5.0	3.7	7.8	2.2	6.9	15.1	6.6	10.5	0.8	24.9	12.4
Clerical-financial	2.2	0.6	5.1	3.6	2.3	1.9	3.8	15.2	39.2	6.4	6.1	0.8	7.2	5.6
Clerical-other	0.8	0.5	0.5	5.2	5.2	14.8	3.6	13.7	14.5	8.4	7.0	0.8	14.2	10.9
Craftsman	0.1	0.1	23.2	12.1	7.9	6.8	1.2	7.2	0.3	20.1	11.7	1.0	2.8	5.8
Farmer	85.5	0.0	0.0	5.1	4.2	0.0	0.0	4.1	0.0	0.0	1.2	0.0	0.0	0.0
Homemaker	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Laborer	4.6	0.9	14.3	14.9	7.9	5.8	3.0	11.7	1.0	6.0	21.5	0.9	4.3	3.4
Manager-sales	0.3	0.0	3.2	7.7	4.1	4.9	7.9	37.4	7.6	6.0	12.1	1.8	5.2	1.8
Manager-government	0.0	0.0	2.0	0.7	0.0	14.7	0.0	0.7	11.0	2.8	6.0	0.4	9.9	52.0
Manager-retail	0.0	0.0	0.7	0.9	3.2	0.7	2.9	53.4	1.0	4.2	23.0	7.5	2.3	0.3
Manager-manufacturing	2.4	0.4	32.4	30.6	8.9	3.6	3.2	3.1	2.2	3.4	6.8	0.2	0.2	2.6
Manager-other	2.2	0.3	4.0	8.1	3.8	5.9	2.5	10.0	22.4	10.0	7.2	3.1	13.6	6.8
Military	0.0	0.0	0.5	0.3	0.0	5.5	0.0	0.9	0.0	0.6	0.3	0.0	13.9	78.0
Skilled operative	2.3	0.8	7.8	23.4	8.7	14.8	5.6	6.1	1.3	9.4	10.4	0.8	4.5	4.3
Professional-arts	1.7	0.0	0.3	4.4	1.7	10.2	1.1	4.4	2.8	13.2	15.5	29.2	11.8	3.8
Professional-medical	0.4	0.0	0.0	0.4	0.1	0.1	0.8	1.3	0.4	0.8	9.2	0.2	81.7	4.8
Professional-engineer	0.8	0.0	12.6	43.5	8.3	6.0	0.8	1.4	1.3	3.3	5.2	0.3	6.3	10.2
Physician	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	1.3	5.3	0.0	78.1	13.7
Professional-legal	0.0	0.0	1.1	0.0	0.1	0.0	0.0	0.8	4.6	14.5	15.0	0.0	45.5	18.5
Professional-other	2.4	0.0	0.1	3.6	2.9	4.3	0.7	3.4	18.3	5.2	7.6	3.5	39.0	9.2
Owner-retail	0.0	0.0	0.0	0.0	0.8	0.2	0.0	66.1	0.0	6.7	24.1	2.0	0.1	0.0
Owner-manufacturing	4.3	0.0	62.4	9.6	4.4	0.0	1.0	8.8	0.0	3.4	6.1	0.0	0.0	0.0
Owner-other	9.6	0.1	3.6	6.3	1.3	5.2	3.1	10.5	6.8	7.6	32.7	4.5	7.4	1.4
Protective services	1.0	0.0	0.8	0.8	0.0	2.1	0.0	2.3	0.7	2.7	8.5	1.9	14.1	65.2
Sales	0.7	0.0	0.5	5.7	6.9	4.0	9.1	40.4	12.7	8.1	7.2	2.1	2.5	0.3
School teacher	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.7	5.5	0.4	76.5	15.9
Service	0.0	0.0	0.2	0.6	1.6	4.2	0.7	18.8	1.3	2.6	37.3	5.4	24.8	2.5
Tech-computer related	0.0	0.0	0.2	16.0	3.9	11.4	3.7	6.8	19.1	11.6	4.6	0.6	12.3	10.0
Tech-noncomputer related	0.3	1.3	2.5	6.8	2.7	13.4	0.5	5.7	4.5	12.9	8.8	2.5	29.9	8.4
Highest degree earned by 1992														
Less than high school	4.0	0.0	10.9	10.7	13.0	3.5	3.0	16.7	2.3	8.0	19.1	1.2	3.9	3.8
High school	2.3	0.4	8.4	9.7	4.3	6.3	3.4	15.9	6.0	7.2	14.0	2.4	11.3	8.3
Certificate	1.1	0.2	6.6	5.6	3.1	6.4	1.7	12.1	7.6	8.9	18.4	1.7	17.7	8.9
Associate's	2.0	0.2	4.5	8.5	5.0	7.8	2.7	11.4	7.0	7.1	13.9	2.7	21.6	5.7
Bachelor's	1.5	0.1	2.6	7.5	3.8	5.8	2.5	9.9	15.1	6.4	8.2	2.4	23.4	10.7
Master's	1.0	0.0	0.9	10.5	5.4	4.5	0.8	4.7	10.9	2.8	8.6	1.6	39.5	8.8
Professional	0.0	0.0	0.0	2.1	0.5	0.5	0.0	1.9	1.1	12.3	14.2	0.0	47.2	20.3
Doctorate	—	—	—	—	—	—	—	—	—	—	—	—	—	—

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Table 3.2—Percentage distribution of 1980 high school sophomores, by industry of employment in 1992 and selected characteristics—Continued

Student characteristics	Agriculture	Mining	Construction	Manufacture durable goods	Manufacture nondurables	Public utilities	Wholesale trade	Retail trade	Finance	Business services	Personal services	Recreation services	Professional service	Public administration
Marital status in 1992														
Married	2.0	0.2	6.3	9.3	4.9	6.0	3.1	12.1	8.5	7.0	12.5	1.6	17.1	9.6
Separated	1.4	0.0	8.4	8.6	3.9	4.4	1.5	17.2	6.5	6.7	14.9	3.3	15.5	7.9
Divorced	1.4	1.0	10.3	11.5	4.2	7.1	2.4	12.2	4.6	6.2	14.0	2.9	13.9	8.6
Widowed	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Never married	2.2	0.3	5.7	7.4	4.3	5.8	2.5	15.4	8.5	7.4	14.0	2.9	16.3	7.3
Living in a marriage-like relationship	3.4	0.0	8.0	6.8	1.0	9.2	6.2	9.6	4.6	11.6	13.5	5.9	12.2	8.1
Sex														
Male	3.2	0.4	10.6	11.1	4.6	7.5	3.4	12.8	5.1	8.9	11.8	2.3	8.7	9.7
Female	0.6	0.2	1.5	5.9	4.5	4.3	2.2	14.0	11.7	5.0	15.2	2.1	25.5	7.2
Race–ethnicity														
Native American/ Alaska Native	2.9	0.0	7.4	8.9	2.8	4.4	1.1	15.1	4.4	3.4	22.4	3.0	15.8	8.5
Asian/Pacific Islander	0.8	0.0	1.1	7.7	3.8	8.5	1.4	15.3	9.0	5.3	15.3	4.0	20.2	7.8
Black	1.3	0.0	3.3	6.7	4.2	9.4	2.4	10.3	7.0	5.5	15.9	2.1	17.7	14.1
Hispanic	2.0	0.7	6.1	8.5	6.3	5.7	2.7	15.7	6.8	5.7	14.2	1.3	15.7	8.7
White	2.1	0.3	6.8	9.0	4.5	5.6	3.0	13.6	8.5	7.4	12.6	2.3	16.5	7.7

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.3—Percentage distribution of 1980 high school sophomores, by occupation in 1992 and selected characteristics

Student characteristic	Clerical	Craftsman	Farmer	Home-maker	Laborer	Manager	Military	Skilled operative	Profes-sional	Owner	Protective services	Sales	School teacher	Service	Tech-nical
Total	15.8	6.4	0.4	0.1	15.1	17.0	1.8	5.9	12.5	2.6	2.1	6.6	2.3	6.9	4.7
Industry															
Agriculture	9.2	0.3	17.6	0.0	34.9	11.4	0.0	6.8	7.1	8.9	1.0	2.5	0.0	0.0	0.2
Mining	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Construction	7.4	23.2	0.0	0.0	33.9	17.9	0.2	7.2	3.0	5.6	0.3	0.5	0.0	0.2	0.7
Manufacture durable goods	8.5	8.9	0.2	0.0	25.8	17.6	0.1	15.8	9.5	1.7	0.2	4.3	0.0	0.5	6.9
Manufacture nondurables	13.0	11.1	0.4	0.0	26.1	15.7	0.0	11.3	5.5	1.0	0.0	9.9	0.0	2.5	3.6
Public utilities	21.4	7.2	0.0	0.0	14.4	13.6	1.7	14.5	6.8	1.4	0.7	4.3	0.0	4.8	9.3
Wholesale trade	16.8	2.6	0.0	0.0	15.8	21.1	0.0	11.6	3.2	1.9	0.0	21.0	0.0	1.8	4.3
Retail trade	13.0	3.4	0.1	0.0	13.2	28.8	0.1	2.7	2.2	4.4	0.4	19.8	0.0	9.7	2.2
Finance	41.3	0.2	0.0	0.0	1.9	25.1	0.0	0.9	9.5	1.3	0.2	10.2	0.2	1.1	8.0
Business services	15.5	18.0	0.0	0.1	12.6	16.3	0.1	7.7	8.3	2.5	0.8	7.4	0.2	2.6	7.9
Personal services	9.8	5.6	0.0	0.2	24.3	14.3	0.0	4.6	8.7	5.2	1.3	3.5	1.0	19.3	2.1
Recreation services	5.7	2.9	0.0	0.0	5.9	24.7	0.0	2.0	27.3	3.8	1.8	6.3	0.5	16.6	2.6
Professional service	16.3	1.1	0.0	0.0	4.0	8.1	1.5	1.6	37.7	0.7	1.8	1.0	10.7	10.4	5.2
Public administration	18.6	4.3	0.0	0.2	6.0	12.6	16.4	3.0	11.1	0.3	16.0	0.2	4.3	2.0	5.1
Highest degree earned by 1992															
Less than high school	4.3	13.9	0.4	0.0	39.7	9.9	0.0	9.8	2.9	2.4	0.1	6.8	0.6	8.9	0.5
High school	17.4	7.7	0.5	0.1	20.7	15.8	2.3	7.9	4.6	3.2	2.5	6.3	0.6	7.4	2.9
Certificate	19.6	10.5	0.1	0.0	13.7	9.3	1.4	6.1	10.1	3.0	3.2	4.9	0.4	13.6	4.2
Associate's	21.5	5.8	1.0	0.3	8.9	18.5	0.8	4.1	15.4	2.0	1.8	5.0	0.3	7.5	7.3
Bachelor's	13.0	1.2	0.2	0.0	2.9	24.7	1.9	1.7	25.5	1.9	1.4	8.8	7.1	2.2	7.8
Master's	4.3	0.0	0.0	0.0	0.7	20.0	0.0	0.9	40.8	1.6	1.0	3.8	11.3	3.1	12.4
Professional	3.0	0.0	0.0	0.0	0.0	3.3	2.5	1.8	78.7	3.5	2.6	2.5	0.5	0.5	1.1
Doctorate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Marital status in 1992															
Married	17.0	6.7	0.4	0.0	13.3	17.6	2.1	5.8	12.0	2.9	1.9	6.4	2.3	6.5	5.1
Separated	18.3	9.1	0.0	0.0	21.9	7.3	3.0	9.0	8.5	3.0	0.6	7.6	0.8	10.0	1.0
Divorced	15.1	6.6	0.0	0.0	20.0	13.9	3.1	6.5	11.0	3.1	2.2	5.5	1.3	8.8	2.8
Widowed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Never married	13.6	5.8	0.5	0.1	16.2	16.7	1.1	6.0	14.0	2.3	2.5	7.3	2.5	7.0	4.6
Living in a marriage-like relationship	15.2	7.7	0.0	0.0	31.1	17.9	0.6	4.3	5.6	0.0	1.9	2.1	1.8	11.0	0.7
Sex															
Male	4.8	10.6	0.7	0.1	21.4	17.7	3.0	8.7	9.7	3.3	3.2	6.4	1.0	4.0	5.6
Female	28.5	1.4	0.1	0.0	7.9	16.0	0.4	2.8	15.7	1.9	0.8	6.8	3.9	10.3	3.5

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Table 3.3—Percentage distribution of 1980 high school sophomores, by occupation in 1992 and selected characteristics—Continued

Student characteristic	Clerical	Craftsman	Farmer	Home-maker	Laborer	Manager	Military	Skilled operative	Profes-sional	Owner	Protective services	Sales	School teacher	Service	Tech-nical
Race–ethnicity															
Native American/ Alaska Native	10.0	14.6	0.0	0.6	26.5	13.7	0.9	5.6	7.5	2.3	4.0	5.5	2.0	4.3	2.6
Asian/Pacific Islander	19.5	2.3	0.0	0.0	8.9	14.0	1.6	6.2	21.3	4.0	2.6	2.4	0.9	10.6	5.8
Black	18.6	4.7	0.1	0.0	20.8	11.0	3.1	6.6	10.5	0.9	4.1	3.8	1.7	10.9	3.3
Hispanic	17.9	6.4	0.5	0.0	21.9	14.0	1.6	6.2	8.0	1.9	3.1	6.8	1.5	6.8	3.5
White	15.2	6.5	0.5	0.1	13.3	18.1	1.7	5.8	13.2	3.0	1.7	7.2	2.5	6.3	5.0

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.4—Percentage distribution of 1980 high school sophomores, by annual earnings in 1991 and selected characteristics

Student characteristics	Less than $15,000	$15,000–$29,999	$30,000–$49,999	$50,000–$74,999	$75,000 or more
Total	29.1	48.4	19.7	2.2	0.7
Highest degree earned by 1992					
Less than high school	51.1	38.8	8.6	1.4	0.1
High school	33.1	49.7	14.9	1.5	0.7
Certificate	32.7	49.8	16.1	0.6	0.8
Associate's	24.3	55.8	18.4	1.1	0.4
Bachelor's	16.3	46.5	33.3	3.4	0.5
Master's	19.4	33.1	36.3	9.1	2.1
Professional	16.2	31.3	34.7	13.4	4.4
Doctorate	—	—	—	—	—
Marital status in 1992					
Married	27.7	49.4	20.3	2.1	0.6
Separated	44.8	43.2	11.9	0.1	0.1
Divorced	35.2	49.8	13.7	0.5	0.9
Widowed	—	—	—	—	—
Never married	29.0	47.6	20.0	2.7	0.8
Living in a marriage-like relationship	32.0	51.9	14.3	1.9	0.0
Sex					
Male	21.9	49.0	25.1	3.1	1.0
Female	37.3	47.6	13.6	1.1	0.4
Amount still owed for education					
None	29.5	48.9	18.8	2.0	0.8
Less than $1,000	26.9	46.8	24.8	1.5	0.0
$1,000 or more	26.9	45.7	23.8	3.4	0.3
Occupation in 1992					
Clerical	31.6	57.3	9.8	0.7	0.6
Craftsman	19.0	57.1	21.3	1.7	1.0
Farmer	—	—	—	—	—
Homemaker	—	—	—	—	—
Laborer	39.6	46.1	12.9	1.2	0.1
Manager	12.9	53.3	29.5	3.6	0.7
Military	17.7	59.3	22.1	0.9	0.0
Skilled operative	18.4	59.9	19.7	1.9	0.0
Professional	20.1	44.4	30.8	3.9	0.9
Owner	27.4	37.8	19.6	10.5	4.7
Protective services	23.5	46.0	28.9	1.7	0.0
Sales	32.8	41.9	21.0	3.8	0.5
School teacher	34.9	57.7	7.4	0.0	0.0
Service	53.6	38.3	7.3	0.3	0.6
Technical	8.8	42.0	46.1	2.3	0.9
Race–ethnicity					
Native American/Alaska Native	46.9	39.5	10.9	0.7	2.0
Asian/Pacific Islander	18.6	47.3	28.4	3.9	1.7
Black	37.0	46.7	14.0	1.9	0.5
Hispanic	32.0	49.4	16.2	1.7	0.7
White	27.7	48.3	21.0	2.3	0.7

—Sample size is too small for a reliable estimate.

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.5—Average earnings among 1980 high school sophomores in their first year after terminating their education, by highest degree attained and selected characteristics

Student characteristics	High school	Certificate	Associate's	Bachelor's	Advanced degree	Average earnings, all degrees
Total	$15,729	$15,014	$17,785	$21,356	$26,122	$18,028
Marital status in 1992						
Married	16,962	16,227	18,889	22,385	27,310	19,042
Separated	12,714	13,370	—	—	—	14,858
Divorced	14,160	14,505	18,582	20,147	—	15,853
Widowed	—	—	—	—	—	—
Never married	13,708	13,162	15,731	20,371	24,861	16,859
Living in a marriage-like relationship	—	—	—	—	—	16,696
Sex						
Male	17,286	18,155	17,870	23,341	28,181	19,918
Female	14,293	12,659	17,725	19,500	23,759	16,367
Repeated grade/held back in school						
Never repeated	13,836	15,304	17,930	20,771	—	16,334
Repeated grade	16,191	15,386	17,877	21,627	25,952	18,526
Race–ethnicity						
Native American/Alaska Native	17,714	9,428	—	—	—	15,426
Asian/Pacific Islander	16,177	—	—	21,096	27,762	19,607
Black	13,724	13,170	14,181	19,721	22,127	14,775
Hispanic	14,284	14,752	17,536	21,811	25,893	16,216
White	16,283	15,737	18,391	21,478	26,564	18,736

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.6.A—Average earnings among 1980 high school sophomores in their first and third year after attaining a bachelor's degree, by selected characteristics

Student characteristics	Earnings in first year after bachelor's degree	Earnings in third year after bachelor's degree
Total	$20,932	$24,215
Sex		
Male	22,649	27,190
Female	19,362	21,526
Institution control where earned bachelor's degree		
Private not-for-profit	21,682	25,199
Public	20,931	24,082
Race–ethnicity		
Native American/Alaska Native	—	—
Asian/Pacific Islander	20,798	25,442
Black	20,112	21,199
Hispanic	22,436	25,463
White	20,984	24,372
Undergraduate major		
Agriculture/home economics	21,802	21,588
Business	21,634	25,494
Journalism/communications	19,222	22,687
Education	16,295	18,526
Math/computers/engineering	26,643	30,442
Health	27,253	29,467
Sciences (biology, chemistry)	19,339	21,559
Sciences (psychology, economics)	18,875	21,902
Art/music	16,945	19,210
Letters/languages/history	17,357	21,560
Other	18,328	20,754

—Sample size is too small for a reliable estimate.

NOTE: All estimates are in 1992 dollars.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.6.B—Average earnings among 1980 high school graduates in their first and third year after attaining an associate's degree, by selected characteristics

Student characteristics	Earnings in first year after associate's degree	Earnings in third year after associate's degree
Total	$16,912	$20,093
Sex		
Male	17,054	21,685
Female	16,813	18,988
Race–ethnicity		
Native American/Alaska Native	—	—
Asian/Pacific Islander	—	—
Black	13,655	15,550
Hispanic	15,590	25,163
White	17,614	20,302
Undergraduate major		
Agriculture/home economics	—	—
Business	16,813	17,940
Journalism/communications	—	—
Education	—	—
Math/computers/engineer	16,785	19,220
Health	20,911	23,346
Sciences (biology, chemistry)	—	—
Sciences (psychology, economics)	—	—
Art/music	—	—
Letters/languages/history	—	—
Other	14,805	17,225

—Sample size is too small for a reliable estimate.

NOTE: All estimates are in 1992 dollars.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 3.6.C—Average earnings among 1980 high school sophomores in their first and third year after attaining a postsecondary certificate, by selected characteristics

Student characteristics	Earnings in first year after certificate	Earnings in third year after certificate
Total	$14,526	$17,551
Sex		
Male	17,437	21,137
Female	12,266	14,869
Race–ethnicity		
Native American/Alaska Native	10,529	—
Asian/Pacific Islander	—	—
Black	12,869	14,611
Hispanic	14,593	14,532
White	15,145	18,712
Undergraduate major		
Agriculture/home economics	—	—
Business	12,956	15,444
Journalism/communications	—	—
Education	—	—
Math/computers/engineering	16,284	18,947
Health	15,364	18,101
Sciences (biology, chemistry)	—	—
Sciences (psychology, economics)	—	—
Art/music	—	—
Letters/languages/history	—	—
Other	13,879	19,514

—Sample size is too small for a reliable estimate.

NOTE: All estimates are in 1992 dollars.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Section 4

Voting Behavior, Attitudes, and Family Formation of the 1980 Sophomore Class

Voting Behavior

- Roughly 65 percent of 1980 high school sophomores were registered to vote in 1986 and 1992. Fifty-three percent of all sophomores voted in the 1988 presidential election, while only one-third voted in any other 1988 elections. More respondents voted in the 1988 presidential election than in the 1984 election (table 4.1).

- The 1980 high school sophomores' voting rates in the 1988 elections were positively associated with educational attainment: as attainment increased, the percentage who voted also increased. For example, 25 percent of those with less than a high school education voted in the 1988 presidential election, compared with 46 percent of those with a high school diploma (table 4.1).

Attitudes

- Questions about the values held by the 1980 sophomores reveal that more than 95 percent of all 1980 high school sophomores felt that success in work, having steady work, strong friendships, and better opportunities for their children were important. By contrast, only about half (56 percent) said that having money was important (table 4.2).

- Males were significantly more likely than females to feel that success in work, steady work, and money were important, and were equally as likely as women to value friendship and children's opportunities (table 4.2).

Family Formation

- Respondents who rated themselves as “very popular” in 1982 (when most of them were high school seniors) were more likely to never have been married than those who rated themselves “somewhat popular” (table 4.3).

- Approximately half the 1980 high school sophomores had at least one child by 1992, while nearly 10 percent had at least three children. The rate of parenting varied by gender, however, and males were significantly more likely than females to report having no children (table 4.4).

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Table 4.1—Voting indicators for 1980 high school sophomores, by selected characteristics

Student characteristics	Percent registered in 1986	Percent registered in 1992	Percent voted 1984 presidential	Percent voted 1988 in non-presidential	Percent voted 1988 presidential
Total	66.9	65.0	48.8	33.5	52.7
Political beliefs in 1980					
Conservative	75.6	75.5	58.3	42.2	65.7
Moderate	69.9	70.0	56.0	40.3	60.8
Liberal	74.4	71.2	60.3	37.7	62.1
Radical	72.4	67.2	50.3	36.0	52.3
None	57.7	57.6	39.3	27.6	44.4
Highest degree earned by 1992					
Less than high school	46.1	43.0	24.1	14.4	25.3
High school	61.6	61.1	43.0	29.9	46.2
Certificate	67.6	65.1	48.0	35.1	53.0
Associate's	69.3	71.2	56.9	39.4	60.4
Bachelor's	80.2	76.0	63.8	43.4	72.0
Master's	87.3	85.3	65.9	49.7	75.6
Professional	79.4	81.2	63.7	42.0	70.6
Doctorate	—	—	—	—	—
Marital status in 1992					
Married	65.5	64.3	47.4	33.2	52.7
Separated	65.2	54.1	41.5	22.7	38.7
Divorced	57.0	55.5	36.9	22.9	40.0
Widowed	—	—	—	—	—
Never married	70.6	68.2	53.4	36.3	56.1
Living in a marriage-like relationship	63.4	62.9	45.5	35.6	47.4
Sex					
Male	67.2	64.2	48.2	32.2	51.5
Female	66.5	65.8	49.4	34.9	53.9
Race–ethnicity					
Native American/ Alaska Native	64.5	65.6	41.4	29.4	40.2
Asian/Pacific Islander	50.6	56.8	33.2	25.7	39.9
Black	73.9	70.7	51.2	36.1	51.3
Hispanic	62.4	63.0	41.3	29.8	43.3
White	66.6	64.5	49.7	33.7	54.6

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 4.2—Percentage of 1980 high school sophomores who reported in 1992 that they valued the specified items in their lives, by selected characteristics

Student characteristics	Success in their work	Steady work	Money	Strong friendships	Making their children better off
Total	95.9	95.6	55.6	95.2	96.5
Marital and parental status in 1992					
Married no children	96.8	97.7	55.2	97.5	95.8
Married with children	95.6	93.5	52.3	95.0	98.6
Divorced/sep/widow no children	97.2	98.7	50.8	95.3	93.0
Divorced/sep/widow with children	95.6	95.5	56.2	91.5	98.4
Never married no children	95.9	96.5	57.9	96.6	93.9
Never married with children	95.6	96.6	62.3	88.3	98.0
Living together no children	99.8	98.1	46.8	100.0	95.4
Living together with children	95.7	99.7	76.6	94.3	100.0
Highest degree earned by 1992					
Less than high school	95.4	95.3	63.8	94.2	99.6
High school	95.3	95.2	56.2	94.4	97.5
Certificate	96.8	95.2	57.1	94.0	98.0
Associate's	96.3	97.5	56.5	96.2	97.5
Bachelor's	96.6	96.0	49.7	98.2	93.0
Master's	98.4	96.3	49.8	98.1	89.4
Professional	98.4	99.5	50.7	99.7	96.8
Doctorate	—	—	—	—	—
Sex					
Male	97.3	97.4	60.1	95.1	96.2
Female	94.5	93.9	51.2	95.3	96.8
Race–ethnicity					
Native American/ Alaska Native	97.4	93.5	57.7	96.3	96.8
Asian/Pacific Islander	95.9	97.6	58.3	98.2	97.1
Black	96.3	96.5	66.0	85.1	98.1
Hispanic	97.1	95.6	61.5	92.2	98.4
White	95.7	95.4	52.9	97.2	96.0

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 4.3—Percentage distribution of 1980 high school sophomores, by number of times they had been married by 1992 and selected characteristics

Student characteristics	Never married	One	Two	Three or more
Total	37.9	56.8	5.1	0.3
Sex				
Male	45.5	50.8	3.7	0.1
Female	30.7	62.4	6.3	0.6
Race–ethnicity				
Native American/Alaska Native	36.5	51.5	11.7	0.3
Asian/Pacific Islander	49.4	46.8	3.8	0.0
Black	55.2	41.7	3.1	0.1
White	34.7	59.5	5.4	0.4
Hispanic-Mexican	40.4	56.3	3.2	0.0
Hispanic-Cuban	37.7	58.2	4.2	0.0
Hispanic-Puerto Rican	44.6	51.2	3.7	0.5
Hispanic-other	36.0	59.2	4.8	0.0
Religious background in 1980				
Baptist	32.4	59.3	8.1	0.3
Methodist	34.2	60.4	5.2	0.2
Lutheran	34.3	61.8	3.9	0.1
Presbyterian	34.0	61.9	3.7	0.4
Episcopalian	48.5	45.8	5.7	0.0
Other Protestant	31.1	65.2	3.6	0.1
Catholic	41.8	54.5	3.6	0.1
Other Christian	32.0	59.9	6.6	1.5
Jewish	62.0	33.9	3.6	0.6
Other religion	29.9	64.4	4.4	1.4
None	44.4	50.6	4.5	0.5
Popularity in 1982				
Very popular	44.2	52.7	3.1	0.0
Somewhat popular	37.0	57.6	5.0	0.3
Not at all popular	38.9	56.4	4.7	0.1

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Table 4.4—Percentage distribution of 1980 sophomores, by the number of children parented through 1992 and selected characteristics

	None	One	Two	Three or four	Five or more
Total	48.9	21.3	20.1	9.4	0.2
Marital status in 1992					
Married	29.7	27.8	28.8	13.4	0.3
Separated	20.6	24.8	32.7	21.2	0.7
Divorced	32.4	30.0	26.9	10.5	0.3
Widowed	—	—	—	—	—
Never married	81.0	10.0	6.0	3.0	0.1
Living in a marriage-like relationship	46.3	23.7	17.0	12.9	0.1
Sex					
Male	56.2	19.1	16.8	7.7	0.1
Female	41.8	23.5	23.3	11.1	0.4
Race–ethnicity					
Native American/Alaska Native	33.5	16.4	31.9	17.8	0.4
Asian/Pacific Islander	62.4	23.1	8.5	6.0	0.0
Black	36.7	25.8	21.9	15.2	0.4
White	51.9	20.3	19.6	8.0	0.2
Hispanic-Mexican	41.7	23.4	19.9	15.0	0.0
Hispanic-Cuban	51.4	20.8	19.9	7.9	0.0
Hispanic-Puerto Rican	44.5	21.8	23.9	9.6	0.2
Hispanic-other	41.7	24.4	21.9	12.1	0.0
Religious background in 1980					
Baptist	40.4	22.8	25.1	11.5	0.2
Methodist	47.8	25.3	20.8	5.8	0.3
Lutheran	54.4	19.0	17.8	8.6	0.3
Presbyterian	56.2	19.7	20.0	4.1	0.0
Episcopalian	68.1	14.9	13.9	3.2	0.0
Other Protestant	54.9	20.1	15.8	8.7	0.6
Catholic	57.2	20.2	15.3	7.3	0.1
Other Christian	40.1	22.4	23.8	13.6	0.1
Jewish	80.0	10.4	6.0	3.7	0.0
Other religion	38.9	19.4	25.2	16.0	0.5
None	46.7	23.0	18.5	11.5	0.3
Number of marriages					
Never married	81.1	9.9	6.0	2.9	0.1
One	31.4	28.5	28.1	11.7	0.2
Two	16.5	24.5	30.3	27.1	1.7
Three or more	14.6	33.8	25.2	14.6	11.9

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Appendix A: Glossary

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Appendix A
Glossary

This glossary describes the variables used in this report. These items were taken directly from the HS&B Fourth Followup Data Analysis System (DAS), an NCES software application that generates tables directly from Fourth Followup data files. A description of the DAS files can be found in appendix B.

The variables and definitions are divided into the following categories: postsecondary education variables, other education variables, demographic and status variables, employment variables, and other variables. The variables are organized within each category in alphabetic order by item name.

Postsecondary Education Variables

Accepted at 1982 first choice college (SY14B1)

No applications	Student did not apply to college in 1982.
Attended first choice college	Student was accepted and attended first choice school in 1982.
Accepted but did not attend	Student was accepted at first choice school in 1982, but did not attend at that time.
Was not accepted at first choice	Student was denied admission to first choice school.

Accepted at first choice graduate school (Y4210)

Yes

No

Don't know yet

Amount still owed for education (Y4216)

The amount still owed for education is stored as a continuous variable in the HS&B Fourth Followup Data Analysis System file.

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Applied to graduate or professional institution (Y4206)

Yes

No

Entry status (Y4203C01)

Immediate entrants	Students who first entered postsecondary education before November 1982.
Delayed entrants	Students who first entered postsecondary education after October 1982.

First postsecondary institution type (composite of ATNDTYPA–ATNDTYPE)

Never enrolled	Student never enrolled in postsecondary education
Private for-profit	Student first attended a private for-profit (proprietary) institution. A private for-profit institution is a postsecondary institution that is privately owned and operated as a profit-making enterprise. Includes career colleges and proprietary institutions.
Private NFP less-than-4-year	Student first attended a private not-for-profit institution offering a less-than-4-year degree. A private, not-for-profit institution is a postsecondary institution that is controlled by an independent governing board and incorporated under section 501(c)(3) of the Internal Revenue Code.
Public less-than-2-year	Student first attended a public less-than-2-year (vocational-technical) institution. A public institution is a postsecondary education institution operated by publicly elected or appointed officials in which the program and activities are under the control of these officials and which is supported primarily by public funds.
Public 2-year	Student first attended a public institution offering a 2- to 3-year degree (i.e., associate's degree).
Public 4-year	Student first attended a public college or university offering a bachelor's degree or higher.
Private not-for-profit 4-year	Student first attended a private not-for-profit college or university offering a bachelor's degree or higher.

First postsecondary institution start date (derived from MONSTRT)

The MONSTRT variable records the number of months between June 1982 and the student's first entry into postsecondary education. This variable was used to derive the categories in the first institution start date variable.

Never enrolled

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Before November 1982

November 1982 to May 1983

June 1983 to May 1984

June 1984 to May 1986

June 1986 or later

Intensity of initial enrollment (Y4203G01)

Full-time	Students who reported that they enrolled full time in the first institution that they attended.
Part-time	Students who reported that they enrolled less than full time in the first institution that they attended.

Highest degree attained by 1992 (HGHDG92)

This variable is a composite that summarizes the highest degree attained by 1980 high school sophomores as of June 1992. The variable categories are mutually exclusive, so each student is included in only one category. Students who did not earn a postsecondary certificate or degree may have attended a postsecondary institution at some time between 1982 and 1992, and students who earned a degree might have enrolled in an institution offering a higher degree than the one that they earned without completing the program by June 1992. Likewise, students in higher degree attainment categories may have also earned a lower degree as well, even though it is not reflected in this variable. In several tables, the master's degree, professional degree, and doctorate categories were combined into a single advanced degree category.

Less than high school graduate	Student did not complete high school.
High school graduate only	Student completed high school.
Vocational certificate	Student completed a vocational certificate, diploma, or award.
Associate's degree	Student completed an associate's degree.
Bachelor's degree	Student completed a bachelor's degree.
Master's degree	Student completed a master's degree.
Professional degree	Student completed a professional degree.
Doctorate	Student completed a doctorate.

Number of applications to college in 1982 (FY124)

Did not apply	Student did not apply to any colleges in 1982.
One college	Student applied to one college in 1982.

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2–3 colleges	Student applied to two or three colleges in 1982.
4 or more colleges	Student applied to four or more colleges in 1982.

Number of applications to graduate school (Y4208)

This is a continuous variable that records the number of applications for graduate school that 1980 sophomores reported.

Number of postsecondary institutions attended prior to highest degree attainment in 1992 (composite of PSSCHLA–PSSCHLF)

The number of schools attended prior to degree attainment is specified both in relation to the type of degree attained and across all degree types. The average number of institutions attended by degree type or across all types of degrees include only those students who had attained a degree; students who attended but did not attain a degree were not included in the calculation. The number of schools was determined by asking students how many schools they had attended and by matching institutional identification numbers (FICE codes) to ensure that multiple spells of attendance at one school were not counted as more than one school.

Number of spells of enrollment prior to highest degree attainment in 1992 (ENROLSPL)

ENROLSPL is a composite variable that summarizes across degree types the number of spells of enrollment experienced by students prior to their highest degree attainment; the number of spells is determined for each type of degree by PSSPELLA–PSSPELLF. A single spell of enrollment was defined as any number of months of enrollment that did not include breaks of longer than one month (i.e., attendance was not recorded for any part of two adjacent months), excluding summer (i.e., the student was enrolled in the last standard term of an academic year and the first standard term of the following academic year). A single spell could include attendance at more than one school, provided the break between enrollments did not exceed one month or was not longer than the break between academic years.

Postsecondary expectations in 1982 (PSEPLANS)

This variable describes the highest degree students planned to get at the time they were surveyed in 1982, when most of the 1980 sophomores were high school seniors.

None	Student did not expect to pursue postsecondary education.
Vocational/technical	Student planned to earn a vocational/technical certificate, diploma, or award.
Less-than 4-year degree	Student planned to earn a less-than-4-year degree, most commonly an associate's degree.
College degree	Student planned to earn a bachelor's degree.
Advanced degree	Student planned to earn a master's degree, professional degree, or doctorate.

Took graduate or professional exams (Y4207A)

The 1980 sophomores were asked in the 1992 survey whether they had taken a graduate or

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professional admission examination. Types of examinations included Dental Admission Test, Graduate Management Admission Test, Graduate Record Examination, Law School Admission Test, Medical College Admission Test, or other admission test.

Type of postsecondary institution (Y4203A01)

4-year institutions	Includes 4-year private, not-for-profit and 4-year public institutions that offer bachelor's degrees or higher. These institutions may also offer associate's degrees or vocational certificates.
Public 2-year institutions	Includes public 2- to 3-year institutions that offer associate's degrees or vocational certificates.
Other institutions	Includes private, for-profit (proprietary) institutions, public less-than-2-year institutions, and private, not-for-profit less-than-4-year institutions.

Type of start in postsecondary education (PSESTART)

This is a composite variable that combines type of institution, intensity of initial enrollment, and timing of initial enrollment into a single variable.

No enrollment	Student did not enroll in postsecondary education.
Full-time 4-year, fall 1982	Student enrolled full time in a private, not-for-profit or public 4-year institution before November 1982.
Full-time public 2-year, fall 1982	Student enrolled full time in a public 2- to 3-year institution before November 1982.
Part-time 4-year, fall 1982	Student enrolled part time in a private, not-for-profit or public 4-year institution before November 1982.
Part-time public 2-year, fall 1982	Student enrolled part time in a public 2- to 3-year institution before November 1982.
Delay 4-year	Student enrolled full time or part time in a private, not-for-profit or public 4-year institution after October 1982.
Delay public 2-year	Student enrolled full time or part time in a public 2- to 3-year institution after October 1982.
Less-than-2-year, fall 1982	Student enrolled full time or part time before November 1982 in a private, not-for-profit less-than-2-year institution; a private, for-profit less-than-2-year institution; or a public less-than-2-year institution.
Delay, less-than-2-year	Student enrolled full time or part time after October 1982 in a private, not-for-profit less-than-2-year institution; a private, for-profit less-than-2-year institution; or a public less-than-2-year institution.

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Other enrollment	Student enrolled in a postsecondary institution that did not fit into one of the other categories (e.g., a 4-year proprietary institution).

Undergraduate major (UGMAJOR)

Undergraduate majors were recorded for bachelor's degree recipients in this composite variable. Majors were reported by students and recorded by a 2-digit Classification of Instructional program (CIP) code. These codes were then aggregated into the categories shown here.

Agriculture/home economics

Business/marketing

Journalism/communications

Education

Math/computer science/engineering

Health

Sciences (e.g., biology, chemistry)

Social sciences (e.g., economics, psychology)

Art/music

Letters/languages/history

Other

Other Education Variables

College expectations in sixth grade (YB072A)

Yes, decided to go	Student expected while in sixth grade to attend college.
Planned not to go	Student expected while in sixth grade not to attend college.
Not sure	Student was not sure whether he or she would attend college.
Hadn't thought about it	Student had not thought about college while in the sixth grade.

Father's 1982 after-high-school aspirations for children (FY63A) and *mother's 1982 after-high-school aspirations for children (FY63B)*

These variables record the respondent's mother's and father's after-high-school aspirations for respondent at the time of the first follow-up survey in 1982. These are student-reported variables.

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Go to college	Parent wants sophomore to go to college after high school.
Full-time job	Parent wants sophomore to work full time after high school.
Trade school	Parent wants sophomore to go to a trade school after high school.
Military service	Parent wants sophomore to go into the military after high school.

Grades in high school (HSGRADES)

This is primarily a student-reported variable combining data from the base-year and first follow-up surveys, but it also includes some data from the transcript surveys. The variable categories are described both as letter grades (e.g., mostly As) and as their numerical equivalents on a 100-point scale.

Mostly As (90–100)

Half As and Half Bs (85–89)

Mostly Bs (80–84)

Half Bs and half Cs (75–79)

Mostly Cs (70–74)

Half Cs and half Ds (65–69)

Mostly Ds (60–64)

High school diploma type (HSDIPLOM)

Regular diploma	Student received a high school diploma, and either graduated early or on time (June 1982).
Returned for diploma	Student stopped out at some point during high school or did not graduate on time, but returned to high school to finish their diploma or general equivalency diploma (GED).
Returned but no diploma	Student stopped out at some point during high school or did not graduate on time, returned to high school at a later time, but did not complete a diploma or GED.
Never returned	Student dropped out of high school and did not complete a diploma or GED at a later time.

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Program in high school

General	Students reported that their high school program was neither vocational nor academic.
Academic	Students reported that their high school program was academic.
Vocational	Students reported that their high school program was vocational.

Repeated grade/held back (FY59)

Never repeated	Student did not report repeating a grade or being held back a term at some time between the first and ninth grades.
Repeated grade	Student reported repeating a grade or being held back a term at some time between the first and ninth grades.

Test score composite 1982 (FUTEST)

FUTEST in the Fourth Followup is a percentile composite based on the variable FUTEST from the First Followup in 1982. Originally, this variable was coded as a standard normal variable with a zero mean and a variance of 1, and was a composite score based on the average non-missing reading, vocabulary, and mathematics (part 1) test scores. The original standardized test score composite was converted to a percentile format by ranking students on an index that ranged from 1 to 100. Two versions of this variable were used in this report: as mean column values for groups defined in the rows (table 1.1); and as a row variable with the following format:

Low quartile	Students whose percentile rank ranged from 1 to 25 percent.
Middle two quartiles	Students whose percentile rank ranged from 26 to 75 percent.
High quartile	Students whose percentile rank ranged from 76 to 100 percent.

Demographic and Status Variables

Family income in 1980 (FAMINC)

Family income is based on sophomore- and parent-reported data from the base year survey. This variable was recoded from earlier surveys for inclusion in the HS&B Fourth Followup Data Analysis System file.

Less than $8,000

$8,000–$14,999

$15,000–$19,999

$20,000–$24,999

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$25,000–$29,999

$30,000–$39,999

$40,000–$49,999

$50,000 or more

Father's occupation in 1980 (BB038)

Father's occupation is based on data reported by sophomores in the 1980 base year survey. Students were asked to describe their father's most recent job and to categorize his occupation into one of 16 standard occupational classifications. The job description and classifications were reviewed for consistency and recoded where obvious inconsistencies were apparent.

Clerical	Bank teller, bookkeeper, typist, secretary, mail carrier, ticket agent.
Craftsman	Baker, automobile mechanic, machinist, painter, plumber, telephone installer, carpenter.
Farmer, farm manager	
Homemaker only	
Laborer	Construction worker, car washer, sanitary worker, farm laborer.
Manager, administrator	Sales manager, office manager, school administrator, buyer, restaurant manager, government official.
Military	Career officer, enlisted man in armed forces.
Operative	Meat cutter, assembler, machine operator, welder, taxicab, bus, or truck driver.
Professional	Accountant, artist, registered nurse, engineer, librarian, writer, social worker, actor, athlete, politician. Excludes school teachers.
Professional	Clergyman, dentist, physician, lawyer, scientist, college teacher.
Proprietor/owner	Small business owner, construction contractor, restaurant owner.
Protective services	Detective, police officer, security guard, sheriff, fire fighter.
Sales	Salesperson, advertising or insurance agent, real estate broker.
School teacher	Elementary or secondary.

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Service	Barber, beautician, practical nurse, private household worker, janitor, waiter.
Technical	Draftsman, medical and dental technician, computer programmer.

Language spoken at home in 1982 (HOMELANG)

This is a composite variable created from student-reported data in the base-year language file. This file only contains data on students who reported that a non-English language was spoken in their home.

Single non-English language	A non-English language is the only language spoken in the home.
Non-English language dominant	A non-English language is the predominant language used in the home, but English is also spoken.
Combination of languages	More than one language was reported as being spoken in the home with no single language being dominant.
English is the dominant language	Composite category that includes students who reported more than one language spoken in the home with English the predominant language, as well as students who did not report any other languages but English.

Mother worked before elementary school (BB037C), while in elementary school (BB037B), while in high school (BB037A)

Students were asked whether their mothers worked outside of the home at various stages of the students' lives. Each of these variables has the same set of row categories.

Did not work	Mother did not work outside of the home.
Part-time work	Mother worked part time outside the home.
Full-time work	Mother worked full time outside the home.

Occupational aspiration for age 30 in 1982 (FY77A)

Occupational aspirations are based on data reported by 1980 sophomores in the first follow-up survey in 1982. Respondents were asked to describe their job aspirations at age 30 and to categorize this occupation into one of 16 standard occupational classifications. The job description and classifications were reviewed for consistency and recoded where obvious inconsistencies were apparent.

Clerical	Bank teller, bookkeeper, typist, secretary, mail carrier, ticket agent.
Craftsman	Baker, automobile mechanic, machinist, painter, plumber, telephone installer, carpenter.

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Farmer, farm manager	
Homemaker only	
Laborer	Construction worker, car washer, sanitary worker, farm laborer.
Manager, administrator	Sales manager, office manager, school administrator, buyer, restaurant manager, government official.
Military	Career officer, enlisted man in armed forces.
Operative	Meat cutter, assembler, machine operator, welder, taxicab, bus, or truck driver.
Professional	Accountant, artist, registered nurse, engineer, librarian, writer, social worker, actor, athlete, politician. Excludes school teachers.
Professional	Clergyman, dentist, physician, lawyer, scientist, college teacher.
Proprietor/owner	Small business owner, construction contractor, restaurant owner.
Protective services	Detective, police officer, security guard, sheriff, fire fighter.
Sales	Salesperson, advertising or insurance agent, real estate broker.
School teacher	Elementary or secondary.
Service	Barber, beautician, practical nurse, private household worker, janitor, waiter.
Technical	Draftsman, medical and dental technician, computer programmer.

Parents' educational attainment in 1980 (PAREDUC)

PAREDUC is a composite variable that records the higher level of educational attainment for the respondent's father or mother. The variable is based on student-reported data on the base-year and first follow up surveys.

No high school diploma	Neither of the student's parents had completed a high school diploma as of 1980.
High school graduate	One or both of the student's parents had completed a high school diploma by 1980.
Vocational/technical	One or both of the student's parents had earned a vocational/technical degree, diploma, or certificate.

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Some college	One or both of the student's parents had completed one or more years of college. One or both parents may have also completed a postsecondary degree less than a bachelor's degree other than a vocational-technical certificate.
Bachelor's degree	One or both of the student's parents had completed a bachelor's degree or bachelor's degree plus a fifth year certificate (such as a teaching credential).
Advanced degree	One or both of the student's parents had completed a master's degree, professional degree, or doctorate.

Political beliefs in 1980 (BB094)

Student-reported political beliefs in the base-year survey.

Popularity in 1982 (FY74A)

Very popular	Student believes self to be very popular with peers.
Somewhat popular	Student believes self to be somewhat popular with peers.
Not at all popular	Student believes self to be not at all popular with peers.

Race–ethnicity (RACE4)

This is a composite variable that draws upon information from the fourth follow-up and from earlier surveys. Two versions of this variable appear in the tables of this report, but the only difference between these variables is that one version distinguishes among Hispanics by their country of origin, while the other version has a single Hispanic category.

Native American/Alaska Native	A person having origins in any of the original peoples of North America and who maintains cultural identification through tribal affiliation or community recognition.
Asian/Pacific Islander	A person having origins in any of the Pacific Islander original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or Pacific Islands. This includes people from China, Japan, Korea, the Philippine Islands, Samoa, India, and Vietnam.
Black, non-Hispanic	A person having origins in any of the black racial groups of Africa, except those of Hispanic origin.
White, non-Hispanic	A person having origins in any of the original peoples of the Europe, North Africa, or the Middle East (except those of Hispanic origin).
Hispanic	A person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race. The four Hispanic subgroups that are shown separately in some of the tables are Mexican, Puerto Rican, Cuban, and other.

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Religious background (BB091)

Student reported religious background in the base-year survey.

Self-concept (FYCONCPT), Locus-of control (FYLOCUS), and Community orientation (FYCOMMUN)

These three variables are scalar measures of 1980 high school sophomores' self-concepts, sense of control over their lives, and attitudes about the importance of community, respectively. Each of these scale variables is a composite measure of a series of questions administered during the First Followup in 1982. These variables were originally coded as standard normal distribution with a zero mean and a variance of 1, but were converted to a percentile format for the Fourth Followup by ranking students' scores on an index that ranged from 1 to 100. These variables are reported only as mean column values for groups defined in the rows.

Sex (SEX)

Male

Female

Socioeconomic status (SES) composite 1980 (BYSES)

BYSES in the Fourth Followup is a percentile composite based on the variable BYSES from the 1980 base year file. Originally, this variable was coded as a standard normal variable with a zero mean and a variance of 1, and was a composite score based on the average non-missing values for father's occupation, father's education, mother's education, family income, and material possessions in the home. The original standardized test score composite was converted to a percentile format by ranking students on an index that ranged from 1 to 100. Two versions of this variable were used in this report: as mean column values for groups defined in the rows (table 1.1); and as a row variable with the following format:

Low quartile	Students whose percentile rank ranged from 1 to 25 percent.
Middle two quartiles	Students whose percentile rank ranged from 26 to 75 percent.
High quartile	Students whose percentile rank ranged from 76 to 100 percent.

Time watching TV (weekdays) in 1982 (FY61)

Student-reported number of hours of TV on weekdays in 1982.

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Values cited as "important" by 1980 high school sophomores in 1992

Respondents were asked whether they valued the following (yes or no):

Providing their children with better opportunities than they had (VALUOPPR)

Money (VALUMONY)

Steady work (VALUSTED)

Strong friendships (VALUFRND)

Success in their work (VALUWORK)

Employment Variables

Real earnings in first year after terminating education (RELERNA1)

In order to facilitate comparisons of earnings across different levels of degree attainment and the year in which 1980 sophomores terminated their education, real earnings have been recorded for respondents both in relation to the timing of their highest degree attained and also in relation to their last enrollment in postsecondary education. Real earnings are reported in 1992 dollars, and nominal earnings were adjusted using the Consumer Price Index (CPI). Real earnings data are stored as continuous variables in the HS&B Fourth Followup Data Analysis System files.

Real earnings in third year after terminating education (RELERNA3)

See description of real earnings in first year after terminating education (RELERNA1) for explanation of this variable.

Earnings in 1991 (Y4301B9)

Earnings are stored as a continuous variable. Earnings were reported by respondents on an annual basis from 1983 through 1991.

Employment status February 1992 (EMST9202)

The HS&B Data Analysis System files contain a monthly employment status variable for each respondent from January 1986 through June 1992, although missing data are a problem for the months after February 1992. Each monthly employment status variable includes four categories.

Working	Employed in the month specified either full time or part time.
Unemployed, receiving benefits	Unemployed in the month specified and receiving unemployment benefits.
Unemployed, not receiving benefits	Unemployed in the month specified, but not receiving any unemployment benefits.
Out of the labor force	Not employed for pay outside of the home. This category

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	also includes discouraged workers who are not looking for work.

Industry of Employment in 1992 (Y4303CA)

Agriculture	Includes also forestry and fisheries (private only).
Mining	
Construction	Examples include building trades such as carpenters and electricians.
Manufacturing–durable goods	
Manufacturing–non-durable goods	
Public utilities	Examples include transportation, communications, and organizations like the U.S. Postal Service, Federal Express, and travel agents.
Wholesale trade	
Retail trade	
Finance	Also includes insurance and real estate.
Business and repair services	Examples include industries such as auto repair, business agents, public relations, advertising, and photo developing.
Personal services	Examples include cleaners, beauty shops, funeral homes, hotels and restaurants, and domestics.
Recreation services	Examples include entertainment and recreation, amusement parks, bowling alleys, and theaters.
Professional services	Examples include public and private hospitals, schools, social services, health practitioners such as doctors, dentists, nurses, and chiropractors.
Public administration	

Occupation of employment in 1992 (Y4303FA)

The occupation variable contains 29 categories, not all of which are shown in the tables of this report. These 29 categories can be collapsed to the 16 standard Dictionary of Occupational Titles (DOT) categories that were used to record father's, mother's, and respondent's occupation in earlier surveys. The full 29 categories are shown here.

Clerical, secretarial	Secretary, typist, file clerk, receptionist, word processor.
Clerical, financial	Bookkeeper, bank teller.
Clerical, other	Ticket agent, mail carrier, meter reader, shipping and

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	receiving, telephone operator, library clerk, office machine operator, messenger, dispatcher.
Craftsperson	Baker, auto mechanic, machinist, plumber, house painter, carpenter, brick mason, telephone installer, other unspecified mechanics, tile setter, carpet installer, roofer.
Farmer/farm manager	
Homemaker	No other outside job.
Laborer	Construction worker, car washer, sanitary worker, farm laborer, machine cleaner, stock handler, bagger, loader, stevedore, tradesperson's helper, gas station attendant, handyperson.
Manager/administrator–sales/purchasing	Sales manager, buyer.
Manager/administrator–government	Local, state, or federal.
Manager/administrator–retail, hospitality	Store, restaurant, hotel, etc.
Manager/administrator–manufacturing, construction	Line supervisor, etc.
Manager/administrator–other	
Skilled operative	Truck driver, assembler, machine operator, welder, inspector, bus driver, forklift operator, train engineer, cab driver, chauffeur, sewing machine operator, printing press operator.
Professional–arts/entertainment/media	Actor, artist, writer, athlete, designer, editor, disc jockey, publicist, photographer.
Professional–medical	Nurse, social worker. Excludes physicians.
Professional–engineer	
Professional–physician	
Professional–legal	
Professional–other	Clergyman, scientist, college professor, other postsecondary teacher, psychologist, accountant.
Proprietor/owner–retail/hospitality	Store, restaurant, hotel, motel.

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Proprietor/owner–manufacturing and construction	Construction contractor.
Proprietor/owner–other	
Protective services	Detective, police, fire fighter, security guard, crossing guard, FBI agent.
Sales	Salesperson, advertising or insurance agent, real estate broker, counter held, cashier.
School teacher	Elementary or secondary.
Service	Barber, beautician, janitor, waitperson, practical nurse, nurse's aide, maid, orderly, cook, kitchen help, exterminator, flight attendant.
Technical–computer related	Programmer, computer technician, systems analyst.
Technical–noncomputer related	Draftsperson, medical/dental technician.

Other Variables

Activities in week prior to survey in June 1992 (Y4103A–Y4103K)

Students were asked to describe their major activities in the week prior to being surveyed in June 1992.

Working

Looking for work

On temporary layoff

Taking vocational/technical courses

Taking undergraduate/academic courses

Taking graduate/professional courses

In apprenticeship or training program

On active duty in the armed forces

Keeping house

Taking a break

Other

Community lived in February 1982 (FY100)

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This variable is a student-reported measure of the degree of urbanization of the community in which the student lived in February 1982.

Rural/farm	A rural or farming community.
Small city	A small city or town of fewer than 50,000 people that is not a suburb of a larger place.
Medium city	A city of between 50,000 and 100,000 residents.
Suburb, medium city	A suburb of a medium-sized city.
Large city	A city of 100,000 to 500,000 people.
Suburb, large city	A suburb of a large city.
Huge city	A city with more than 500,000 people.
Suburb, huge city	A suburb of a huge city.
Military base	A military base or station.

Marital Status in June 1992 (MARST92)

Married	Respondent was married in June 1992.
Separated	Respondent was separated from spouse in June 1992.
Divorced	Respondent had been married but was divorced in June 1992.
Widowed	Respondent had been married but the spouse died sometime before June 1992.
Never married	Respondent had never been married.
Living in a marriage-like relationship	Respondent reported living with a partner but not being married.

Marital and parental status in 1992 (FMFRM92)

Married, no children

Married, with children

Divorced/separated/widowed, no children

Never married, no children

Never married, with children

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Living together, no children

Living together, with children

Number of marriages (TMSMAR92)

Stored as a continuous variable on the HS&B Fourth Followup Data Analysis System files.

Urbanicity of high school area (HSURBAN)

This variable classifies the community where the respondent's high school was located according to the CIC urbanization code.

Urban	Urban or central city.
Suburban	Suburban, in SMSA but not in central city.
Rural	Rural, or not in SMSA

Volunteer activities in 1992 (Y4502A–Y4502J)

The 1980 high school sophomores were asked to describe any volunteer activities in which they had been engaged in the year prior to being surveyed.

Any volunteer groups or organizations (yes/no)

Youth organizations such as little league coach, scout leader, etc.

Union, farm, trade, or professional associations

Political clubs or organizations

Organized volunteer work such as in a hospital

Sports teams or clubs

Educational organizations such as PTA or academic group

Service clubs such as Rotary, Chamber of Commerce, Veterans, Lions, Kiwanis, Elks, etc.

Other volunteer groups

Voting indicators

Registered in 1986 (TY56)

Registered in 1992 (Y4503)

Voted in presidential election in 1984 (TY58)

Voted in non-presidential local, state or national elections in 1988 (Y4504)

Voted in presidential election in 1988 (Y4505)

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Appendix B: Technical Notes

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Appendix B
Technical Notes

The High School and Beyond Fourth Followup

The High School and Beyond (HS&B) survey began in the spring of 1980 with the collection of base year questionnaire and test data on over 58,000 high school seniors and sophomores. The first followup survey was conducted in the spring of 1982, the second followup in the spring of 1984, the third followup in the spring of 1986, and the fourth followup in the spring of 1992.

The HS&B Fourth Followup Survey is the fifth wave of the longitudinal study, but unlike previous rounds, the fourth followup focused exclusively on a sophomore class. The Fourth Followup included two components: a respondent survey with sample of 14,825 members of the 1980 sophomore cohort, and a transcript study based on the 9,064 sophomore cohort members who reported postsecondary attendance. The goals of the fourth followup were to obtain information on issues of access to and choice of undergraduate and graduate educational institutions, persistence in attaining educational goals and progress through the curriculum, rates of degree attainment and of other educational outcomes, and labor market outcomes in relation to educational attainment and labor market experiences.

Sample design. In the base year, students were selected using a two-stage, stratified probability sample design with schools as the first-stage units and students within schools as the second-stage units.[14] The total number of schools selected for the sample was 1,122, from a frame of 24,725 schools with grades 10 or 12 or both. Within each stratum schools were selected with probabilities proportional to the estimated enrollment in their 10th and 12th grades. Within each school, 36 seniors and 36 sophomores were randomly selected. In those schools with fewer than 36 seniors or 36 sophomores, all eligible students were drawn in the sample.

The first follow-up sophomore and senior cohort samples were based on the HS&B base year samples, retaining the essential features of a stratified multi-stage design (for further details see Tourangeau, et al., 1983).[15] Subsequent to the first followup survey, high school transcripts were sought for a probability subsample of nearly 18,500 members of the 1980 sophomore cohort. The subsampling plan for the Transcript Study emphasized the retention of members of subgroups of special relevance for education policy analysis. Compared to the base year and first followup surveys, the Transcript Study sample design further increased the overrepresentation of racial and ethnic minorities (especially those with above average HS&B achievement test scores), students who attended private high schools, school dropouts,

[14]For further details on the base year sample design see Frankel, M.; Kohnke, L.; Buonanno, D.; and Tourangeau, R. (1981), High School and Beyond Sample Design Report. Chicago: National Opinion Research Center.
[15]Tourangeau, R; McWilliams, H.; Jones, C.; Frankel, M.; and O'Brien, F. (1983), *High School and Beyond First Follow-Up (1982) Sample Design Report*. Chicago: National Opinion Research Center.

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transfers and early graduates, and students whose parents participated in the base year Parent's Survey on financing postsecondary education.

The samples for the second and third followup surveys of the 1980 sophomore cohort were based upon the transcript study design. A total of 14,825 cases were selected from among the 18,500 retained for the transcript study. As was the case for the transcript sample, the sophomore cohort second and third follow-up samples included disproportionate numbers of sample members from policy-relevant subpopulations (e.g., racial and ethnic minorities, students from private high schools, high school dropouts, students who planned to pursue some type of postsecondary schooling, and so on).[16] The members of the senior cohort selected into the second follow-up sample consisted exactly of those selected into the first follow-up sample. The third followup was the last one conducted for the senior cohort.

The fourth followup is composed solely of members from the sophomore cohort. The members of the sophomore cohort selected into the fourth follow-up sample consisted exactly of those selected into the second and third follow-up sample. For any student who ever enrolled in postsecondary education, complete transcript information was requested from the institutions indicated by the student.

Sample weights. The general purpose of weighting is to compensate for the unequal probability of selection into the sample, and to adjust for respondent nonresponse to the survey. The weights are based on the inverse of the selection probabilities at each stage of the sample selection process and on nonresponse adjustment factors computed within weighting cells. The fourth followup had two major components, the collection of survey data and the collection of postsecondary transcript data. Nonresponse occurred during both of these data collection phases. Weights were computed to account for nonresponse during either phase. For the survey data, two weights were computed. The first weight (FU4WT) was computed for all fourth follow-up respondents. The second weight (PANEL5WT) was computed for all fourth follow-up respondents who also participated in the base year and first, second and third followup surveys. For more information about the design and implementation of the survey weights, see the High School and Beyond Fourth Followup Methodology Report.[17]

Accuracy of Estimates

The estimates in this report are derived from samples and are subject to two broad classes of error—sampling and nonsampling error. Sampling errors occur because the data are collected from a sample of a population rather than from the entire population. Estimates based on a sample will differ somewhat from the values that would have been obtained from a universe survey using the same instruments, instructions, and procedures. Nonsampling

[16]See Tables 2.4-1 through 2.4-4 of C. Jones and B. D. Spencer (1985), *High School and Beyond Second Follow-Up (1984) Sample Design Report*. Chicago: National Opinion Research Center.
[17]Zahs, Pedlow, Morrissey, Marnell, and Nichols, *The High School and Beyond Fourth Follow-Up Methodology Report* (U.S. Department of Education, National Center for Education Statistics, Postsecondary Longitudinal Studies Branch, 1994), Section 3.

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errors come from a variety of sources and affect universe surveys as well as sample surveys. Examples of sources of nonsampling error include design, reporting, and processing errors and errors due to nonresponse. The effects of nonsampling errors are more difficult to evaluate than those that result from sampling variability. As much as possible, procedures are built into surveys in order to minimize nonsampling errors.

The standard error is a measure of the variability due to sampling when estimating a parameter. It indicates how much variance there is in the population of possible estimates of a parameter for a given sample size. Standard errors can be used as a measure of the precision expected from a particular sample. The probability that a complete census would differ from the sample by less than the standard error is about 68 out of 100. The chances that the difference would be less than 1.65 times the standard error are about 90 out of 100; that the difference would be less than 1.96 times the standard error, about 95 out of 100. Selected standard errors are presented in table B.1, and standard errors for the essay tables are presented in appendix C.

Data Analysis System

The estimates presented in this report were produced using the NCES Data Analysis System (DAS) for the HS&B Fourth Followup. The DAS software makes it possible for users to specify and generate their own tables from the HS&B data. With the DAS, users can recreate or expand upon the tables presented in this report. In addition to the table estimates, the DAS calculates appropriate standard errors and weighted sample sizes for the estimates.[18] For example, table B.1 presents the standard errors that correspond to table 1.1 in the table compendium. If the number of valid cases is too small to produce an estimate, the DAS prints the message “low-N” instead of the estimate (converted to a “—” in the Compendium tables).

In addition to the tables, the DAS will also produce a correlation matrix of selected variables that can be used in linear regression models, and the design effects (DEFT) for all the parameter estimates in the correlation matrix. Since statistical procedures generally compute regression coefficients based on simple random sample assumptions, the standard errors must be adjusted with the design effects to take into account the complex sampling procedures used in the HS&B surveys.

[18]The HS&B sample is not a simple random sample, and techniques for estimating standard errors that are appropriate for simple random samples will not produce accurate standard errors for these data. The DAS takes into account the complex sampling procedures and calculates standard errors that are appropriate for such samples. The method for computing sampling errors used by the DAS involves approximating the estimator by the linear terms of a Taylor series expansion. This procedure is typically referred to as the Taylor series method.

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For more information about the 1992 HS&B Fourth Followup DAS, contact:

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Methodology and Statistical Procedures

The comparisons in the text have all been tested for statistical significance to ensure that the differences are larger than those that might be expected due to sampling variation. Three types of comparisons have been made in the text.

Differences in two estimated percentages. The Student's t statistic was used to test the likelihood that the differences between two percentages were larger than would be expected due to sampling error. The Student's t values can be computed for comparisons using the estimates in these tables with the following formula:

$$t = \frac{P_1 - P_2}{\sqrt{se_1^2 + se_2^2}}$$

where P_1 and P_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. This formula is only valid for independent estimates. When estimates are not independent (for example, when comparing the percentages within a percent distribution—in this report, within a row in a table), a covariance term was added to the denominator of the t-test formula.

There are hazards in reporting statistical tests for each comparison. First, large t-values may appear to merit special attention. However, the magnitude of the t-statistic is related not only to the observed differences in means or percentages, but also to the number of students in the categories that are being compared. A small difference compared across a large number of students will produce a large t-statistic.

Second, as the number of comparisons on the same set of data increases, the likelihood that the t value for at least one of the comparisons will exceed 1.96 simply due to sampling error increases. For a single comparison, there is a 5 percent chance that the t value will exceed 1.96 due to sampling error. For five tests, the risk of getting at least one t value that high increases to 23 percent, and for 20 comparisons, it increases to 64 percent.

One way to compensate for this danger when making multiple comparisons is to adjust the critical value that the t-statistic must equal or exceed to take into account the number of comparisons being made. This is done using a Bonferroni adjustment to control for the number

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of possible comparisons—the family of comparisons—between the categories of the variable being tested. Family size, k, is calculated as follows: $k = [j * (j - 1)]/2$, where j is equal to the number of categories in the variable. In a 5-category variable such as parent's education, k would be equal to [(5)(5-1)]/2, or 10. The family size is then used to adjust the probability that one would incorrectly conclude that two estimates were different because of sampling error. Differences between two estimates were only reported when $p \leq 0.05/k$, or in the case of parents' education, when $p \leq 0.005$ (that is, 0.05/10). In order to conclude that two estimates were different in this case, the critical value that the t-statistic had to equal or exceed was 2.81, which was obtained from a table of t statistics for a two-tailed test.

Trends. In several instances, pair-wise comparisons proved too cumbersome. For example, one would like to say something about the general relationship between the percentage of 1980 high school sophomores with a postsecondary degree and their parents' level of educational attainment. In many cases, not all of the ten possible comparisons are statistically significant, even though the data appear to suggest clear trends. In such cases, a weighted least squares regression formula was used to test whether the upward trend between parents' attainment and the percentage of sophomores with a postsecondary degree was significant, even if all of the pair-wise comparisons were not.

This regression test for linearity was done in this analysis using the data manipulation and regression capabilities of the Microsoft EXCEL spreadsheet program. The input data for the regressions were the estimates and standard errors in the output tables created by the Data Analysis System. All of the variables included in the regression equations were transformed by dividing them by the standard error of the relevant proportion. An intercept variable was also created by diving a column of 1s by the standard error of the corresponding proportion. The new dependent variable was then regressed on the new independent variable and the intercept variable. The statistical significance of beta for the independent variable was then evaluated in relation $p \leq 0.05$, or $t \geq 1.96$. One important limitation of this test is that it can only be used to assess trends across ordered variables or variable categories.

Differences in distributions. The third type of test used in this report is the chi-square test, which was used to assess whether one distribution was different from another. For example, one would like to evaluate the highest level of educational attainment in 1992 of the 1980 sophomores in relation to their educational expectations in 1982. Even with the advanced degree categories (master's, professional, and doctorate) collapsed into a single category, there are five levels of postsecondary attainment (none, vocational certificate, associate degree, bachelor degree, and advanced degree), and five levels of postsecondary expectations, which implies 120 (i.e., 5!) pair-wise comparisons. In this instance, the chi-square test enables one to evaluate whether for each level of expectations the attainment distributions are different with a single test.

Once the chi-square value is calculated, it is adjusted by the cell-specific design effects (DEFT)—rather than the average DEFT for the whole sample—to take into account the complex sample design. These effects were estimated using a Microsoft EXCEL spreadsheet

model, which is based on work by Rao and Thomas.[19] In general, this adjustment reduces the value of the chi-square (because complex samples are not as efficient as simple random samples of equivalent size). This value is then evaluated in relation to a critical value that is obtained from a table for a test with n degrees of freedom and a specified signficance level. In this case, the signficance level was set at $p \leq 0.05$. The degrees of freedom were calculated as the number of row categories minus 1 times the number of column categories minus 1.

[19]J.N.K. Rao and D.R. Thomas, "Chi-Squared Tests for Contingency Tables," in Skinner, Holt, and Smith, *Analysis of Complex Surveys* (New York: Wiley and Sons, 1989), chapter 4.

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Table B.1—Standard errors for Table 1.1: Average percentile rank of 1980 high school sophomores in specialized composite scales, by selected characteristics

Student characteristics	Socio-economic status (1980)	Test scores (1982)	Self-concept (1982)	Locus of control (1982)	Community orientation (1982)
Total	0.50	0.49	0.40	0.41	0.42
Sex					
Male	0.60	0.62	0.54	0.59	0.58
Female	0.62	0.59	0.51	0.51	0.53
Race–ethnicity					
Native American/Alaska Native	2.07	2.75	2.59	3.49	2.91
Asian/Pacific Islander	2.45	2.41	1.93	1.50	1.71
Black	1.04	0.94	1.05	1.26	1.03
White	0.52	0.49	0.44	0.44	0.42
Hispanic-Mexican	1.72	1.59	1.67	1.73	1.47
Hispanic-Cuban	3.78	4.13	2.77	2.89	3.03
Hispanic-Puerto Rican	2.56	2.42	3.39	2.75	2.47
Hispanic-other	2.11	1.82	2.36	2.63	2.25
Family income in 1980					
Less than $8,000	1.25	1.56	1.59	1.57	1.55
$8,000–$14,999	0.89	1.14	0.93	0.97	0.95
$15,000–$19,999	0.88	1.05	0.99	0.96	0.99
$20,000–$24,999	0.92	1.05	0.93	1.05	0.95
$25,000–$29,999	0.83	0.97	0.91	0.87	0.93
$30,000–$39,999	0.79	0.93	0.90	0.84	0.99
$40,000–$49,999	1.07	1.29	1.15	1.12	1.24
$50,000 or more	0.95	1.27	1.13	1.05	1.11
Father's occupation in 1980					
Technical	1.00	1.83	1.69	1.68	1.76
Clerical	1.42	2.33	2.23	2.28	2.34
Craftsman	0.66	0.94	0.96	0.97	0.98
Farmer	1.22	1.79	1.72	1.78	1.66
Laborer	0.83	1.13	1.11	1.19	1.14
Manager	0.66	1.03	1.05	0.97	1.15
Military	2.03	2.77	2.94	3.00	2.59
Operative	0.73	1.00	1.07	1.01	1.06
Professional	0.93	1.58	1.48	1.41	1.53
Professional/doctor	0.66	1.43	1.71	1.65	1.82
Proprietor/owner	0.95	1.40	1.37	1.26	1.40
Protective service	1.52	2.10	1.87	2.07	2.09
Sales	1.01	1.51	1.68	1.54	1.69
School teacher	1.34	3.24	2.99	2.78	3.21
Service	2.01	2.81	2.85	2.62	2.34
Program in high school					
General	0.72	0.68	0.74	0.78	0.81
Academic	0.65	0.58	0.51	0.47	0.53
Vocational	0.64	0.59	0.67	0.74	0.66
Urbanicity of high school area					
Urban	1.19	1.35	0.88	1.06	0.94
Suburb	0.76	0.77	0.57	0.58	0.60
Rural	0.87	0.76	0.70	0.72	0.77

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Table B.1—Standard errors for Table 1.1: Average percentile rank of 1980 high school sophomores in specialized composite scales, by selected characteristics—Continued

Student characteristics	Socio-economic status (1980)	Test scores (1982)	Self-concept (1982)	Locus of control (1982)	Community orientation (1982)
Community lived in Feb 1982					
Rural/farm	0.78	0.88	0.75	0.76	0.74
Small city	0.79	0.75	0.65	0.60	0.60
Medium city	1.03	1.11	0.83	0.89	0.88
Burb medium city	1.39	1.67	1.10	1.21	1.16
Large city	1.53	1.51	1.07	1.16	1.09
Burb large city	1.44	1.44	1.26	1.24	1.28
Huge city	2.08	2.39	1.57	1.79	1.63
Burb huge city	1.91	2.12	1.60	1.77	1.61
Military base	3.37	3.49	2.94	3.54	3.92
Religious background in 1980					
Baptist	0.87	0.98	0.88	0.94	0.85
Methodist	1.28	1.25	1.09	1.16	1.30
Lutheran	1.27	1.41	1.33	1.42	1.36
Presbyterian	1.82	1.79	1.80	1.82	1.83
Episcopalian	2.59	2.63	2.30	2.26	2.36
Other protestant	1.92	1.85	1.94	1.82	1.89
Catholic	0.72	0.65	0.60	0.60	0.61
Other Christian	1.42	1.53	1.55	1.49	1.53
Jewish	3.04	2.47	3.21	3.12	3.35
Other religion	1.66	1.60	1.55	1.68	1.78
None	1.61	1.77	1.50	1.52	1.64
Political beliefs in 1980					
Conservative	1.35	1.53	1.36	1.23	1.33
Moderate	0.72	0.70	0.67	0.65	0.70
Liberal	1.08	1.08	1.02	1.05	0.98
Radical	1.72	1.94	1.63	1.75	1.81
None	1.24	1.20	1.21	1.31	1.22
Grades in high school					
Mostly A 90–100	1.61	1.32	1.57	1.31	1.56
Half A/B 85–89	0.95	0.92	0.88	0.79	0.90
Mostly B 80–84	0.82	0.77	0.71	0.68	0.71
Half B/C 75–79	0.73	0.67	0.66	0.63	0.69
Mostly C 70–74	0.78	0.74	0.77	0.76	0.79
Half C/D 65–69	1.09	0.91	1.15	1.26	1.26
Mostly D 60–64	2.43	1.59	2.57	3.52	2.87
Parents educational attainment by 1980					
High school	0.44	0.59	0.60	0.62	0.64
Vocational/technical	0.61	0.87	0.82	0.81	0.92
Some college	0.57	0.81	0.70	0.71	0.76
Bachelor's degree	0.69	1.11	1.12	1.04	1.11
Advanced degree	0.76	1.44	1.61	1.38	1.73

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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Appendix C: Essay Standard Error Tables

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Standard errors for Table 1
Percentage of 1980 high school sophomores by highest degree attained through 1992, by postsecondary expectations in 1982

Student characteristics	Highest degree through 1992							
	Less than high school graduate	High school	Certi-ficate	Assoc-iate's	Bachelor's	Master's	Profes-sional	Doctorate
Total	0.34	0.70	0.43	0.31	0.55	0.20	0.10	0.05
Postsecondary expectations in 1982								
None	1.01	1.25	0.72	0.42	0.21	0.10	0.00	0.07
Vocational-technical	0.56	1.28	1.06	0.82	0.46	0.07	0.00	0.00
Less than four-year degree	0.35	1.54	1.12	1.07	1.00	0.31	0.12	0.00
College degree	0.22	1.28	0.61	0.58	1.27	0.55	0.22	0.04
Advanced degree	0.26	1.41	0.68	0.63	1.46	0.77	0.50	0.26

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

Standard errors for Table 2
Percentage of 1980 high school sophomores by highest degree attained through 1992, by immediate versus delayed entry

Entry status	Highest degree through 1992				
	High school	Certi-ficate	Assoc-iate's	Bachelor's	Advanced degree
Immediate entrants	0.84	0.53	0.56	0.89	0.47
Delayed entrants	1.41	1.24	0.89	0.76	0.26

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 3
Percentage of 1980 high school sophomores by highest degree attained through 1992, by postsecondary expectations in 1982 among immediate versus delayed entrants

Postsecondary expectations in 1982	Highest degree through 1992				
	High school	Certi-ficate	Assoc-iate's	Bachelor's	Advanced degree
Immediate entrants					
None	5.18	4.78	3.63	2.46	0.00
Vocational-technical	2.48	2.28	2.04	1.21	0.27
Less than four-year degree	1.96	1.41	1.71	1.59	0.59
College degree	1.24	0.62	0.67	1.41	0.74
Advanced degree	1.36	0.56	0.7	1.55	1.05
Delayed entrants					
None	2.68	2.37	1.80	0.86	0.52
Vocational-technical	2.62	2.33	1.75	0.88	0.00
Less than four-year degree	3.08	2.58	0.90	2.13	0.49
College degree	3.49	2.53	2.01	2.59	0.79
Advanced degree	4.48	3.47	2.25	3.44	1.70

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 4
Percentage of 1980 high school sophomores by highest degree attained through 1992, by timing and intensity of initial postsecondary enrollment

Type of start in postsecondary education	Highest degree through 1992							
	Less than high school graduate	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Total	0.34	0.70	0.43	0.31	0.55	0.20	0.10	0.05
4-year institution								
Full-time fall 1982	0.03	0.95	0.44	0.52	1.10	0.65	0.37	0.17
Part-time fall 1982	0.00	4.57	2.75	2.78	4.27	1.76	0.09	0.38
Delayed entry	0.23	2.92	1.45	1.67	2.21	1.10	0.31	0.33
2-year institution								
Full-time fall 1982	0.19	1.69	1.20	1.49	1.50	0.53	0.15	0.00
Part-time fall 1982	1.05	2.89	1.90	1.53	2.19	0.50	0.48	0.01
Delayed entry	0.42	1.92	1.52	1.27	0.90	0.16	0.00	0.00
Other institution								
Fall 1982	0.13	2.07	2.38	2.14	1.76	0.61	0.32	0.00
Delayed entry	0.55	2.53	2.75	1.85	0.89	0.07	0.07	0.00
Other enrollment	0.00	0.00	2.79	1.83	1.87	0.72	0.28	0.80
No enrollment	0.95	0.95	0.00	0.00	0.00	0.00	0.00	0.00

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 5
Average length of initial delay (in months) among 1980 high school sophomores who delayed entry into postsecondary education, by highest degree attained through 1992 and type of institution

Type of institution	Average length of delay (months)	Average length of delay in months by highest degree through 1992: High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	0.38	0.68	1.22	0.85	0.18	0.31
4-year	1.46	2.23	5.14	4.99	1.55	—
2-year public	1.13	1.50	2.87	2.43	2.27	—

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

Standard errors for Table 6
Average length of initial delay before entering postsecondary education (in months) among 1980 high school sophomores, by highest degree attained through 1992 and postsecondary expectations

Postsecondary expectations (1982)	Average length of delay (months)	Average length of delay in months by highest degree through 1992: High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	0.38	0.68	1.22	0.85	0.18	0.31
None	1.66	2.24	3.15	4.67	—	—
Vocational-technical	1.01	1.44	1.98	1.80	1.89	—
Less than four-year degree	0.72	1.33	1.76	0.84	0.61	1.36
College degree	0.47	1.12	2.71	1.82	0.15	0.44
Advanced degree	0.33	1.05	1.08	1.83	0.26	0.36

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 7
Average length of initial delay before entering postsecondary education (in months) among 1980 high school sophomores, by highest degree attained through 1992, socioeconomic status quartile, and test score quartile

Student characteristic	Average length of delay (months)	Average length of delay in months by highest degree through 1992				
		High school	Certificate	Associate's	Bachelor's	Advanced degree
Total	0.38	0.68	1.22	0.85	0.18	0.31
Socioeconomic status						
Low quartile	1.13	1.60	2.69	2.46	1.10	—
Middle two quartiles	0.49	0.94	1.29	0.97	0.26	0.38
High quartile	0.36	0.96	2.01	1.28	0.20	0.39
Test score composite (1982)						
Low quartile	1.44	1.79	3.07	2.72	1.91	—
Middle two quartiles	0.49	0.82	1.43	0.96	0.34	0.60
High quartile	0.33	1.14	2.26	1.02	0.18	0.19

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 8
Average number of months between first enrollment and attainment of degrees, by type of degree, postsecondary expectations, and timing and intensity of initial postsecondary enrollment

Postsecondary education characteristics	Certificate	Associate's	Bachelor's
Total	1.07	0.89	0.44
Postsecondary expectations			
None	1.83	2.98	—
Vocational-technical	1.37	1.50	3.93
Less than 4-year degree	3.05	1.50	1.54
College degree	2.61	1.75	0.63
Advanced degree	3.23	2.50	0.55
Type of start in postsecondary education			
4-year institution			
Full-time fall 1982	2.77	2.25	0.43
Part-time fall 1982	—	—	4.28
Delayed entry	5.39	5.75	1.74
2-year institution			
Full-time fall 1982	3.54	1.21	1.51
Part-time fall 1982	4.82	4.51	3.55
Delayed entry	3.46	2.90	3.78
Other institution			
Fall 1982	1.75	2.16	2.18
Delayed entry	1.52	2.94	—

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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Standard errors for Table 9
Average number of postsecondary institutions attended by highest degree attained through 1992, by timing and intensity of initial postsecondary enrollment

Type of start in postsecondary education	Certificate	Associate's	Bachelor's
Total	0.03	0.03	0.02
4-year institution			
Full-time fall 1982	0.08	0.09	0.02
Part-time fall 1982	—	—	0.22
Delayed entry	0.15	0.15	0.07
2-year institution			
Full-time fall 1982	0.07	0.04	0.06
Part-time fall 1982	0.12	0.12	0.14
Delayed entry	0.11	0.09	0.13
Other institution			
Fall 1982	0.04	0.06	0.12
Delayed entry	0.04	0.08	—

—Sample size is too small for a reliable estimate.

SOURCE: National Center for Education Statistics, High School & Beyond: Sophomore Cohort 1980–1992

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EXHIBIT 1a

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NATIONAL CENTER FOR EDUCATION STATISTICS

Statistical Analysis Report January 1995

High School and Beyond: 1992 Descriptive Summary of 1980 High School Sophomores 12 Years Later

With an Essay on:
Educational Attainment of 1980 High School Sophomores by 1992

John Tuma
Sonya Geis
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Berkeley, CA 94704

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Project Officer
National Center for Education Statistics

U.S. Department of Education
Office of Educational Research and Improvement **NCES**

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Table 2.4.A—Percentage distribution of 1980 high school sophomores by highest degree earned through 1992, by selected characteristics

Student characteristics	Less than high school	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Total	5.8	51.5	11.0	7.9	20.0	2.7	0.9	0.2
Sex								
Male	6.5	53.5	9.7	6.7	19.5	2.6	1.3	0.2
Female	5.0	49.5	12.4	9.1	20.5	2.8	0.5	0.1
High school diploma status in 1982								
Regular diploma	0.3	51.9	10.8	8.7	23.9	3.2	1.1	0.2
Returned for diploma	6.8	68.3	14.4	7.0	3.4	0.1	0.1	0.0
Returned but no diploma	27.1	47.7	19.9	3.4	1.9	0.0	0.0	0.0
Never returned	51.5	35.7	9.5	2.1	0.9	0.3	0.0	0.0
Postsecondary expectations in 1982								
None	15.5	71.1	9.3	3.0	1.0	0.1	0.0	0.1
Vocational/technical	4.6	61.6	19.8	10.7	3.3	0.1	0.0	0.0
Less-than-4-year degree	1.6	53.2	13.3	15.6	15.0	1.1	0.2	0.0
College degree	0.9	35.3	6.8	6.3	44.9	5.0	0.8	0.1
Advanced degree	0.8	28.9	5.2	5.7	45.1	9.0	4.4	0.8
Socioeconomic status (1980)								
Low quartile	9.0	64.6	12.3	6.9	6.4	0.7	0.1	0.0
Middle two quartiles	3.9	53.8	11.5	9.1	19.0	2.0	0.5	0.1
High quartile	1.4	32.7	7.0	7.6	41.2	6.9	2.7	0.5
Test score composite (1982)								
Low quartile	15.6	64.0	13.0	4.1	3.0	0.2	0.0	0.1
Middle two quartiles	3.1	56.2	12.8	10.1	16.1	1.5	0.3	0.0
High quartile	0.1	26.5	4.8	7.2	49.2	8.7	3.0	0.6
Type of start in postsecondary education								
Fall 1982 full-time 4-year	0.0	21.2	3.5	4.6	57.8	9.0	3.4	0.5
Fall 1982 full-time public 2-year	0.3	36.5	11.9	24.4	24.6	2.1	0.2	0.0
Fall 1982 part-time 4-year	0.0	52.2	6.7	10.0	27.2	3.5	0.1	0.4
Fall 1982 part-time public 2-year	1.6	59.5	13.4	9.4	14.4	0.9	0.8	0.0
Fall 1982 other	0.2	23.0	34.3	24.5	15.7	1.9	0.4	0.0
Delay 4-year	0.4	55.6	8.1	7.4	24.0	3.7	0.4	0.4
Delay public 2-year	1.7	63.0	16.9	12.0	6.2	0.2	0.0	0.0
Delay other	1.9	31.4	48.4	14.4	3.8	0.1	0.1	0.0
Other enrollment	0.0	0.0	86.5	5.1	6.0	1.1	0.4	0.8
No enrollment	16.1	83.9	0.0	0.0	0.0	0.0	0.0	0.0

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Table 2.4.A—Percentage distribution of 1980 high school sophomores by highest degree earned through 1992, by selected characteristics—Continued

Student characteristics	Less than high school	High school	Certificate	Associate's	Bachelor's	Master's	Professional	Doctorate
Race–ethnicity								
Native American/Alaska Native	17.8	58.2	11.8	5.0	6.7	0.5	0.0	0.0
Asian/Pacific Islander	0.6	40.9	6.9	6.2	32.7	4.7	7.5	0.7
Black	6.9	59.6	16.3	5.2	10.0	1.5	0.5	0.2
Hispanic	11.9	59.6	11.2	7.3	9.0	0.6	0.3	0.0
White	4.9	49.1	10.1	8.4	23.1	3.2	1.0	0.2
Parents' educational attainment in 1980								
No high school diploma	6.5	59.8	12.8	8.6	10.8	1.2	0.3	0.1
High school graduate	5.2	59.1	12.4	6.0	16.6	0.3	0.4	0.0
Vocational/technical	3.0	49.2	15.4	10.2	19.1	2.4	0.5	0.1
Some college	2.1	43.7	8.4	8.4	32.0	4.3	1.0	0.2
Bachelor's degree	1.4	32.6	4.9	8.1	42.4	6.9	3.1	0.5
Advanced degree	3.5	23.9	8.6	4.9	44.1	10.0	4.3	0.7

NOTE: Percentages may not sum to 100 percent due to rounding.

SOURCE: National Center for Education Statistics, High School & Beyond: 1980 Sophomore Cohort, 1980–1992.

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EXHIBIT 2

NEWS RELEASE
BUREAU OF LABOR STATISTICS
U.S. DEPARTMENT OF LABOR

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For release 10:00 a.m. (EDT) Friday, June 24, 2016 USDL-16-1250

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AMERICAN TIME USE SURVEY — 2015 RESULTS

In 2015, 38 percent of workers in management, business, and financial operations occupations, and 35 percent of those employed in professional and related occupations, did some or all of their work from home on days they worked, the U.S. Bureau of Labor Statistics reported today. Workers employed in other occupations were less likely to work from home on days they worked.

These and other results from the American Time Use Survey (ATUS) were released today. These data include the average amount of time per day in 2015 that individuals worked, did household activities, and engaged in leisure and sports activities. Additionally, measures of the average time per day spent providing childcare—both as a primary (or main) activity and while doing other things—for the combined years 2011-2015 are provided. For a further description of ATUS data and methodology, see the Technical Note.

Working (by Employed Persons) in 2015

- Employed persons worked an average of 7.6 hours on the days they worked. More hours were worked, on average, on weekdays than on weekend days—8.0 hours compared with 5.6 hours. (See table 4.)

- On the days they worked, employed men worked 42 minutes more than employed women. This difference partly reflects women's greater likelihood of working part time. However, even among full-time workers (those usually working 35 hours or more per week), men worked longer than women—8.2 hours compared with 7.8 hours. (See table 4.)

- On the days they worked, 82 percent of employed persons did some or all of their work at their workplace and 24 percent did some or all of their work at home. Employed persons spent more time working at the workplace than at home—8.0 hours compared with 3.2 hours. (See table 6.)

- The share of workers doing some or all of their work at home grew from 19 percent in 2003—the first year the ATUS was conducted—to 24 percent in 2015. In this same period, the average time employed persons spent working at home on days they worked increased by 40 minutes (from 2.6 hours to 3.2 hours). (See table 6.)

- Compared to workers with less education, employed persons age 25 and over with a bachelor's degree or higher were the least likely to work at their workplace on days they worked (74 percent), and they were the most likely to do some or all of their work from home (39 percent).

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By comparison, 94 percent of workers with less than a high school diploma worked at their workplace on days they worked and 7 percent worked from home. (See table 6.)

- On the days they worked, 38 percent of persons employed in management, business, and financial operations and 35 percent of those employed in professional and related occupations did some or all of their work from home. Workers employed in other occupations were less likely to work from home on days they worked. (See table 7.)

- Multiple jobholders were more likely to work on an average day than were single jobholders—80 percent compared with 67 percent. (For a definition of 'average day,' see the Technical Note.) Multiple jobholders also were more likely to work at home than were single jobholders—36 percent compared with 23 percent. (See table 6.)

Household Activities in 2015

- On an average day, 85 percent of women and 67 percent of men spent some time doing household activities such as housework, cooking, lawn care, or financial and other household management. (See table 1.)

- On the days they did household activities, women spent an average of 2.6 hours on such activities, while men spent 2.1 hours. (See table 1.)

- On an average day, 22 percent of men did housework—such as cleaning or laundry—compared with 50 percent of women. Forty-three percent of men did food preparation or cleanup, compared with 70 percent of women. Men were slightly more likely to engage in lawn and garden care than were women—12 percent compared with 8 percent. (See table 1.)

- From 2003 to 2015, the share of men doing food preparation and cleanup on an average day increased from 35 percent to 43 percent. The average time per day men spent doing food preparation and cleanup increased by 5 minutes, from 16 minutes in 2003 to 21 minutes in 2015. (See table 1.)

- From 2003 to 2015, the share of women doing housework on an average day decreased from 54 percent to 50 percent. The average time per day women spent doing housework declined from 58 minutes in 2003 to 52 minutes in 2015. (See table 1.)

Leisure Activities in 2015

- On an average day, nearly everyone age 15 and over (96 percent) engaged in some sort of leisure activity such as watching TV, socializing, or exercising. Of those who engaged in leisure activities, men spent more time in these activities (5.8 hours) than did women (5.1 hours). (See table 1.)

- Watching TV was the leisure activity that occupied the most time (2.8 hours per day), accounting for more than half of leisure time, on average, for those age 15 and over. Socializing, such as visiting with friends or attending or hosting social events, was the next most common leisure activity, accounting for 41 minutes per day. (See table 1.)

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- Men were more likely than women to participate in sports, exercise, or recreation on a given day—23 percent compared with 18 percent. On days they participated, men also spent more time in these activities than did women—1.7 hours compared with 1.2 hours. (See table 1.)

- On an average day, adults age 75 and over spent 7.8 hours engaged in leisure activities—more than any other age group; 35- to 44-year-olds spent 4.0 hours engaged in leisure and sports activities—less than other age groups. (See table 11.)

- Time spent reading for personal interest and playing games or using a computer for leisure varied greatly by age. Individuals age 75 and over averaged 1.1 hours of reading per weekend day and 20 minutes playing games or using a computer for leisure. Conversely, individuals ages 15 to 19 read for an average of 8 minutes per weekend day and spent 1.3 hours playing games or using a computer for leisure. (See table 11.)

- Employed adults living in households with no children under age 18 engaged in leisure activities for 4.5 hours per day, 1.1 hours more than employed adults living with a child under age 6. (See table 8B.)

Care of Household Children for the period 2011-2015

- Adults living in households with children under age 6 spent an average of 2.0 hours per day providing primary childcare to household children. Adults living in households where the youngest child was between the ages of 6 and 17 spent less than half as much time providing primary childcare to household children—49 minutes per day. Primary childcare is childcare that is done as a main activity, such as providing physical care or reading to children. (See table 9.)

- On an average day, among adults living in households with children under age 6, women spent 1.0 hour providing physical care (such as bathing or feeding a child) to household children; by contrast, men spent 25 minutes providing physical care. (See table 9.)

- Adults living in households with at least one child under age 6 spent an average of 5.3 hours per day providing secondary childcare—that is, they had at least one child in their care while doing activities other than primary childcare. Secondary childcare provided by adults living in households with children under age 6 was most commonly provided while doing leisure activities (2.1 hours) or household activities (1.3 hours). (See table 10.)

- Adults living in households with children under age 6 spent more time providing primary childcare on an average weekday (2.1 hours) than on an average weekend day (1.8 hours). However, they spent less time providing secondary childcare on weekdays than on weekend days—4.5 hours compared with 7.4 hours. (See tables 9 and 10.)

Additional Data

ATUS 2015 data files are available for users to do their own tabulations and analyses. In accordance with BLS and Census Bureau policies that protect the privacy of survey respondents, identifying information does not appear on the data files. The 2015 data files are available on the BLS website at www.bls.gov/tus/data.htm.

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Technical Note

The estimates in this news release are based on annual average data from the American Time Use Survey (ATUS). The ATUS, which is conducted by the U.S. Census Bureau for the Bureau of Labor Statistics (BLS), is a continuous survey about how individuals age 15 and over spend their time.

Information in this release will be made available to sensory impaired individuals upon request. Voice phone: (202) 691-5200; Federal Relay Service: (800) 877-8339.

Survey methodology

Data collection for the ATUS began in January 2003. Sample cases for the survey are selected monthly, and interviews are conducted continuously throughout the year. In 2015, approximately 10,900 individuals were interviewed. Estimates are released annually.

ATUS sample households are chosen from the households that completed their eighth (final) interview for the Current Population Survey (CPS), the nation's monthly household labor force survey. ATUS sample households are selected to ensure that estimates will be nationally representative.

One individual age 15 or over is randomly chosen from each sampled household. This "designated person" is interviewed by telephone once about his or her activities on the day before the interview—the "diary day."

All ATUS interviews are conducted using Computer Assisted Telephone Interviewing. Procedures are in place to collect information from the small number of households that did not provide a telephone number during the CPS interview.

ATUS designated persons are preassigned a day of the week about which to report. Preassignment is designed to reduce variability in response rates across the week and to allow oversampling of weekend days so that accurate weekend day measures can be developed. Interviews occur on the day following the assigned day. For example, a person assigned to report about a Monday would be contacted on the following Tuesday. Ten percent of designated persons are assigned to report about each of the five weekdays. Twenty-five percent are assigned to report about each weekend day. Households are called for up to 8 consecutive weeks (for example, 8 Tuesdays) in order to secure an interview.

About the questionnaire

In the time diary portion of the ATUS interview, survey respondents sequentially report activities they did between 4 a.m. on the day before the interview ("yesterday") until 4 a.m. on the day of the interview. For each activity, respondents are asked how long the activity lasted. For activities other than personal care activities (such as sleeping and grooming), interviewers also ask respondents where they were and who was in the room with them (if at home) or who accompanied them (if away from home). If respondents report doing more than one activity at a time, they are asked to identify which one was the "main" (primary) activity. If none can be identified, then the interviewer records the first activity mentioned. After completing the time diary, interviewers ask respondents additional questions to clearly identify work, volunteering, and secondary childcare activities. Secondary childcare is defined as having a child under age 13 in one's care while doing other activities. Questions to identify eldercare providers and activities done as eldercare were added to the survey in 2011.

In addition, the ATUS includes an update of the household composition from the last CPS interview (2 to 5 months prior to the ATUS interview), the labor force status of the respondent, and the employment status of his or her spouse or unmarried partner. For respondents who became employed or changed jobs between the last CPS interview and the ATUS interview, information also is collected on industry, occupation, class of worker, and earnings. Finally, a question about current school enrollment status is asked of all respondents ages 15 to 49.

After completing the interview, primary activity descriptions are assigned a single 6-digit code using the ATUS Coding Lexicon. The 3-tier coding system consists of 17 major activity categories, each with multiple second- and third-tier subcategories. These coding lexicon categories are then combined into composite categories for publication, such as in this news release. Descriptions of categories shown in this release can be found in the Major activity category definitions section of this Technical Note. The ATUS Coding Lexicon can be accessed at www.bls.gov/tus/lexicons.htm.

Because of the complexity of coding everyday activities into narrowly-defined lexicon categories, coders use a comprehensive set of rules to guide their decisions. Travel activities have more complicated coding rules than other activities captured in the ATUS. In order to capture useful and detailed information, travel activities are coded according to the purpose of travel. For more information, see Exhibit 5.1 of the ATUS User's guide at www.bls.gov/tus/atususersguide.pdf.

Concepts and definitions

Average day. The average day measure reflects an average distribution across all persons in the reference population and all days of the week. Average day measures for the entire population provide a mechanism for seeing the overall distribution of time allocation for society as a whole. The ATUS collects data about daily activities from all segments of the population age 15 and over, including persons who are employed and not employed. Activity profiles differ based upon age, employment status, gender, and other characteristics. On an average day in 2015, persons in the United States age 15 and over did work and work-related activities for 3.5 hours, slept 8.8 hours, spent 5.2 hours doing leisure and sports activities, and spent 1.8 hours doing household activities. The remaining 4.7 hours were spent doing a variety of other activities, including eating and drinking, attending school, and shopping. (See table 1.) By comparison, an average weekday for persons employed full

time on days that they worked included 9.2 hours doing work and work-related activities, 7.8 hours sleeping, 2.9 hours doing leisure and sports activities, and 0.9 hour doing household activities. The remaining 3.2 hours were spent in other activities, such as those described above. (These estimates include related travel time.)

Many activities typically are not done on a daily basis, and some activities only are done by a subset of the population. For example, only 42 percent of all persons age 15 years and over worked on an average day in 2015 because some were not employed and those who were employed did not work every day. (See table 1.)

Average hours per day. The average number of hours spent in a 24-hour day (between 4 a.m. on the diary day and 4 a.m. on the interview day) doing a specified activity.

- *Average hours per day, population.* The average number of hours per day is computed using all responses from a given sample of the population, including those of respondents who did not do a particular activity on their diary day. These estimates reflect how many persons engaged in an activity and the amount of time they spent doing it.

- *Average hours per day, persons who did the activity.* The average number of hours per day is computed using only responses from those who engaged in a particular activity on their diary day.

Diary day. The diary day is the day about which the respondent reports. For example, the diary day of a respondent interviewed on Tuesday is Monday.

Earnings

- *Usual weekly earnings.* Estimates represent the earnings of full-time wage and salary workers with one job only (both incorporated and unincorporated self-employed are excluded), before taxes and other deductions. They include any overtime pay, commissions, or tips usually received. Usual weekly earnings are only updated in ATUS for about one-third of employed respondents—if the respondent changed jobs or employment status between the CPS and ATUS interviews or if the CPS weekly earnings value was imputed. This means that the earnings information could be out of date because the CPS interview was done 2 to 5 months prior to the ATUS interview. Respondents are asked to identify the easiest way for them to report earnings (hourly, weekly, biweekly, twice monthly, annually, or other) and how much they usually earn in the reported time period. Earnings reported on a basis other than weekly are converted to a weekly equivalent. The term "usual" is as perceived by the respondent. If the respondent asks for a definition of usual, interviewers are instructed to define the term as more than half the weeks worked during the past 4 or 5 months.

- *Weekly earnings ranges.* The ranges used represent approximately 25 percent of full-time wage and salary workers (both incorporated and unincorporated self-employed are excluded) who held only one job. For example, 25 percent of full-time wage and salary workers with one job only had weekly earnings of $560 or less in 2015. These dollar values vary from year to year.

Employment status

- *Employed.* All persons who:

  1) At any time during the 7 days prior to the interview did any work at all as paid employees, or worked in their own business or profession or on their own farm; or

  2) Were not working during the 7 days prior to the interview but had jobs or businesses from which they were temporarily absent because of illness, bad weather, vacation, childcare problems, labor-management disputes, maternity or paternity leave, job training, or other family or personal reasons, whether or not they were paid for the time off or were seeking other jobs; or

  3) Usually worked 15 hours or more as unpaid workers in a family-operated enterprise.

- *Employed full time.* Full-time workers are those who usually worked 35 or more hours per week at all jobs combined.

- *Employed part time.* Part-time workers are those who usually worked fewer than 35 hours per week at all jobs combined.

- *Not employed.* Persons are not employed if they do not meet the conditions for employment. People who are not employed include those classified as unemployed as well as those classified as not in the labor force (using CPS definitions).

The numbers of employed and not employed persons in this release do not correspond to published totals from the CPS for several reasons. First, the reference population for the ATUS is age 15 years and over, whereas it is age 16 years and over for the CPS. Second, ATUS data are collected continuously, the employment reference period being the 7 days prior to the interview. By contrast, CPS data are usually collected during the week including the 19th of the month and generally refer to employment during the week containing the 12th of the month. Finally, the CPS accepts

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answers from household members about other household members whereas such proxy responses are not allowed in the ATUS. One consequence of the difference in proxy reporting is that a significantly higher proportion of teenagers report employment in the ATUS than in the CPS. While the information on employment from the ATUS is useful for assessing work in the context of other daily activities, the employment data are not intended for analysis of current employment trends. Compared with the CPS and other estimates of employment, the ATUS estimates are based on a much smaller sample and are only available with a substantial lag since ATUS data and estimates are published during the year following data collection.

Household children. Household children are children under age 18 residing in the household of the ATUS respondent. The children may be related to the respondent (such as his or her own children, grandchildren, nieces or nephews, or brothers or sisters) or not related (such as foster children or children of roommates or boarders).

Primary activity. A primary activity is the main activity a respondent was doing at a specified time. With the exception of secondary childcare in table 10, the estimates presented in this release reflect time spent in primary activities only.

Secondary activities. A secondary (or simultaneous) activity is an activity done at the same time as a primary activity. With the exception of the care of children under age 13, information on secondary activities is not systematically collected in the ATUS.

Secondary childcare. Secondary childcare is care for children under age 13 that is done while doing an activity other than primary childcare, such as cooking dinner. Secondary childcare estimates are derived by summing the durations of activities during which respondents had at least one child under age 13 in their care while doing other things. The time individuals spend providing secondary childcare is further restricted to the time between when the first household child under age 13 woke up and when the last household child under age 13 went to bed. It is also restricted to times the respondent was awake. If respondents report providing both primary and secondary care at the same time, the time is attributed to primary care only.

Weekday, weekend, and holiday estimates. Estimates for weekdays are an average of reports about Monday through Friday. Estimates for weekend days and holidays are an average of reports about Saturdays, Sundays, and the following holidays: New Year's Day, Easter, Memorial Day, the Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day. Data were not collected about New Year's Day in 2012, and Christmas Day in 2011 and 2014.

Major activity category definitions

The following definitions describe the activity categories shown in this report. All major time-use categories in this release include related travel time and waiting time. For example, time spent "driving to the stadium" and time spent "waiting to get into the stadium to play ball" are included in Leisure and sports.

Personal care activities. Personal care activities include sleeping, grooming (such as bathing or dressing), health-related self-care, and personal or private activities. Receiving unpaid personal care from others (for example, "my sister put polish on my nails") also is captured in this category. In general, respondents are not asked who they were with or where they were for personal care activities, as such information can be sensitive.

Eating and drinking. All time spent eating or drinking (except eating and drinking done as part of a work or volunteer activity), whether alone, with others, at home, at a place of purchase, or somewhere else, is classified here.

Household activities. Household activities are activities done by people to maintain their households. These include housework; cooking; lawn and garden care; pet care; vehicle maintenance and repair; home maintenance, repair, decoration, and renovation; and household management and organizational activities (such as filling out paperwork or planning a party). Food preparation, whether or not reported as done specifically for another household member, is always classified as a household activity unless it was done as a volunteer, work, or income-generating activity. For example, "making breakfast for my son" is coded as a household activity, not as childcare.

Purchasing goods and services. This category includes time spent purchasing consumer goods, professional and personal care services, household services, and government services. Consumer purchases include most purchases and rentals of consumer goods, regardless of the mode or place of purchase or rental (in person, via telephone, over the Internet, at home, or in a store). Gasoline, grocery, other food purchases, and all other shopping are further broken out in subcategories.

Time spent obtaining, receiving, and purchasing professional and personal care services provided by someone else also is classified in this category. Professional services include childcare, financial services and banking, legal services, medical and adult care services, real estate services, and veterinary services. Personal care services include day spas, hair salons and barbershops, nail salons, and tanning salons. Activities classified here include time spent paying, meeting with, or talking to service providers, as well as time spent receiving the service or waiting to receive the service.

Time spent arranging for and purchasing household services provided by someone else also is classified here. Household services include housecleaning; cooking; lawn care and landscaping; pet care; tailoring, laundering, and dry cleaning; vehicle maintenance and repairs; and home repairs, maintenance, and construction.

This category also captures the time spent obtaining government services—such as applying for food stamps—

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and purchasing government-required licenses or paying fines or fees.

Caring for and helping household members. Time spent doing activities to care for or help any child (under age 18) or adult in the household, regardless of relationship to the respondent or the physical or mental health status of the person being helped, is classified here. Caring for and helping activities for household children and adults are coded separately in subcategories.

Primary childcare activities include time spent providing physical care; playing with children; reading with children; assistance with homework; attending children's events; taking care of children's health needs; and dropping off, picking up, and waiting for children. Passive childcare done as a primary activity (such as "keeping an eye on my son while he swam in the pool") also is included. A child's presence during the activity is not enough in itself to classify the activity as childcare. For example, "watching television with my child" is coded as a leisure activity, not as childcare.

Secondary childcare occurs when persons have a child under age 13 ″in their care" while doing activities other than primary childcare. For a complete definition, see the Concepts and definitions section of this Technical Note.

Caring for and helping household members also includes a range of activities done to benefit adult members of households, such as providing physical and medical care or obtaining medical services. Doing something as a favor for or helping another household adult does not automatically result in classification as a helping activity. For example, a report of "helping my spouse cook dinner" is considered a household activity (food preparation), not a helping activity, because cooking dinner benefits the household as a whole. By contrast, doing paperwork for another person usually benefits the individual, so a report of "filling out an insurance application for my spouse" is considered a helping activity.

Caring for and helping nonhousehold members. This category includes time spent in activities done to care for or help others—both children (under age 18) and adults—who do not live in the household. When done for or through an organization, time spent helping nonhousehold members is classified as volunteering, rather than as helping nonhousehold members. Care of nonhousehold children, even when done as a favor or helping activity for another adult, is always classified as caring for and helping nonhousehold children, not as helping another adult.

Working and work-related activities. This category includes time spent working, doing activities as part of one's job, engaging in income-generating activities not as part of one's job, and job search activities. "Working" includes hours spent doing the specific tasks required of one's main or other job, regardless of location or time of day. "Work-related activities" include activities that are not obviously work but are done as part of one's job, such as having a business lunch and playing golf with clients. "Other income-generating activities" are those done "on the side" or under informal arrangement and are not part of a regular job. Such activities might include selling homemade crafts, babysitting, maintaining a rental property, or having a yard sale. These activities are those for which people are paid or will be paid.

Travel time related to working and work-related activities includes time spent traveling to and from work, as well as time spent traveling for work-related, income-generating, and job search activities.

Educational activities. Time spent taking classes for a degree or for personal interest (including taking Internet or other distance-learning courses), time spent doing research and homework, and time spent taking care of administrative tasks related to education (such as registering for classes or obtaining a school ID) are included in this category. For high school students, before- and after-school extracurricular activities (except sports) also are classified as educational activities. Educational activities do not include time spent for classes or training received as part of a job. Time spent helping others with their education-related activities is classified as an activity involving caring for and helping others.

Organizational, civic, and religious activities. This category captures time spent volunteering for or through an organization, performing civic obligations, and participating in religious and spiritual activities. Civic obligations include government-required duties, such as serving jury duty or appearing in court, and activities that assist or influence government processes, such as voting or attending town hall meetings. Religious activities include those normally associated with membership in or identification with specific religions or denominations, such as attending religious services; participating in choirs, youth groups, orchestras, or unpaid teaching (unless identified as volunteer activities); and engaging in personal religious practices, such as praying.

Leisure and sports. The leisure and sports category includes time spent in sports, exercise, and recreation; socializing and communicating; and other leisure activities. Sports, exercise, and recreation activities include participating in—as well as attending or watching—sports, exercise, and recreational activities. Recreational activities include yard games like croquet or horseshoes, as well as activities like billiards and dancing. Socializing and communicating includes face-to-face social communication and hosting or attending social functions. Leisure activities include watching television; reading; relaxing or thinking; playing computer, board, or card games; using a computer or the Internet for personal interest; playing or listening to music; and other activities, such as attending arts, cultural, and entertainment events.

Telephone calls, mail, and e-mail. This category captures time spent in telephone communication and household or personal mail or e-mail. This category also includes texting and Internet voice and video calling. Telephone and Internet purchases are classified in Purchasing goods and services. Telephone calls, mail, or e-

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mail identified as related to work or volunteering are classified as work or volunteering.

Other activities, not elsewhere classified. This residual category includes security procedures related to traveling, traveling not associated with a specific activity category, ambiguous activities that could not be coded, and missing activities. Missing activities result when respondents did not remember what they did for a period of time, or when they considered an activity too private or personal to report.

Processing and estimation

After ATUS data are collected, they go through an editing and imputation procedure. Responses to CPS questions that are re-asked in the ATUS go through the regular CPS edit and imputation procedures. Some item nonresponses for questions unique to the ATUS (such as where an activity took place or how much time was spent doing secondary childcare) also are imputed. Missing activities and missing values for who was present during an activity are never imputed.

ATUS records are weighted quarterly to reduce bias in the estimates due to differences in sampling and response rates across subpopulations and days of the week. Specifically, the data are weighted to ensure the following:

- Weekdays represent about 5/7 of the weighted data, and weekend days represent about 2/7 of the weighted data for the population as a whole. The actual proportions depend on the number of weekdays and weekend days in a given quarter.

- The sum of the weights is equal to the number of person-days in the quarter for the population as a whole and for selected subpopulations.

Reliability of the estimates

Statistics based on the ATUS are subject to both sampling and nonsampling error. When a sample, rather than the entire population, is surveyed, estimates differ from the true population values they represent. The component of this difference that occurs because samples differ by chance is known as sampling error, and its variability is measured by the standard error of the estimate.

Sample estimates from a given survey design are unbiased when an average of the estimates from all possible samples would yield, hypothetically, the true population value. In this case, the sample estimate and its standard error can be used to construct approximate confidence intervals, or ranges of values that include the true population value with known probabilities. If the process of selecting a sample from the population were repeated many times, an estimate made from each sample, and a suitable estimate of its standard error calculated for each sample, then approximately 90 percent of the intervals from 1.645 standard errors below the estimate to 1.645 standard errors above the estimate would include the true population value. BLS analyses are generally conducted at the 90-percent level of confidence.

The ATUS data also are affected by nonsampling error, which is the average difference between population and sample values for samples generated by a given process. Nonsampling error can occur for many reasons, including failure to sample a segment of the population, inability to obtain information for all persons in the sample, inability or unwillingness of respondents to provide correct information, and errors made in the collection or processing of the data. Errors also could occur if nonresponse is correlated with time use.

Publication requirements

Estimates of average hours per day and participation rates are not published unless there are a minimum number of respondents representing the given population. Additional publication criteria are applied that include the number of respondents who reported doing a specified activity and the standard error or coefficient of variation for the estimate. Estimates that are considered "close to zero" or that round to 0.00, are published as approximately zero or "~0." For a detailed description of the statistical reliability criteria necessary for publication, please contact ATUS staff at ATUSinfo@bls.gov.

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Table 1. Time spent in primary activities and percent of the civilian population engaging in each activity, averages per day by sex, 2015 annual averages

Activity	Average hours per day, civilian population			Average percent engaged in the activity per day			Average hours per day for persons who engaged in the activity		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total, all activities[1]	24.00	24.00	24.00	–	–	–	–	–	–
Personal care activities	9.64	9.43	9.85	100.0	99.9	100.0	9.65	9.44	9.85
Sleeping	8.83	8.77	8.90	99.9	99.8	100.0	8.84	8.78	8.90
Eating and drinking	1.18	1.24	1.13	95.0	95.1	95.0	1.24	1.30	1.19
Household activities	1.84	1.43	2.23	76.4	67.0	85.2	2.41	2.13	2.61
Housework	0.57	0.26	0.86	36.3	21.5	50.1	1.58	1.23	1.71
Food preparation and cleanup	0.60	0.35	0.83	56.9	42.7	70.2	1.05	0.82	1.19
Lawn and garden care	0.20	0.28	0.12	9.8	12.1	7.7	2.00	2.30	1.57
Household management	0.13	0.10	0.16	18.4	15.2	21.4	0.72	0.68	0.75
Purchasing goods and services	0.75	0.60	0.88	44.0	40.0	47.7	1.70	1.50	1.86
Consumer goods purchases	0.36	0.28	0.44	40.4	36.6	43.9	0.90	0.77	0.99
Professional and personal care services	0.08	0.05	0.11	7.8	5.5	10.0	1.06	0.91	1.13
Caring for and helping household members	0.51	0.31	0.70	25.0	19.4	30.1	2.06	1.61	2.32
Caring for and helping household children	0.40	0.23	0.55	20.7	15.6	25.6	1.91	1.46	2.16
Caring for and helping nonhousehold members	0.19	0.16	0.21	11.2	9.5	12.8	1.66	1.68	1.65
Caring for and helping nonhousehold adults	0.07	0.07	0.07	7.1	6.4	7.7	0.96	1.03	0.90
Working and work-related activities	3.53	4.18	2.92	43.9	49.8	38.5	8.03	8.40	7.58
Working	3.19	3.78	2.64	42.1	47.8	36.7	7.57	7.89	7.19
Educational activities	0.46	0.48	0.45	8.0	7.6	8.3	5.79	6.26	5.39
Attending class	0.25	0.26	0.23	5.0	5.1	4.9	4.94	5.13	4.76
Homework and research	0.17	0.17	0.17	5.7	5.4	5.9	2.99	3.08	2.92
Organizational, civic, and religious activities	0.33	0.29	0.37	15.0	12.8	16.9	2.23	2.28	2.20
Religious and spiritual activities	0.15	0.12	0.17	9.9	8.1	11.5	1.52	1.54	1.50
Volunteering (organizational and civic activities)	0.15	0.13	0.16	6.5	6.0	7.0	2.23	2.21	2.25
Leisure and sports	5.21	5.58	4.86	96.1	96.6	95.6	5.42	5.77	5.09
Socializing and communicating	0.68	0.64	0.72	38.1	36.2	39.9	1.78	1.77	1.80
Watching television	2.78	3.02	2.56	79.9	81.5	78.3	3.48	3.70	3.26
Participating in sports, exercise, and recreation	0.31	0.39	0.22	20.4	22.9	18.1	1.50	1.71	1.24
Telephone calls, mail, and e-mail	0.16	0.12	0.20	21.4	16.7	25.7	0.75	0.71	0.78
Other activities, not elsewhere classified	0.19	0.19	0.20	13.9	12.3	15.4	1.40	1.54	1.30

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.

- Not applicable.

NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included. Data refer to persons 15 years and over.

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Table 2. Time spent in primary activities and percent of the civilian population engaging in each activity, averages per day on weekdays and weekends, 2015 annual averages

Activity	Average hours per day, civilian population		Average percent engaged in the activity per day		Average hours per day for persons who engaged in the activity	
	Weekdays	Weekends and holidays	Weekdays	Weekends and holidays	Weekdays	Weekends and holidays
Total, all activities[1]	24.00	24.00	–	–	–	–
Personal care activities	9.42	10.17	100.0	99.9	9.42	10.18
Sleeping	8.59	9.40	99.9	99.8	8.60	9.42
Eating and drinking	1.12	1.33	95.3	94.4	1.17	1.41
Household activities	1.71	2.16	76.2	76.9	2.24	2.80
Housework	0.52	0.71	34.8	39.8	1.48	1.77
Food preparation and cleanup	0.59	0.62	58.7	52.8	1.01	1.18
Lawn and garden care	0.17	0.25	9.3	11.2	1.88	2.25
Household management	0.12	0.15	18.4	18.5	0.68	0.84
Purchasing goods and services	0.70	0.85	43.3	45.6	1.62	1.86
Consumer goods purchases	0.31	0.50	38.8	44.1	0.79	1.12
Professional and personal care services	0.10	0.04	9.5	3.8	1.07	1.00
Caring for and helping household members	0.54	0.45	26.6	21.2	2.04	2.11
Caring for and helping household children	0.41	0.37	22.2	17.3	1.84	2.13
Caring for and helping nonhousehold members	0.17	0.23	10.4	13.2	1.63	1.74
Caring for and helping nonhousehold adults	0.06	0.09	6.2	9.1	0.93	1.00
Working and work-related activities	4.47	1.28	53.1	22.1	8.42	5.80
Working	4.04	1.17	51.0	21.1	7.93	5.55
Educational activities	0.58	0.19	9.1	5.5	6.36	3.53
Attending class	0.34	0.02	6.8	0.6	4.99	3.67
Homework and research	0.18	0.15	6.1	4.8	2.92	3.20
Organizational, civic, and religious activities	0.24	0.55	12.8	20.1	1.88	2.76
Religious and spiritual activities	0.08	0.32	7.2	16.2	1.09	1.96
Volunteering (organizational and civic activities)	0.14	0.16	6.5	6.6	2.12	2.49
Leisure and sports	4.69	6.43	95.6	97.2	4.91	6.62
Socializing and communicating	0.51	1.07	35.6	44.1	1.44	2.43
Watching television	2.56	3.29	79.5	80.8	3.23	4.07
Participating in sports, exercise, and recreation	0.29	0.35	21.1	18.8	1.36	1.85
Telephone calls, mail, and e-mail	0.16	0.16	22.7	18.1	0.71	0.88
Other activities, not elsewhere classified	0.20	0.19	14.5	12.4	1.35	1.55

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.

- Not applicable.

NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included. Data refer to persons 15 years and over.

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Table 3. Time spent in primary activities for the civilian population by age, sex, race, Hispanic or Latino ethnicity, marital status, and educational attainment, 2015 annual averages

Characteristic	Average hours per day spent in primary activities[1]											
	Personal care activities	Eating and drinking	Household activities	Purchasing goods and services	Caring for and helping household members	Caring for and helping nonhousehold members	Working and work-related activities	Educational activities	Organizational, civic, and religious activities	Leisure and sports	Telephone calls, mail, and e-mail	Other activities, not elsewhere classified
Age and sex												
Total, 15 years and over	9.64	1.18	1.84	0.75	0.51	0.19	3.53	0.46	0.33	5.21	0.16	0.19
15 to 19 years	10.70	1.13	0.64	0.56	0.15	0.11	1.01	3.20	0.23	5.81	0.26	0.22
20 to 24 years	10.11	1.06	1.16	0.59	0.44	0.14	3.98	1.33	0.18	4.72	0.11	0.17
25 to 34 years	9.64	1.15	1.65	0.65	1.06	0.11	4.71	0.29	0.20	4.25	0.10	0.18
35 to 44 years	9.42	1.14	1.85	0.75	1.17	0.14	4.90	0.09	0.27	4.00	0.09	0.19
45 to 54 years	9.16	1.15	2.04	0.82	0.38	0.24	4.79	0.08	0.36	4.70	0.12	0.17
55 to 64 years	9.37	1.19	2.18	0.79	0.12	0.28	3.67	0.05	0.40	5.57	0.18	0.20
65 to 74 years	9.63	1.35	2.45	0.91	0.12	0.28	1.37	0.02	0.58	6.84	0.26	0.20
75 years and over	10.10	1.35	2.30	0.84	0.11	0.16	0.23	–[2]	0.50	7.82	0.30	0.29
Men, 15 years and over	9.43	1.24	1.43	0.60	0.31	0.16	4.18	0.48	0.29	5.58	0.12	0.19
15 to 19 years	10.57	1.10	0.48	0.43	0.07	0.08	1.02	3.22	0.20	6.38	0.23	0.22
20 to 24 years	9.90	1.10	1.07	0.48	0.08	0.21	4.08	1.49	0.20	5.10	0.13	0.16
25 to 34 years	9.40	1.20	1.26	0.48	0.53	0.10	5.63	0.24	0.19	4.69	0.09	0.19
35 to 44 years	9.31	1.20	1.29	0.58	0.76	0.12	5.91	0.06	0.25	4.30	0.07	0.16
45 to 54 years	8.86	1.22	1.48	0.66	0.32	0.15	5.75	0.07	0.31	4.96	0.08	0.15
55 to 64 years	9.09	1.26	1.82	0.67	0.12	0.25	4.10	–[2]	0.34	6.00	0.11	0.21
65 to 74 years	9.49	1.44	2.01	0.73	0.09	0.23	1.75	–[3]	0.50	7.41	0.14	0.18
75 years and over	9.82	1.49	1.91	0.79	0.09	0.16	0.41	–[2]	0.44	8.31	0.23	0.35
Women, 15 years and over	9.85	1.13	2.23	0.88	0.70	0.21	2.92	0.45	0.37	4.86	0.20	0.20
15 to 19 years	10.84	1.15	0.80	0.69	0.24	0.13	0.99	3.18	0.25	5.22	0.29	0.22
20 to 24 years	10.33	1.01	1.25	0.70	0.81	0.07	3.89	1.17	0.16	4.33	0.09	0.18
25 to 34 years	9.88	1.11	2.04	0.82	1.58	0.12	3.81	0.34	0.21	3.82	0.11	0.17
35 to 44 years	9.53	1.08	2.38	0.92	1.56	0.16	3.92	0.12	0.29	3.71	0.12	0.22
45 to 54 years	9.45	1.09	2.56	0.97	0.43	0.33	3.87	0.10	0.40	4.45	0.16	0.18
55 to 64 years	9.62	1.13	2.51	0.91	0.12	0.30	3.27	0.07	0.47	5.17	0.24	0.19
65 to 74 years	9.75	1.28	2.83	1.05	0.15	0.32	1.04	–[2]	0.64	6.35	0.36	0.21
75 years and over	10.30	1.25	2.59	0.87	0.12	0.16	0.11	–[3]	0.54	7.46	0.34	0.25
Race and Hispanic or Latino ethnicity												
White, 15 years and over	9.58	1.22	1.94	0.76	0.51	0.19	3.58	0.42	0.31	5.15	0.16	0.19
Men	9.38	1.28	1.53	0.61	0.32	0.16	4.30	0.41	0.28	5.43	0.11	0.19

See footnotes at end of table.

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Table 3. Time spent in primary activities for the civilian population by age, sex, race, Hispanic or Latino ethnicity, marital status, and educational attainment, 2015 annual averages — Continued

Characteristic	Average hours per day spent in primary activities[1]											
	Personal care activities	Eating and drinking	Household activities	Purchasing goods and services	Caring for and helping household members	Caring for and helping non-household members	Working and work-related activities	Educational activities	Organizational, civic, and religious activities	Leisure and sports	Telephone calls, mail, and e-mail	Other activities, not elsewhere classified
Women	9.77	1.17	2.33	0.89	0.70	0.22	2.89	0.42	0.35	4.87	0.20	0.20
Black or African American, 15 years and over	10.03	0.84	1.29	0.69	0.40	0.19	3.13	0.47	0.52	6.01	0.20	0.22
Men	9.72	0.88	0.90	0.54	0.16	0.18	3.52	0.48	0.49	6.78	0.17	0.18
Women	10.29	0.80	1.62	0.82	0.59	0.21	2.81	0.46	0.55	5.38	0.23	0.25
Asian, 15 years and over	9.76	1.46	1.68	0.71	0.78	0.15	3.50	1.04	0.23	4.38	0.14	0.17
Men	9.60	1.46	1.07	0.58	0.44	0.18	3.73	–[3]	0.10	5.24	0.08	0.19
Women	9.91	1.46	2.27	0.84	1.10	0.12	3.29	0.74	0.35	3.56	0.20	0.15
Hispanic or Latino ethnicity, 15 years and over	9.97	1.15	1.83	0.74	0.67	0.16	3.75	0.70	0.25	4.49	0.11	0.19
Men	9.93	1.14	1.11	0.61	0.39	0.14	4.62	0.66	0.22	4.90	0.08	0.20
Women	10.01	1.15	2.54	0.86	0.95	0.17	2.89	0.74	0.29	4.09	0.14	0.17
Marital status and sex												
Married, spouse present	9.34	1.27	2.16	0.79	0.72	0.20	3.86	0.09	0.38	4.87	0.13	0.20
Men	9.11	1.34	1.61	0.63	0.47	0.16	4.74	0.07	0.34	5.24	0.08	0.20
Women	9.57	1.20	2.72	0.94	0.97	0.23	2.96	0.11	0.43	4.49	0.18	0.21
Other marital statuses	9.97	1.09	1.51	0.71	0.30	0.18	3.18	0.85	0.28	5.56	0.20	0.19
Men	9.79	1.12	1.22	0.56	0.13	0.16	3.53	0.95	0.24	5.96	0.16	0.18
Women	10.11	1.07	1.75	0.83	0.44	0.19	2.88	0.78	0.32	5.22	0.23	0.19
Educational attainment, 25 years and over												
Less than a high school diploma	10.07	1.10	2.11	0.70	0.55	0.21	2.76	–[2]	0.36	5.84	0.09	0.19
High school diploma, no college	9.67	1.12	2.15	0.73	0.42	0.23	3.21	0.04	0.30	5.81	0.14	0.18
Some college or associate degree	9.44	1.15	2.10	0.80	0.56	0.19	3.72	0.18	0.33	5.14	0.19	0.21
Bachelor's degree and higher	9.20	1.34	1.85	0.84	0.67	0.18	4.46	0.13	0.43	4.53	0.17	0.20

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.
[2] Estimate is approximately zero.
[3] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.
NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included. Unless otherwise specified, data refer to persons 15 years and over. Persons of Hispanic or Latino ethnicity may be of any race.

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Table 4. Employed persons working and time spent working on days worked by full- and part-time status and sex, jobholding status, educational attainment, and day of week, 2015 annual averages

[Numbers in thousands]

Characteristic	Total Employed	Employed persons who worked on an average day			Employed persons who worked on an average weekday			Employed persons who worked on an average Saturday, Sunday, and holiday		
		Number	Percent of employed	Average hours of work	Number[1]	Percent of employed	Average hours of work	Number[2]	Percent of employed	Average hours of work
Full- and part-time status and sex										
Total, 15 years and over[3]	156,867	106,765	68.1	7.60	130,024	82.9	7.95	52,717	33.6	5.57
Full-time workers	122,640	88,594	72.2	8.06	108,195	88.2	8.46	41,988	34.2	5.62
Part-time workers	34,227	18,170	53.1	5.31	21,617	63.2	5.29	10,783	31.5	5.42
Men[3]	83,072	58,601	70.5	7.91	71,045	85.5	8.34	29,918	36.0	5.56
Full-time workers	70,174	51,953	74.0	8.22	63,129	90.0	8.70	25,658	36.6	5.49
Part-time workers	12,898	6,648	51.5	5.50	7,788	60.4	5.38	4,292	33.3	5.96
Women[3]	73,795	48,164	65.3	7.21	58,990	79.9	7.47	22,775	30.9	5.59
Full-time workers	52,466	36,641	69.8	7.84	45,075	85.9	8.14	16,301	31.1	5.82
Part-time workers	21,329	11,522	54.0	5.20	13,823	64.8	5.24	6,481	30.4	5.04
Jobholding status										
Single jobholders	142,925	95,558	66.9	7.57	117,455	82.2	7.90	44,605	31.2	5.60
Multiple jobholders	13,942	11,206	80.4	7.77	12,574	90.2	8.43	8,074	57.9	5.40
Educational attainment, 25 years and over										
Less than a high school diploma	10,736	7,272	67.7	7.95	9,210	85.8	8.09	2,907	27.1	6.92
High school graduates, no college	34,366	22,892	66.6	7.85	27,760	80.8	8.05	10,356	30.1	6.50
Some college or associate degree	33,456	22,706	67.9	7.78	28,023	83.8	8.04	10,374	31.0	6.17
Bachelor's degree and higher	56,632	40,506	71.5	7.43	49,442	87.3	8.04	19,662	34.7	3.84

[1] Number was derived by multiplying the "Total employed" by the percent of employed persons who worked on an average weekday.

[2] Number was derived by multiplying the "Total employed" by the percent of employed persons who worked on an average Saturday, Sunday, and holiday.

[3] Includes workers whose hours vary.

NOTE: Includes work at main and other job(s), and excludes travel related to work. Unless otherwise specified, data refer to persons 15 years and over.

Table 5. Employed persons working on main job and time spent working on days worked by class of worker, occupation, earnings, and day of week, 2015 annual averages

[Numbers in thousands]

Characteristic	Total Employed	Employed persons who worked on an average day			Employed persons who worked on an average weekday			Employed persons who worked on an average Saturday, Sunday, and holiday		
		Number	Percent of employed	Average hours of work	Number[1]	Percent of employed	Average hours of work	Number[2]	Percent of employed	Average hours of work
Class of worker (main job only)										
Wage and salary workers	144,820	96,599	66.7	7.62	119,217	82.3	7.94	44,801	30.9	5.63
Self-employed workers[3]	11,788	8,370	71.0	6.59	9,693	82.2	7.00	4,672	39.6	4.22
Occupation (main job only)[4]										
Management, business, and financial operations	26,128	19,026	72.8	7.52	23,737	90.8	8.02	7,618	29.2	3.74
Professional and related	39,491	26,921	68.2	7.22	33,051	83.7	7.76	12,644	32.0	3.95
Service	25,733	15,666	60.9	7.19	18,405	71.5	7.24	9,433	36.7	6.98
Sales and related	15,679	10,191	65.0	7.76	12,091	77.1	8.03	6,217	39.6	6.69
Office and administrative support	18,230	12,220	67.0	7.52	15,134	83.0	7.62	3,993	21.9	6.47
Farming, fishing, and forestry	1,132	–[5]	–[5]	8.22	–[5]	–[5]	8.47	–[5]	–[5]	7.14
Construction and extraction	7,456	5,019	67.3	8.18	6,596	88.5	8.40	1,610	21.6	6.26
Installation, maintenance, and repair	4,442	3,184	71.7	8.00	3,787	85.2	8.33	–[5]	–[5]	5.86
Production	8,695	5,686	65.4	8.13	7,473	85.9	8.42	2,112	24.3	6.08
Transportation and material moving	9,881	6,409	64.9	8.05	7,702	77.9	8.36	3,550	35.9	6.55
Earnings of full-time wage and salary workers (single jobholders only)[6]										
$0 - $560	25,605	17,152	67.0	8.01	20,767	81.1	8.11	8,551	33.4	7.45
$561 - $870	25,388	17,296	68.1	8.18	22,056	86.9	8.38	6,141	24.2	6.50
$871 - $1,380	25,045	17,586	70.2	8.17	21,992	87.8	8.48	6,785	27.1	5.70
$1,381 and higher	25,450	18,618	73.2	7.93	23,570	92.6	8.55	7,819	30.7	3.85

[1] Number was derived by multiplying the "Total employed" by the percent of employed persons who worked on an average weekday.

[2] Number was derived by multiplying the "Total employed" by the percent of employed persons who worked on an average Saturday, Sunday, and holiday.

[3] Includes self-employed workers whose businesses are unincorporated. Self-employed workers whose businesses are incorporated are classified as wage and salary workers.

[4] These values were generated using the 2010 Census occupational classification system which was introduced with the 2011 estimates. Estimates are not strictly comparable to those from earlier years.

[5] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.

[6] These values are based on usual weekly earnings. The earnings data are limited to wage and salary workers (both incorporated and unincorporated self-employed workers are excluded). Each earnings range represents approximately 25 percent of full-time wage and salary workers who held only one job.

NOTE: Includes work at main job only and excludes travel related to work. Data refer to persons 15 years and over.

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Table 6. Employed persons working at home, workplace, and time spent working at each location by full- and part-time status and sex, jobholding status, and educational attainment, 2015 annual averages

[Numbers in thousands]

Characteristic	Total Employed	Employed persons who worked on an average day			Employed persons who worked at their workplace on an average day[1]			Employed persons who worked at home on an average day[1, 2]		
		Number	Percent of employed	Average hours of work	Number	Percent of those who worked	Average hours of work at workplace	Number	Percent of those who worked	Average hours of work at home
Full- and part-time status and sex										
Total, 15 years and over[3]	156,867	106,765	68.1	7.60	87,625	82.1	7.96	25,703	24.1	3.22
Full-time workers	122,640	88,594	72.2	8.06	74,245	83.8	8.33	21,459	24.2	3.33
Part-time workers	34,227	18,170	53.1	5.31	13,380	73.6	5.93	4,244	23.4	2.67
Men[3]	83,072	58,601	70.5	7.91	48,421	82.6	8.22	14,033	23.9	3.31
Full-time workers	70,174	51,953	74.0	8.22	43,718	84.1	8.47	12,535	24.1	3.24
Part-time workers	12,898	6,648	51.5	5.50	4,703	70.7	5.88	1,498	22.5	3.84
Women[3]	73,795	48,164	65.3	7.21	39,204	81.4	7.64	11,670	24.2	3.11
Full-time workers	52,466	36,641	69.8	7.84	30,527	83.3	8.11	8,924	24.4	3.44
Part-time workers	21,329	11,522	54.0	5.20	8,677	75.3	5.96	2,746	23.8	2.03
Jobholding status										
Single jobholders	142,925	95,558	66.9	7.57	79,143	82.8	7.95	21,660	22.7	3.28
Multiple jobholders	13,942	11,206	80.4	7.77	8,482	75.7	8.06	4,043	36.1	2.88
Educational attainment, 25 years and over										
Less than a high school diploma	10,736	7,272	67.7	7.95	6,800	93.5	7.98	527	7.2	–[4]
High school graduates, no college	34,366	22,892	66.6	7.85	19,714	86.1	8.05	3,198	14.0	3.95
Some college or associate degree	33,456	22,706	67.9	7.78	19,379	85.3	8.02	4,486	19.8	3.58
Bachelor's degree and higher	56,632	40,506	71.5	7.43	30,012	74.1	8.06	15,870	39.2	3.02

[1] Individuals may have worked at more than one location.

[2] Working at home includes any time persons did work at home and is not restricted to persons whose usual workplace is their home.

[3] Includes workers whose hours vary.

[4] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.

NOTE: Includes work at main and other job(s) and at locations other than home or workplace. Excludes travel related to work. Unless otherwise specified, data refer to persons 15 years and over.

Table 7. Employed persons working on main job at home, workplace, and time spent working at each location by class of worker, occupation, and earnings, 2015 annual averages

[Numbers in thousands]

Characteristic	Total Employed	Employed persons who worked on an average day			Employed persons who worked at their workplace on an average day[1]			Employed persons who worked at home on an average day[1, 2]		
		Number	Percent of employed	Average hours of work	Number	Percent of those who worked	Average hours of work at workplace	Number	Percent of those who worked	Average hours of work at home
Class of worker (main job only)										
Wage and salary workers	144,820	96,599	66.7	7.62	82,095	85.0	7.93	19,449	20.1	3.08
Self-employed workers[3]	11,788	8,370	71.0	6.59	4,655	55.6	7.47	4,296	51.3	4.23
Occupation (main job only)[4]										
Management, business, and financial operations	26,128	19,026	72.8	7.52	13,900	73.1	8.20	7,190	37.8	3.61
Professional and related	39,491	26,921	68.2	7.22	19,717	73.2	7.90	9,311	34.6	2.94
Service	25,733	15,666	60.9	7.19	14,196	90.6	7.36	1,647	10.5	3.25
Sales and related	15,679	10,191	65.0	7.76	8,877	87.1	7.89	2,255	22.1	3.70
Office and administrative support	18,230	12,220	67.0	7.52	10,940	89.5	7.73	1,367	11.2	4.08
Farming, fishing, and forestry	1,132	–[5]	–[5]	8.22	–[5]	–[5]	8.28	–[5]	–[5]	–[5]
Construction and extraction	7,456	5,019	67.3	8.18	4,661	92.9	8.13	815	16.2	–[5]
Installation, maintenance, and repair	4,442	3,184	71.7	8.00	2,908	91.3	8.39	305	9.6	–[5]
Production	8,695	5,686	65.4	8.13	5,391	94.8	8.31	314	5.5	–[5]
Transportation and material moving	9,881	6,409	64.9	8.05	5,605	87.4	8.08	492	7.7	–[5]
Earnings of full-time wage and salary workers (single jobholders only)[6]										
$0 - $560	25,605	17,152	67.0	8.01	16,013	93.4	8.14	1,441	8.4	3.11
$561 - $870	25,388	17,296	68.1	8.18	15,823	91.5	8.34	2,269	13.1	2.61
$871 - $1,380	25,045	17,586	70.2	8.17	15,036	85.5	8.46	3,751	21.3	2.80
$1,381 and higher	25,450	18,618	73.2	7.93	14,394	77.3	8.47	6,619	35.5	3.45

[1] Individuals may have worked at more than one location.

[2] Working at home includes any time persons did work at home and is not restricted to persons whose usual workplace is their home.

[3] Includes self-employed workers whose businesses are unincorporated. Self-employed workers whose businesses are incorporated are classified as wage and salary workers.

[4] These values were generated using the 2010 Census occupational classification system which was introduced with the 2011 estimates. Estimates are not strictly comparable to those from earlier years.

[5] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.

[6] These values are based on usual weekly earnings. The earnings data are limited to wage and salary workers (both incorporated and unincorporated self-employed workers are excluded). Each earnings range represents approximately 25 percent of full-time wage and salary workers who held only one job.

NOTE: Includes work at main job only and at locations other than home or workplace. Excludes travel related to work. Data refer to persons 15 years and over.

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Table 8A. Time spent in primary activities for the civilian population 18 years and over by presence and age of youngest household child and sex, 2015 annual averages, total

Activity	Average hours per day spent in primary activities											
	Household child under 18									No household children under 18		
	Total			Youngest household child under 6			Youngest household child 6 to 17			Total	Men	Women
	Total	Men	Women	Total	Men	Women	Total	Men	Women			
Total, all activities[1]	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Personal care activities	9.44	9.21	9.62	9.38	9.09	9.61	9.48	9.29	9.64	9.66	9.42	9.90
Sleeping	8.64	8.54	8.72	8.66	8.52	8.76	8.63	8.56	8.70	8.85	8.77	8.92
Eating and drinking	1.12	1.19	1.07	1.14	1.17	1.12	1.11	1.20	1.04	1.22	1.27	1.17
Household activities	1.91	1.29	2.41	1.92	1.29	2.42	1.90	1.29	2.41	1.91	1.58	2.22
Housework	0.64	0.25	0.96	0.67	0.30	0.96	0.62	0.22	0.96	0.56	0.28	0.84
Food preparation and cleanup	0.74	0.35	1.06	0.80	0.38	1.12	0.70	0.33	1.02	0.56	0.37	0.74
Lawn and garden care	0.13	0.19	0.08	0.09	0.12	0.07	0.16	0.24	0.09	0.25	0.34	0.15
Household management	0.12	0.10	0.14	0.11	0.10	0.13	0.13	0.10	0.14	0.15	0.11	0.18
Purchasing goods and services	0.73	0.58	0.85	0.65	0.50	0.77	0.79	0.64	0.91	0.78	0.63	0.94
Consumer goods purchases	0.38	0.31	0.45	0.35	0.27	0.41	0.41	0.34	0.47	0.37	0.28	0.44
Professional and personal care services	0.06	0.03	0.09	0.05	0.03	0.07	0.08	0.04	0.11	0.10	0.06	0.13
Caring for and helping household members	1.40	0.88	1.83	2.15	1.31	2.81	0.85	0.58	1.08	0.06	0.05	0.07
Caring for and helping household children	1.17	0.72	1.54	1.91	1.15	2.49	0.63	0.42	0.80	–	–	–
Caring for and helping nonhousehold members	0.12	0.08	0.15	0.07	0.05	0.09	0.15	0.10	0.19	0.23	0.21	0.26
Caring for and helping nonhousehold adults	0.05	0.03	0.06	0.02	0.02	0.02	0.06	0.04	0.08	0.08	0.09	0.08
Working and work-related activities	4.35	5.63	3.30	4.16	5.88	2.83	4.49	5.47	3.65	3.34	3.82	2.88
Working	3.97	5.13	3.01	3.79	5.32	2.60	4.10	5.00	3.34	3.01	3.43	2.60
Educational activities	0.23	0.23	0.24	0.19	0.18	0.20	0.26	0.26	0.26	0.28	0.28	0.29
Attending class	0.09	0.10	0.09	0.07	0.06	0.08	0.11	0.12	0.09	0.10	0.09	0.11
Homework and research	0.12	0.11	0.13	0.10	0.10	0.11	0.13	0.11	0.15	0.15	0.15	0.15
Organizational, civic, and religious activities	0.30	0.31	0.30	0.26	0.24	0.27	0.34	0.36	0.33	0.35	0.29	0.42
Religious and spiritual activities	0.14	0.12	0.15	0.12	0.09	0.15	0.15	0.14	0.15	0.16	0.13	0.19
Volunteering (organizational and civic activities)	0.13	0.15	0.12	0.10	0.12	0.08	0.16	0.17	0.15	0.15	0.12	0.18
Leisure and sports	4.09	4.33	3.88	3.79	4.08	3.56	4.31	4.51	4.13	5.79	6.13	5.44
Socializing and communicating	0.68	0.64	0.71	0.69	0.66	0.72	0.67	0.62	0.71	0.68	0.65	0.72
Watching television	2.13	2.36	1.94	2.02	2.25	1.83	2.21	2.43	2.02	3.19	3.44	2.95
Participating in sports, exercise, and recreation	0.24	0.30	0.19	0.22	0.28	0.18	0.25	0.31	0.20	0.31	0.39	0.24
Telephone calls, mail, and e-mail	0.11	0.08	0.13	0.08	0.07	0.09	0.13	0.09	0.16	0.18	0.12	0.24
Other activities, not elsewhere classified	0.21	0.19	0.22	0.20	0.15	0.24	0.21	0.22	0.20	0.19	0.19	0.18

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.

- Not applicable

NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included.

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Table 8B. Time spent in primary activities for the civilian population 18 years and over by presence and age of youngest household child and sex, 2015 annual averages, employed

Activity	Average hours per day spent in primary activities											
	Household child under 18									No household children under 18		
	Total			Youngest household child under 6			Youngest household child 6 to 17			Total	Men	Women
	Total	Men	Women	Total	Men	Women	Total	Men	Women			
Total, all activities[1]	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Personal care activities	9.20	8.99	9.43	9.22	8.92	9.56	9.19	9.03	9.35	9.33	9.12	9.58
Sleeping	8.42	8.33	8.52	8.49	8.35	8.66	8.36	8.31	8.42	8.54	8.47	8.62
Eating and drinking	1.12	1.19	1.04	1.13	1.17	1.09	1.11	1.21	1.00	1.20	1.27	1.13
Household activities	1.54	1.22	1.89	1.51	1.18	1.88	1.56	1.24	1.90	1.57	1.34	1.83
Housework	0.45	0.22	0.71	0.48	0.25	0.73	0.44	0.19	0.70	0.43	0.26	0.63
Food preparation and cleanup	0.57	0.34	0.82	0.58	0.34	0.84	0.56	0.33	0.81	0.44	0.28	0.61
Lawn and garden care	0.13	0.19	0.06	0.09	0.12	0.05	0.16	0.24	0.07	0.19	0.26	0.11
Household management	0.12	0.10	0.13	0.11	0.10	0.12	0.12	0.11	0.14	0.12	0.09	0.16
Purchasing goods and services	0.68	0.55	0.82	0.59	0.51	0.69	0.74	0.58	0.90	0.71	0.55	0.89
Consumer goods purchases	0.35	0.28	0.42	0.33	0.28	0.38	0.37	0.29	0.45	0.34	0.25	0.43
Professional and personal care services	0.06	0.03	0.09	0.04	0.03	0.06	0.07	0.03	0.12	0.07	0.04	0.11
Caring for and helping household members	1.17	0.89	1.47	1.74	1.29	2.24	0.76	0.59	0.93	0.04	0.04	0.04
Caring for and helping household children	0.95	0.73	1.18	1.50	1.13	1.91	0.56	0.44	0.68	–	–	–
Caring for and helping nonhousehold members	0.09	0.07	0.12	0.07	0.06	0.09	0.11	0.08	0.14	0.21	0.18	0.23
Caring for and helping nonhousehold adults	0.04	0.03	0.04	0.02	0.02	0.02	0.05	0.03	0.06	0.07	0.08	0.07
Working and work-related activities	5.85	6.57	5.06	5.68	6.62	4.61	5.97	6.54	5.37	5.63	5.97	5.25
Working	5.38	6.03	4.68	5.23	6.05	4.29	5.49	6.01	4.94	5.14	5.44	4.79
Educational activities	0.19	0.16	0.21	0.18	0.15	0.22	0.19	0.17	0.21	0.23	–[2]	0.25
Attending class	0.08	0.08	0.09	0.08	–[2]	0.10	0.09	0.09	0.08	0.07	0.06	0.09
Homework and research	0.09	0.07	0.10	0.08	0.07	0.10	0.09	0.07	0.11	0.13	0.12	0.13
Organizational, civic, and religious activities	0.29	0.28	0.30	0.26	0.25	0.26	0.31	0.30	0.33	0.26	0.24	0.29
Religious and spiritual activities	0.12	0.11	0.13	0.12	0.10	0.15	0.12	0.11	0.12	0.12	0.10	0.13
Volunteering (organizational and civic activities)	0.13	0.14	0.13	0.10	0.13	0.07	0.16	0.14	0.17	0.11	0.10	0.12
Leisure and sports	3.62	3.84	3.38	3.40	3.66	3.11	3.77	3.97	3.57	4.53	4.83	4.18
Socializing and communicating	0.63	0.63	0.63	0.67	0.69	0.65	0.60	0.58	0.61	0.62	0.57	0.67
Watching television	1.83	2.03	1.62	1.72	1.90	1.52	1.91	2.12	1.69	2.37	2.61	2.09
Participating in sports, exercise, and recreation	0.24	0.26	0.21	0.22	0.24	0.20	0.25	0.28	0.21	0.32	0.36	0.27
Telephone calls, mail, and e-mail	0.09	0.07	0.12	0.07	0.07	0.08	0.11	0.08	0.15	0.12	0.09	0.16
Other activities, not elsewhere classified	0.17	0.17	0.17	0.15	0.12	0.19	0.19	0.21	0.16	0.16	0.17	0.15

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.
[2] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.
- Not applicable
NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included.

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Table 8C. Time spent in primary activities for the civilian population 18 years and over by presence and age of youngest household child and sex, 2015 annual averages, not employed

Activity	Average hours per day spent in primary activities											
	Household child under 18									No household children under 18		
	Total			Youngest household child under 6			Youngest household child 6 to 17			Total	Men	Women
	Total	Men	Women	Total	Men	Women	Total	Men	Women			
Total, all activities[1]	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
Personal care activities	10.09	10.45	9.97	9.80	10.30	9.68	10.33	10.53	10.24	10.13	9.94	10.27
Sleeping	9.27	9.78	9.09	9.08	9.79	8.91	9.42	9.77	9.27	9.28	9.29	9.27
Eating and drinking	1.14	1.17	1.14	1.16	1.18	1.16	1.13	1.16	1.11	1.24	1.28	1.21
Household activities	2.94	1.72	3.35	3.00	2.04	3.23	2.88	1.56	3.47	2.38	1.99	2.68
Housework	1.17	0.44	1.41	1.17	0.63	1.30	1.16	0.35	1.52	0.75	0.32	1.09
Food preparation and cleanup	1.22	0.46	1.49	1.37	0.67	1.53	1.11	0.36	1.44	0.73	0.52	0.89
Lawn and garden care	0.14	0.20	0.11	0.10	–[2]	0.10	0.16	0.24	0.13	0.32	0.48	0.20
Household management	0.13	0.10	0.14	0.12	0.10	0.13	0.14	0.09	0.15	0.19	0.15	0.22
Purchasing goods and services	0.87	0.77	0.91	0.80	0.42	0.88	0.94	0.94	0.93	0.89	0.76	0.99
Consumer goods purchases	0.48	0.45	0.48	0.40	0.21	0.45	0.53	0.57	0.52	0.41	0.34	0.46
Professional and personal care services	0.08	–[2]	0.09	0.07	–[2]	0.08	0.08	–[2]	0.09	0.13	0.10	0.16
Caring for and helping household members	2.07	0.85	2.48	3.25	1.48	3.67	1.11	0.53	1.37	0.09	0.08	0.09
Caring for and helping household children	1.79	0.67	2.18	2.97	1.29	3.37	0.84	0.35	1.06	–	–	–
Caring for and helping nonhousehold members	0.18	0.12	0.20	0.08	–[2]	0.09	0.25	0.16	0.29	0.27	0.25	0.29
Caring for and helping nonhousehold adults	0.08	0.06	0.08	0.03	–[2]	0.04	0.11	–[2]	0.13	0.10	0.10	0.09
Working and work-related activities[3]	0.18	–[2]	0.13	0.21	–[2]	0.13	0.15	–[2]	0.12	0.13	0.17	0.10
Working[3]	–[2]	–[2]	–[2]	–[2]	–[2]	–[2]	–[2]	–[2]	–[2]	–[4]	–[2]	–[4]
Educational activities	0.36	–[2]	0.28	0.22	–[2]	0.18	0.48	–[2]	0.38	0.36	0.40	0.33
Attending class	0.12	–[2]	0.09	–[2]	–[2]	–[2]	0.18	–[2]	0.13	0.14	0.16	0.13
Homework and research	0.21	–[2]	0.17	0.16	–[2]	0.13	0.25	–[2]	–[2]	0.18	0.19	0.17
Organizational, civic, and religious activities	0.35	–[2]	0.31	0.26	–[2]	0.29	0.42	–[2]	0.33	0.48	0.38	0.56
Religious and spiritual activities	0.19	0.19	0.18	0.13	–[2]	0.16	0.23	0.28	0.21	0.22	0.17	0.26
Volunteering (organizational and civic activities)	0.13	–[2]	0.10	0.10	–[2]	0.10	0.15	–[2]	0.09	0.21	0.16	0.25
Leisure and sports	5.39	7.16	4.78	4.80	7.07	4.26	5.86	7.21	5.27	7.55	8.34	6.93
Socializing and communicating	0.82	0.68	0.87	0.75	0.44	0.82	0.89	0.81	0.92	0.77	0.78	0.77
Watching television	2.95	4.24	2.50	2.79	4.83	2.30	3.08	3.95	2.70	4.35	4.84	3.96
Participating in sports, exercise, and recreation	0.24	0.48	0.16	0.21	–[2]	0.14	0.27	0.46	0.18	0.30	0.43	0.20
Telephone calls, mail, and e-mail	0.14	0.11	0.15	0.09	0.07	0.10	0.18	0.13	0.20	0.26	0.18	0.33
Other activities, not elsewhere classified	0.30	0.30	0.30	0.33	–[2]	0.33	0.28	–[2]	0.28	0.22	0.22	0.22

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.
[2] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.
[3] Estimates include a small amount of work time done by persons who do not meet the American Time Use Survey definition for employed.
[4] Estimate is approximately zero.
- Not applicable
NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included.

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Table 9. Time adults spent caring for household children as a primary activity by sex, age, and day of week, average for the combined years 2011-2015

Childcare activities	Average hours per day adults spent caring for household children								
	Total			Weekdays			Weekends and holidays		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Children under age 18, total									
Caring for household children as a primary activity	1.35	0.91	1.73	1.43	0.90	1.87	1.17	0.91	1.38
Physical care	0.42	0.22	0.58	0.44	0.23	0.62	0.36	0.21	0.49
Education-related activities	0.11	0.07	0.15	0.14	0.08	0.19	0.04	0.03	0.05
Reading to/with children	0.04	0.02	0.05	0.04	0.02	0.05	0.03	0.02	0.04
Talking to/with children	0.05	0.03	0.07	0.06	0.03	0.07	0.03	0.02	0.05
Playing/doing hobbies with children	0.30	0.26	0.34	0.28	0.22	0.32	0.37	0.35	0.38
Looking after children	0.08	0.07	0.09	0.07	0.06	0.09	0.09	0.09	0.10
Attending children's events	0.06	0.05	0.07	0.04	0.03	0.05	0.09	0.08	0.10
Travel related to care of household children	0.18	0.12	0.23	0.22	0.14	0.29	0.09	0.08	0.10
Other childcare activities	0.11	0.07	0.15	0.14	0.08	0.19	0.05	0.04	0.06
Youngest child ages 6 to 17									
Caring for household children as a primary activity	0.82	0.57	1.03	0.90	0.60	1.15	0.63	0.51	0.74
Physical care	0.14	0.07	0.20	0.16	0.09	0.22	0.10	0.05	0.14
Education-related activities	0.13	0.08	0.17	0.17	0.10	0.22	0.05	0.04	0.06
Reading to/with children	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.02
Talking to/with children	0.06	0.04	0.08	0.07	0.04	0.09	0.04	0.02	0.05
Playing/doing hobbies with children	0.07	0.08	0.06	0.06	0.06	0.05	0.11	0.13	0.09
Looking after children	0.05	0.04	0.06	0.05	0.04	0.06	0.06	0.05	0.06
Attending children's events	0.08	0.06	0.09	0.06	0.05	0.07	0.13	0.10	0.15
Travel related to care of household children	0.17	0.12	0.21	0.20	0.14	0.26	0.09	0.07	0.10
Other childcare activities	0.10	0.06	0.13	0.11	0.07	0.16	0.05	0.04	0.06
Child under age 6									
Caring for household children as a primary activity	2.02	1.34	2.56	2.10	1.30	2.74	1.82	1.44	2.13
Physical care	0.76	0.41	1.04	0.79	0.41	1.10	0.69	0.41	0.91
Education-related activities	0.09	0.05	0.12	0.12	0.06	0.16	0.03	0.02	0.04
Reading to/with children	0.06	0.04	0.08	0.06	0.04	0.08	0.05	0.04	0.06
Talking to/with children	0.04	0.02	0.05	0.04	0.02	0.06	0.03	0.02	0.04
Playing/doing hobbies with children	0.59	0.49	0.67	0.55	0.42	0.65	0.69	0.64	0.73
Looking after children	0.11	0.09	0.13	0.10	0.07	0.12	0.14	0.14	0.14
Attending children's events	0.03	0.03	0.03	0.02	0.02	0.03	0.05	0.06	0.04
Travel related to care of household children	0.20	0.13	0.25	0.24	0.15	0.32	0.09	0.08	0.10
Other childcare activities	0.13	0.08	0.18	0.17	0.10	0.23	0.05	0.03	0.07

NOTE: Persons 18 years and over living in households with children under 18, whether or not they provided childcare.

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Table 10. Time adults spent in primary activities while providing childcare as a secondary activity by sex, age, and day of week, average for the combined years 2011-2015

Childcare activities[1]	Average hours per day adults spent caring for household children[2]								
	Total			Weekdays			Weekends and holidays		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Children under age 13, total									
Total	5.07	4.10	5.87	4.13	3.06	5.01	7.26	6.52	7.87
Personal care activities	0.26	0.17	0.33	0.22	0.15	0.29	0.34	0.23	0.44
Household activities	1.20	0.68	1.62	1.03	0.48	1.47	1.61	1.16	1.98
Purchasing goods and services	0.35	0.26	0.43	0.27	0.17	0.36	0.54	0.46	0.60
Working and work-related activities	0.19	0.19	0.19	0.21	0.21	0.21	0.14	0.15	0.12
Eating and drinking	0.65	0.58	0.71	0.54	0.45	0.61	0.92	0.86	0.97
Leisure and sports	2.01	1.90	2.10	1.55	1.38	1.69	3.08	3.11	3.06
Other activities	0.41	0.32	0.48	0.31	0.22	0.38	0.63	0.54	0.71
Youngest child ages 6 to 12									
Total	4.71	3.95	5.35	3.70	2.97	4.33	7.09	6.26	7.81
Personal care activities	0.24	0.17	0.30	0.21	0.16	0.26	0.32	0.21	0.41
Household activities	1.06	0.63	1.42	0.85	0.44	1.20	1.55	1.07	1.96
Purchasing goods and services	0.29	0.21	0.36	0.21	0.13	0.27	0.49	0.39	0.57
Working and work-related activities	0.21	0.21	0.20	0.23	0.24	0.22	0.16	0.17	0.15
Eating and drinking	0.58	0.53	0.63	0.47	0.42	0.52	0.85	0.79	0.90
Leisure and sports	1.94	1.90	1.98	1.47	1.41	1.52	3.07	3.07	3.08
Other activities	0.38	0.29	0.46	0.27	0.18	0.34	0.66	0.56	0.75
Child under age 6									
Total	5.34	4.21	6.24	4.46	3.13	5.51	7.38	6.71	7.91
Personal care activities	0.27	0.17	0.35	0.23	0.14	0.31	0.36	0.24	0.46
Household activities	1.31	0.73	1.77	1.16	0.51	1.67	1.65	1.23	1.99
Purchasing goods and services	0.39	0.29	0.48	0.32	0.19	0.42	0.57	0.51	0.62
Working and work-related activities	0.18	0.17	0.18	0.20	0.19	0.21	0.12	0.14	0.10
Eating and drinking	0.70	0.62	0.77	0.59	0.48	0.67	0.98	0.93	1.01
Leisure and sports	2.06	1.90	2.19	1.62	1.37	1.82	3.09	3.13	3.05
Other activities	0.42	0.33	0.49	0.34	0.25	0.41	0.61	0.53	0.68

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.

[2] Secondary childcare is defined as time one has a child under 13 years "in his or her care" while doing something else as a primary activity; information on secondary childcare is not collected for children over 12 years. Estimates include a small amount of care provided to own, nonhousehold children.

NOTE: Includes persons 18 years and over living in households with children under 13 years, whether or not they provided childcare.

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Table 11. Time spent in leisure and sports activities for the civilian population by selected characteristics, 2015 annual averages

Characteristic	Average hours per day spent in leisure and sports activities																
	Total, all leisure and sports activities			Participating in sports, exercise and recreation		Socializing and communicating		Watching TV		Reading		Relaxing/ thinking		Playing games and computer use for leisure		Other leisure and sports activities, including travel[1]	
	Total, all days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days
Sex																	
Men	5.58	4.96	7.02	0.37	0.44	0.48	1.00	2.71	3.75	0.26	0.31	0.30	0.33	0.47	0.60	0.37	0.59
Women	4.86	4.44	5.88	0.21	0.27	0.54	1.13	2.43	2.86	0.37	0.38	0.26	0.29	0.31	0.40	0.32	0.56
Age																	
Total, 15 years and over	5.21	4.69	6.43	0.29	0.35	0.51	1.07	2.56	3.29	0.32	0.35	0.28	0.31	0.39	0.50	0.34	0.58
15 to 19 years	5.81	5.42	6.71	0.56	0.65	0.60	1.14	2.39	2.42	0.21	0.13	0.12	0.13	0.98	1.31	0.55	0.93
20 to 24 years	4.72	4.16	6.01	0.35	0.46	0.54	1.16	1.98	2.47	0.11	0.12	0.19	–[2]	0.66	0.86	0.34	0.69
25 to 34 years	4.25	3.41	6.16	0.25	0.37	0.43	1.37	1.81	2.93	0.17	0.18	0.18	0.19	0.27	0.55	0.31	0.59
35 to 44 years	4.00	3.40	5.43	0.27	0.34	0.46	1.00	1.78	2.84	0.15	0.20	0.24	0.24	0.22	0.31	0.29	0.50
45 to 54 years	4.70	4.14	6.06	0.21	0.34	0.59	1.08	2.35	3.13	0.21	0.24	0.27	0.41	0.22	0.32	0.29	0.54
55 to 64 years	5.57	5.09	6.69	0.27	0.28	0.50	0.91	2.98	3.82	0.37	0.39	0.31	0.38	0.32	0.31	0.35	0.59
65 to 74 years	6.84	6.60	7.42	0.31	0.25	0.50	0.91	3.94	4.24	0.63	0.75	0.37	0.38	0.44	0.44	0.41	0.45
75 years and over	7.82	7.65	8.21	0.21	0.17	0.59	0.90	4.34	4.79	0.99	1.08	0.67	0.51	0.50	0.34	0.34	0.42
Race and Hispanic or Latino ethnicity																	
White	5.15	4.59	6.46	0.30	0.35	0.51	1.09	2.46	3.27	0.35	0.38	0.25	0.29	0.38	0.51	0.34	0.57
Black or African American	6.01	5.73	6.68	0.22	0.28	0.56	1.00	3.62	3.78	0.18	0.18	0.50	0.47	0.26	0.41	0.39	0.56
Asian	4.38	3.98	5.37	0.35	0.44	0.50	0.89	1.84	2.44	0.14	0.20	0.18	0.27	0.71	0.63	0.27	0.50
Hispanic or Latino ethnicity	4.49	3.94	5.80	0.28	0.29	0.47	1.12	2.20	2.97	0.10	0.14	0.33	0.35	0.30	0.39	0.26	0.54
Employment status																	
Employed	4.18	3.48	5.81	0.25	0.40	0.43	1.07	1.85	2.84	0.18	0.25	0.21	0.25	0.25	0.43	0.30	0.57
Full-time workers	4.05	3.28	5.89	0.24	0.40	0.41	1.13	1.76	2.91	0.17	0.24	0.21	0.25	0.21	0.37	0.29	0.59
Part-time workers	4.62	4.19	5.55	0.29	0.39	0.52	0.88	2.19	2.61	0.23	0.28	0.21	0.25	0.42	0.63	0.33	0.51
Not employed	6.86	6.61	7.46	0.35	0.26	0.64	1.07	3.69	4.03	0.52	0.50	0.38	0.40	0.60	0.61	0.42	0.59
Earnings of full-time wage and salary workers (single jobholders only)[3]																	
$0 - $560	4.22	3.63	5.64	0.16	0.23	0.37	1.03	2.04	3.16	0.17	0.13	0.28	0.30	0.27	0.38	0.33	0.42
$561 - $870	4.23	3.37	6.25	0.20	0.45	0.44	1.32	1.90	3.07	0.13	0.17	0.25	0.27	0.22	0.43	0.23	0.54
$871 - $1,380	4.21	3.43	6.11	0.28	0.50	0.42	1.04	1.87	3.11	0.17	0.25	0.20	0.24	0.20	0.35	0.30	0.62
$1,381 and higher	3.94	3.02	5.94	0.29	0.47	0.42	1.07	1.49	2.68	0.21	0.39	0.12	0.22	0.19	0.37	0.29	0.74
Presence and age of household children																	
No household children under 18	5.80	5.30	6.99	0.31	0.34	0.52	1.05	2.96	3.68	0.41	0.47	0.30	0.35	0.44	0.51	0.36	0.59
Household children under 18	4.19	3.66	5.47	0.25	0.36	0.51	1.10	1.89	2.61	0.15	0.13	0.25	0.24	0.29	0.47	0.32	0.56
Children 13 to 17 years, none younger	4.73	4.21	5.99	0.28	0.54	0.54	1.04	2.03	2.88	0.19	0.14	0.24	0.29	0.52	0.57	0.40	0.53

See footnotes at end of table.

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Table 11. Time spent in leisure and sports activities for the civilian population by selected characteristics, 2015 annual averages — Continued

Characteristic	Average hours per day spent in leisure and sports activities																
	Total, all leisure and sports activities			Participating in sports, exercise and recreation		Socializing and communicating		Watching TV		Reading		Relaxing/ thinking		Playing games and computer use for leisure		Other leisure and sports activities, including travel[1]	
	Total, all days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days	Week-days	Week-ends and holi-days
Children 6 to 12 years, none younger	4.19	3.68	5.45	0.24	0.35	0.50	1.04	1.97	2.40	0.16	0.16	0.25	0.26	0.23	0.53	0.33	0.70
Youngest child under 6 years	3.88	3.31	5.19	0.23	0.28	0.49	1.18	1.72	2.63	0.12	0.10	0.26	0.19	0.21	0.36	0.27	0.45
Marital status and sex																	
Married, spouse present	4.87	4.35	6.12	0.27	0.31	0.50	1.04	2.41	3.22	0.32	0.37	0.27	0.32	0.28	0.32	0.30	0.54
Men	5.24	4.62	6.72	0.31	0.41	0.47	0.99	2.68	3.71	0.28	0.37	0.29	0.33	0.27	0.35	0.32	0.57
Women	4.49	4.08	5.49	0.23	0.21	0.54	1.09	2.12	2.72	0.36	0.37	0.26	0.30	0.29	0.30	0.28	0.50
Other marital statuses	5.56	5.05	6.76	0.30	0.39	0.52	1.10	2.73	3.36	0.31	0.32	0.28	0.30	0.50	0.67	0.39	0.62
Men	5.96	5.36	7.36	0.44	0.47	0.50	1.02	2.74	3.79	0.23	0.25	0.31	0.32	0.71	0.89	0.42	0.62
Women	5.22	4.79	6.24	0.19	0.32	0.54	1.17	2.73	2.99	0.38	0.38	0.26	0.28	0.33	0.48	0.37	0.62
Educational attainment, 25 years and over																	
Less than a high school diploma	5.84	5.42	6.85	0.15	0.27	0.51	1.06	3.48	4.10	0.13	0.13	0.60	0.67	0.22	0.27	0.33	0.36
High school graduates, no college	5.81	5.40	6.83	0.23	0.21	0.54	1.00	3.28	4.05	0.32	0.33	0.41	0.40	0.31	0.38	0.31	0.45
Some college or associate degree	5.14	4.56	6.44	0.25	0.30	0.48	0.94	2.59	3.55	0.34	0.38	0.26	0.31	0.33	0.44	0.33	0.54
Bachelor's degree and higher	4.53	3.90	6.03	0.32	0.40	0.49	1.17	1.87	2.72	0.44	0.53	0.15	0.19	0.30	0.37	0.33	0.64

[1] Includes other leisure and sports activities, not elsewhere classified, and travel related to leisure and sports activities.

[2] Estimate is suppressed because it does not meet the American Time Use Survey publication standards.

[3] These values are based on usual weekly earnings. The earnings data are limited to wage and salary workers (both incorporated and unincorporated self-employed workers are excluded). Each earnings range represents approximately 25 percent of full-time wage and salary workers who held only one job.

NOTE: Unless otherwise specified, data refer to persons 15 years and over. Persons of Hispanic or Latino ethnicity may be of any race.

Table 12. Average hours per day spent in primary activities for the civilian population, 2015 quarterly and annual averages
[Not seasonally adjusted]

Activity	2015				
	Quarterly averages				Annual average
	I	II	III	IV	
Total, all activities[1]	24.00	24.00	24.00	24.00	24.00
Personal care activities	9.62	9.73	9.59	9.63	9.64
Sleeping	8.81	8.88	8.79	8.86	8.83
Eating and drinking	1.19	1.18	1.21	1.16	1.18
Household activities	1.75	1.88	1.86	1.86	1.84
Housework	0.60	0.54	0.56	0.59	0.57
Food preparation and cleanup	0.63	0.58	0.59	0.59	0.60
Lawn and garden care	0.08	0.34	0.23	0.14	0.20
Household management	0.15	0.11	0.12	0.14	0.13
Purchasing goods and services	0.72	0.72	0.72	0.83	0.75
Consumer goods purchases	0.35	0.33	0.34	0.42	0.36
Professional and personal care services	0.09	0.08	0.07	0.09	0.08
Caring for and helping household members	0.54	0.52	0.48	0.51	0.51
Caring for and helping household children	0.43	0.40	0.37	0.39	0.40
Caring for and helping nonhousehold members	0.19	0.20	0.19	0.17	0.19
Caring for and helping nonhousehold adults	0.07	0.08	0.06	0.06	0.07
Working and work-related activities	3.52	3.58	3.69	3.32	3.53
Working	3.18	3.25	3.30	3.02	3.19
Educational activities	0.49	0.43	0.30	0.63	0.46
Attending class	0.26	0.25	0.14	0.33	0.25
Homework and research	0.19	0.14	0.12	0.23	0.17
Organizational, civic, and religious activities	0.34	0.36	0.33	0.30	0.33
Religious and spiritual activities	0.15	0.16	0.15	0.14	0.15
Volunteering (organizational and civic activities)	0.15	0.16	0.15	0.12	0.15
Leisure and sports	5.30	5.06	5.25	5.23	5.21
Socializing and communicating	0.59	0.71	0.73	0.68	0.68
Watching television	2.96	2.63	2.62	2.91	2.78
Participating in sports, exercise, and recreation	0.25	0.34	0.37	0.26	0.31
Telephone calls, mail, and e-mail	0.17	0.13	0.16	0.18	0.16
Other activities, not elsewhere classified	0.17	0.21	0.21	0.18	0.19

[1] All major activity categories include related travel time. See Technical Note for activity category definitions.
NOTE: A primary activity refers to an individual's main activity. Other activities done simultaneously are not included. Data refer to persons 15 years and over.

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EXHIBIT 2a

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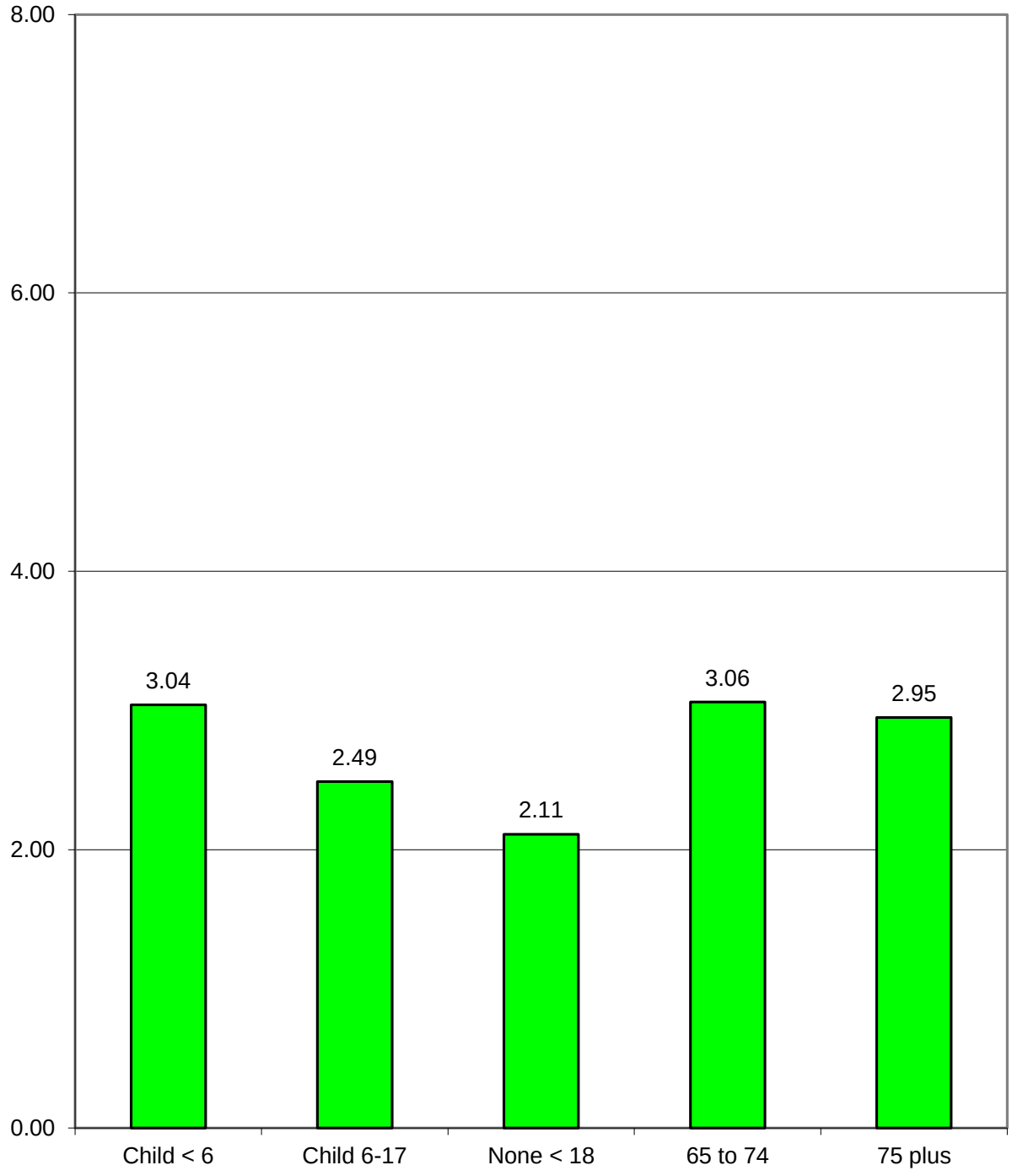
Thomson Econometrics

Household Services - Employed Men



Source: American Time Use Survey, U.S. Dept.of Labor, BLS, 6/24/16.
Note: Services include household, purchasing, caring & helping activities; and exclude secondary activities, indirect supervision & on-call time.

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EXHIBIT 3

National Vital Statistics Reports

Volume 68, Number 7 June 24, 2019

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United States Life Tables, 2017

by Elizabeth Arias, Ph.D., and Jiaquan Xu, M.D., Division of Vital Statistics

Abstract

Objectives—This report presents complete period life tables for the United States by race, Hispanic origin, and sex, based on age-specific death rates in 2017.

Methods—Data used to prepare the 2017 life tables are 2017 final mortality statistics; July 1, 2017 population estimates based on the 2010 decennial census; and 2017 Medicare data for persons aged 66–99. The methodology used to estimate the life tables for the Hispanic population remains unchanged from that developed for the publication of life tables by Hispanic origin for data year 2006. The methodology used to estimate the 2017 life tables for all other groups was first implemented with data year 2008.

Results—In 2017, the overall expectation of life at birth was 78.6 years, decreasing from 78.7 in 2016. Between 2016 and 2017, life expectancy at birth decreased by 0.1 year for males (76.2 to 76.1) and did not change for females (81.1). Life expectancy at birth decreased by 0.1 year for the white population (78.9 to 78.8) and the non-Hispanic white population (78.6 to 78.5) between 2016 and 2017. Life expectancy at birth did not change from 2016 for the black population (75.3), the non-Hispanic black population (74.9), and the Hispanic population (81.8).

Keywords: life expectancy • survival • death rates • race • Hispanic origin

Introduction

There are two types of life tables: the cohort (or generation) life table and the period (or current) life table. The cohort life table presents the mortality experience of a particular birth cohort—all persons born in the year 1900, for example—from the moment of birth through consecutive ages in successive calendar years. Based on age-specific death rates observed through consecutive calendar years, the cohort life table reflects the mortality experience of an actual cohort from birth until no lives remain in the group. To prepare just a single complete cohort life table requires data over many years. It is usually not feasible to construct cohort life tables entirely on the basis of observed data for real cohorts due to data unavailability or incompleteness (1). For example, a life table representation of the mortality experience of a cohort of persons born in 1970 would require the use of data projection techniques to estimate deaths into the future (2,3).

Unlike the cohort life table, the period life table does not represent the mortality experience of an actual birth cohort. Rather, the period life table presents what would happen to a hypothetical cohort if it experienced throughout its entire life the mortality conditions of a particular period in time. For example, a period life table for 2017 assumes a hypothetical cohort that is subject throughout its lifetime to the age-specific death rates prevailing for the actual population in 2017. The period life table may thus be characterized as rendering a snapshot of current mortality experience and shows the long-range implications of a set of age-specific death rates that prevailed in a given year. In this report, the term life table refers only to the period life table and not to the cohort life table.

Life tables can be classified in two ways according to the length of the age interval in which data are presented. A complete life table contains data for every single year of age. An abridged life table typically contains data by 5- or 10-year age intervals. A complete life table can easily be aggregated into 5- or 10-year age groups (see Technical Notes for instructions). Other than the decennial life tables, U.S. life tables based on data before 1997 are abridged life tables constructed by reference to a standard table (4). This report presents complete period life tables by race, Hispanic origin, and sex.

Data and Methods

The data used to prepare the U.S. life tables for 2017 are final numbers of deaths for the year 2017; July 1, 2017 population estimates based on the 2010 decennial census; and age-specific death and population counts for Medicare beneficiaries aged 66–99 for the year 2017 from the Centers for Medicare & Medicaid Services. Data from the Medicare program

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics
National Vital Statistics System

NCHS reports can be downloaded from: https://www.cdc.gov/nchs/products/index.htm.

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are used to supplement vital statistics and census data for ages 66 and over. The U.S. life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates using classification ratios (or correction factors) generated from an updated evaluation of race and Hispanic-origin misclassification on death certificates in the United States (5). (See Technical Notes for a detailed description of the data sets and methodology used to estimate Hispanic-origin life tables.)

Expectation of life

The most frequently used life table statistic is life expectancy (e_x), which is the average number of years of life remaining for persons who have attained a given age (x). Life expectancy and other life table values for each age in 2017 are shown for the total population by race, Hispanic origin, and sex in Tables 1–18. Life expectancy is summarized by age, race, Hispanic origin, and sex in Table A.

Life expectancy at birth (e_0) for 2017 for the total population was 78.6 years. This represents the average number of years that the members of the hypothetical life table cohort can expect to live at the time of birth (Table A).

Survivors to specified ages

Another way of assessing the longevity of the period life table cohort is by determining the proportion that survives to specified ages. The l_x column of the life table provides the data for computing this proportion. Table B summarizes the number of survivors by age, race, Hispanic origin, and sex. To illustrate, 57,839 persons out of the original 2017 hypothetical life table cohort of 100,000 (or 57.8%) were alive at exact age 80. In other words, the probability that a person will survive from birth to age 80, given 2017 age-specific mortality rates, is 57.8%. Probabilities of survival can be calculated at any age by simply dividing the number of survivors at the terminal age by the number at the beginning age. For example, to calculate the probability of surviving from age 20 to age 85, one would divide the number of survivors at age 85 (42,382) by the number of survivors at age 20 (98,937), which results in a 42.8% probability of survival.

Explanation of life table columns

Column 1. Age (between x and $x + 1$)—Shows the age interval between the two exact ages indicated. For instance, "20–21" means the 1-year interval between the 20th and 21st birthdays.

Column 2. Probability of dying (q_x)—Shows the probability of dying between ages x and $x + 1$. For example, for males in the age interval 20–21 years, the probability of dying is 0.001147 (Table 2). This column forms the basis of the life table; all subsequent columns are derived from it.

Column 3. Number surviving (l_x)—Shows the number of persons from the original hypothetical cohort of 100,000 live births who survive to the beginning of each age interval. The l_x values are computed from the q_x values, which are successively applied to the remainder of the original 100,000 persons still alive at the beginning of each age interval. Thus, out of 100,000 female babies born alive, 99,477 will complete the first year of life and enter the second; 99,341 will reach age 10; 99,134 will reach age 20; and 49,264 will live to age 85 (Table 3).

Column 4. Number dying (d_x)—Shows the number dying in each successive age interval out of the original 100,000 live births. For example, out of 100,000 males born alive, 630 will die in the first year of life; 113 between ages 20 and 21; and 971 after reaching age 100 (Table 2). Each figure in column 4 is the difference between the two successive figures in column 3.

Column 5. Person-years lived (L_x)—Shows the number of person-years lived by the hypothetical life table cohort within an age interval x to $x + 1$. Each figure in column 5 represents the total time (in years) lived between two indicated birthdays by all those reaching the earlier birthday. Thus, the figure 98,692 for males in the age interval 20–21 is the total number of years lived between the 20th and 21st birthdays by the 98,749 males (column 3) who reached their 20th birthday out of 100,000 males born alive (Table 2).

Column 6. Total number of person-years lived (T_x)—Shows the total number of person-years that would be lived after the beginning of the age interval x to $x + 1$ by the hypothetical life table cohort. For example, 5,626,672 is the total number of years lived after reaching age 20 by the 98,749 males reaching that age (Table 2).

Column 7. Expectation of life (e_x)—The expectation of life at any given age is the average number of years remaining to be lived by those surviving to that age, based on a given set of age-specific rates of dying. It is derived by dividing the total person-years that would be lived beyond age x by the number of persons who survived to that age interval (T_x/l_x). Thus, the average remaining lifetime for males who reach age 20 is 57.0 years (5,626,672 divided by 98,749) (Table 2).

Results

Life expectancy in the United States

Tables 1–18 show complete life tables for 2017 by race (white and black), Hispanic origin, and sex. Table A summarizes life expectancy by age, race, Hispanic origin, and sex. Life expectancy at birth for 2017 represents the average number of years that a group of infants would live if they were to experience throughout life the age-specific death rates prevailing in 2017. In 2017, life expectancy at birth was 78.6 years, decreasing by 0.1 year from 78.7 in 2016.

Changes in mortality by age and cause of death can have a major effect on life expectancy. Life expectancy between 2016 and 2017 decreased due to increases in mortality from unintentional injuries, suicide, diabetes, Alzheimer disease, Influenza and pneumonia, and decreases in mortality from cancer, heart disease, Viral hepatitis, HIV disease, and septicemia. For males, life expectancy decreased due to increases in mortality from unintentional injuries, suicide, diabetes, hypertension,

Table A. Expectation of life, by age, race, Hispanic origin, race for the non-Hispanic population, and sex: United States, 2017

Age (years)	All races and origins			White			Black			Hispanic[1]			Non-Hispanic white[1]			Non-Hispanic black[1]		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0	78.6	76.1	81.1	78.8	76.4	81.2	75.3	71.9	78.5	81.8	79.1	84.3	78.5	76.1	81.0	74.9	71.5	78.1
1	78.1	75.6	80.5	78.2	75.8	80.6	75.1	71.8	78.2	81.2	78.5	83.7	77.9	75.5	80.3	74.7	71.4	77.9
5	74.1	71.7	76.6	74.2	71.8	76.7	71.2	67.9	74.3	77.3	74.6	79.8	74.0	71.6	76.4	70.8	67.5	74.0
10	69.2	66.7	71.6	69.3	66.9	71.7	66.3	63.0	69.4	72.3	69.6	74.8	69.0	66.6	71.4	65.9	62.5	69.0
15	64.2	61.8	66.7	64.3	61.9	66.7	61.4	58.1	64.4	67.4	64.7	69.8	64.0	61.7	66.4	61.0	57.6	64.1
20	59.4	57.0	61.8	59.5	57.1	61.8	56.6	53.4	59.5	62.5	59.9	64.9	59.2	56.9	61.5	56.2	53.0	59.2
25	54.7	52.4	56.9	54.7	52.5	57.0	51.9	48.9	54.7	57.7	55.2	60.1	54.5	52.2	56.7	51.6	48.5	54.4
30	50.0	47.8	52.1	50.0	47.9	52.2	47.4	44.5	49.9	53.0	50.5	55.2	49.8	47.7	51.9	47.0	44.1	49.6
35	45.3	43.2	47.3	45.4	43.4	47.4	42.8	40.0	45.2	48.2	45.8	50.3	45.2	43.2	47.2	42.5	39.7	44.9
40	40.7	38.7	42.6	40.8	38.8	42.7	38.3	35.7	40.6	43.5	41.2	45.5	40.6	38.6	42.5	38.0	35.3	40.3
45	36.1	34.2	37.9	36.2	34.3	38.0	33.8	31.3	36.0	38.8	36.6	40.7	36.0	34.2	37.8	33.6	31.0	35.8
50	31.6	29.8	33.4	31.7	29.9	33.4	29.5	27.1	31.6	34.2	32.1	36.0	31.6	29.8	33.3	29.3	26.9	31.4
55	27.4	25.6	28.9	27.4	25.7	29.0	25.5	23.2	27.4	29.8	27.7	31.4	27.3	25.6	28.8	25.2	23.0	27.2
60	23.3	21.7	24.7	23.3	21.8	24.7	21.7	19.6	23.4	25.5	23.6	27.0	23.2	21.7	24.6	21.5	19.4	23.3
65	19.4	18.0	20.6	19.4	18.1	20.6	18.2	16.4	19.7	21.4	19.7	22.7	19.3	18.0	20.5	18.1	16.2	19.5
70	15.7	14.5	16.7	15.6	14.5	16.6	15.0	13.4	16.1	17.5	16.0	18.6	15.6	14.5	16.6	14.9	13.3	16.0
75	12.3	11.3	13.0	12.2	11.2	13.0	11.9	10.7	12.8	13.8	12.6	14.7	12.2	11.2	12.9	11.9	10.6	12.7
80	9.2	8.4	9.8	9.1	8.3	9.7	9.2	8.2	9.8	10.5	9.4	11.1	9.1	8.3	9.7	9.2	8.1	9.8
85	6.6	5.9	7.0	6.5	5.9	6.9	6.9	6.1	7.3	7.6	6.7	8.0	6.5	5.9	6.9	6.9	6.1	7.3
90	4.5	4.1	4.8	4.5	4.0	4.7	5.1	4.5	5.2	5.3	4.6	5.5	4.5	4.0	4.7	5.0	4.5	5.2
95	3.1	2.8	3.2	3.0	2.7	3.2	3.7	3.3	3.7	3.6	3.2	3.7	3.0	2.7	3.2	3.6	3.3	3.7
100	2.2	2.0	2.2	2.1	1.9	2.2	2.7	2.5	2.7	2.6	2.2	2.6	2.1	1.9	2.2	2.7	2.5	2.7

[1]Life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table B. Number of survivors out of 100,000 born alive, by age, race, Hispanic origin, race for non-Hispanic population, and sex: United States, 2017

Age (years)	All races and origins			White			Black			Hispanic[1]			Non-Hispanic white[1]			Non-Hispanic black[1]		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,422	99,370	99,477	99,516	99,473	99,562	98,920	98,812	99,033	99,491	99,461	99,523	99,533	99,483	99,585	98,911	98,812	99,013
5	99,326	99,261	99,393	99,429	99,373	99,489	98,771	98,653	98,894	99,415	99,379	99,454	99,444	99,371	99,520	98,748	98,653	98,866
10	99,268	99,199	99,341	99,377	99,316	99,440	98,686	98,560	98,815	99,366	99,328	99,408	99,392	99,310	99,478	98,654	98,560	98,783
15	99,191	99,107	99,280	99,304	99,230	99,382	98,578	98,425	98,736	99,305	99,256	99,359	99,318	99,216	99,425	98,536	98,423	98,700
20	98,937	98,749	99,134	99,066	98,906	99,235	98,208	97,853	98,576	99,091	98,970	99,221	99,080	98,892	99,278	98,134	97,803	98,525
25	98,466	98,071	98,883	98,613	98,262	98,987	97,555	96,871	98,267	98,727	98,447	99,032	98,613	98,234	99,013	97,430	96,746	98,189
30	97,872	97,235	98,543	98,025	97,439	98,646	96,763	95,718	97,843	98,284	97,800	98,814	97,983	97,360	98,639	96,610	95,560	97,742
35	97,163	96,284	98,083	97,312	96,493	98,180	95,837	94,433	97,263	97,799	97,133	98,532	97,204	96,327	98,122	95,641	94,229	97,125
40	96,321	95,196	97,493	96,477	95,422	97,593	94,682	92,897	96,464	97,221	96,341	98,184	96,298	95,173	97,473	94,407	92,586	96,271
45	95,275	93,903	96,697	95,447	94,151	96,814	93,210	91,066	95,322	96,506	95,387	97,717	95,181	93,808	96,614	92,840	90,636	95,055
50	93,797	92,105	95,543	93,997	92,391	95,687	91,184	88,591	93,711	95,438	94,048	96,936	93,649	91,968	95,402	90,725	88,051	93,374
55	91,538	89,365	93,768	91,783	89,701	93,962	88,154	84,962	91,241	93,759	91,914	95,738	91,353	89,207	93,581	87,588	84,296	90,812
60	88,226	85,344	91,162	88,554	85,778	91,438	83,613	79,494	87,562	91,332	88,832	93,974	88,032	85,203	90,956	82,936	78,732	87,013
65	83,696	79,838	87,596	84,141	80,425	87,973	77,385	71,895	82,583	87,731	84,329	91,241	83,559	79,807	87,420	76,584	71,027	81,897
70	77,697	72,785	82,637	78,242	73,517	83,087	69,560	62,551	76,127	82,920	78,413	87,438	77,632	72,896	82,492	68,613	61,536	75,293
75	69,418	63,524	75,344	69,933	64,248	75,748	60,137	51,909	67,819	76,164	70,358	81,818	69,308	63,649	75,113	59,109	50,854	66,870
80	57,839	51,095	64,591	58,237	51,682	64,899	48,332	39,528	56,516	66,348	59,261	73,047	57,607	51,115	64,231	47,325	38,543	55,541
85	42,382	35,439	49,264	42,559	35,762	49,376	34,458	26,042	42,199	52,244	44,188	59,497	42,000	35,287	48,761	33,600	25,258	41,324
90	24,560	18,687	30,222	24,480	18,708	30,103	20,106	13,662	26,129	34,151	26,219	40,715	24,097	18,400	29,665	19,644	13,175	25,499
95	9,361	6,070	12,383	9,125	5,903	12,097	8,620	5,016	11,754	15,837	10,234	19,864	8,964	5,791	11,901	8,353	4,820	11,445
100	1,894	971	2,697	1,761	886	2,524	2,390	1,128	3,289	4,304	2,127	5,582	1,730	869	2,483	2,255	1,086	3,205

[1]Life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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and decreases in mortality from cancer, septicemia, Chronic lower respiratory diseases, Viral hepatitis, and HIV disease. Life expectancy did not change for females between 2016 and 2017 due to decreases in mortality from cancer, heart disease, perinatal conditions, congenital malformations, Viral hepatitis, and increases in mortality from unintentional injuries, Alzheimer disease, Influenza and pneumonia, Chronic lower respiratory diseases, and Nutritional deficiencies (6).

The difference in life expectancy between the sexes was 5.0 years in 2017, increasing by 0.1 year from the difference in 2016. From 1900 to 1975, the difference in life expectancy between the sexes increased from 2.0 years to 7.8 years (Table 19). The increasing gap during these years is attributed to increases in male mortality due to ischemic heart disease and lung cancer, both of which increased largely as the result of men's early and widespread adoption of cigarette smoking (7,8). Between 1979 and 2010, the difference in life expectancy between the sexes narrowed from 7.8 years to 4.8 years and remained at this level through 2015. It has increased every year since 2015 (Table 19).

The 2017 life table may be used to compare life expectancy at any age from birth onward. On the basis of mortality experienced in 2017, a person aged 65 could expect to live an average of 19.4 more years, for a total of 84.4 years; a person aged 85 could expect to live an additional 6.6 years, for a total of 91.6 years; and a person aged 100 could expect to live an additional 2.2 years, on average (Table A).

Life expectancy by race

Between 2016 and 2017, life expectancy decreased by 0.1 year for the white population (78.9 to 78.8) and did not change for the black population (75.3) (Table 19). The difference in life expectancy between the white and black populations was 3.5 years in 2017, 0.1 year above the historically record low level of 3.4 attained in 2015. The white–black difference in life expectancy narrowed from 14.6 years in 1900 to 5.7 years in 1982, but increased to 7.1 years in 1993 before beginning to decline again in 1994 (Table 19). The increase in the gap from 1983 to 1993 was largely the result of increases in mortality among the black male population due to HIV infection and homicide (8).

Among the four race–sex groups (Figure 1), white females continued to have the highest life expectancy at birth (81.2), followed by black females (78.5), white males (76.4), and black males (71.9). Between 2016 and 2017, life expectancy decreased by 0.1 year for black males (72.0 to 71.9) and increased by 0.2 year for black females (78.3 to 78.5). Black males experienced a decline in life expectancy every year for 1984–1989 (8), followed by annual increases in 1990–1992 and 1994–2012. Between 2016 and 2017, life expectancy declined by 0.1 year for white females (81.3 to 81.2). It remained unchanged for white males (76.4). Overall, gains in life expectancy between 1980 and 2017 were 8.1 years for black males, 6.0 years for black females, 5.7 years for white males, and 3.1 years for white females (Table 19).

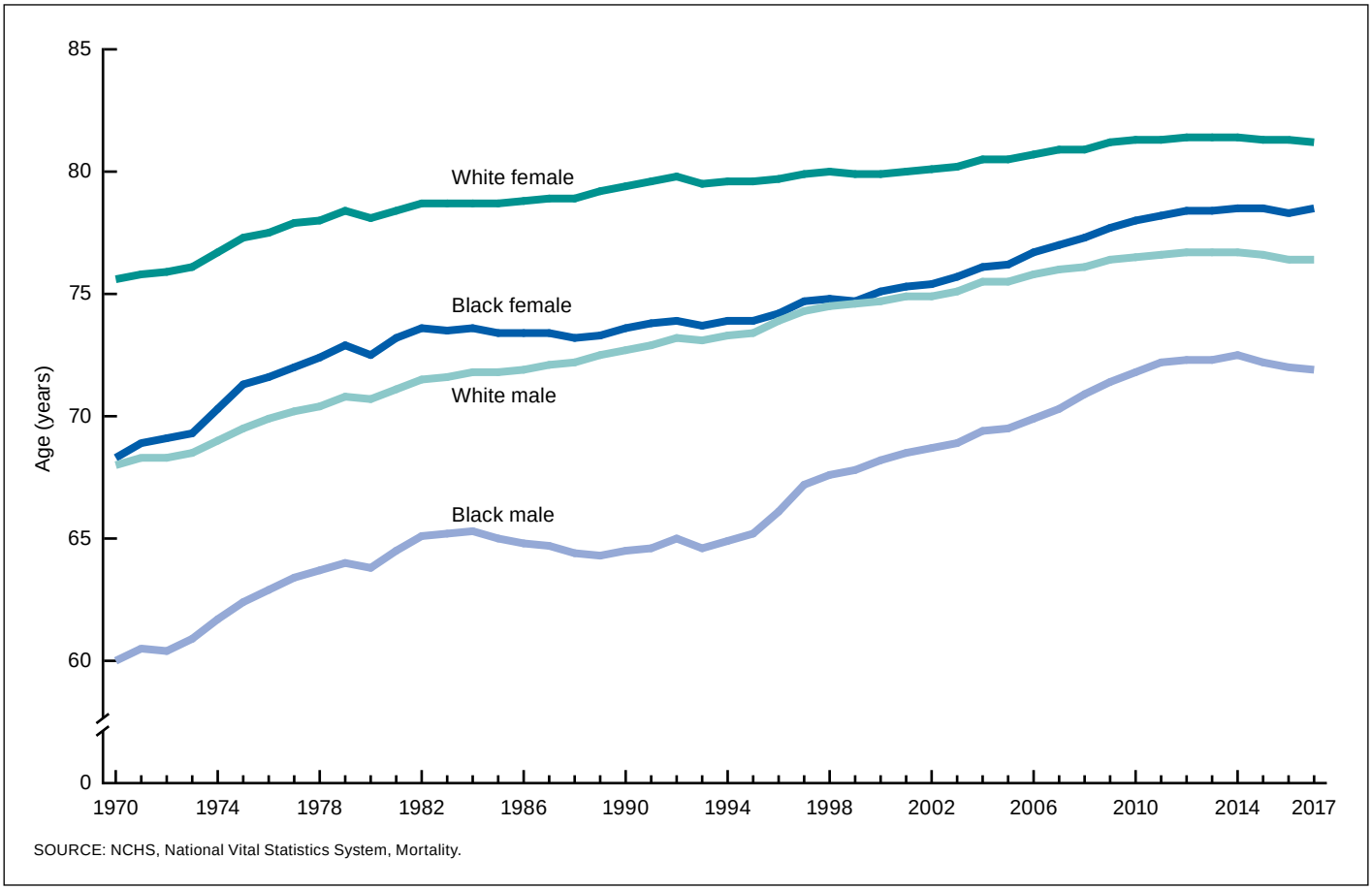

Figure 1. Life expectancy at birth, by race and sex: United States, 1970–2017

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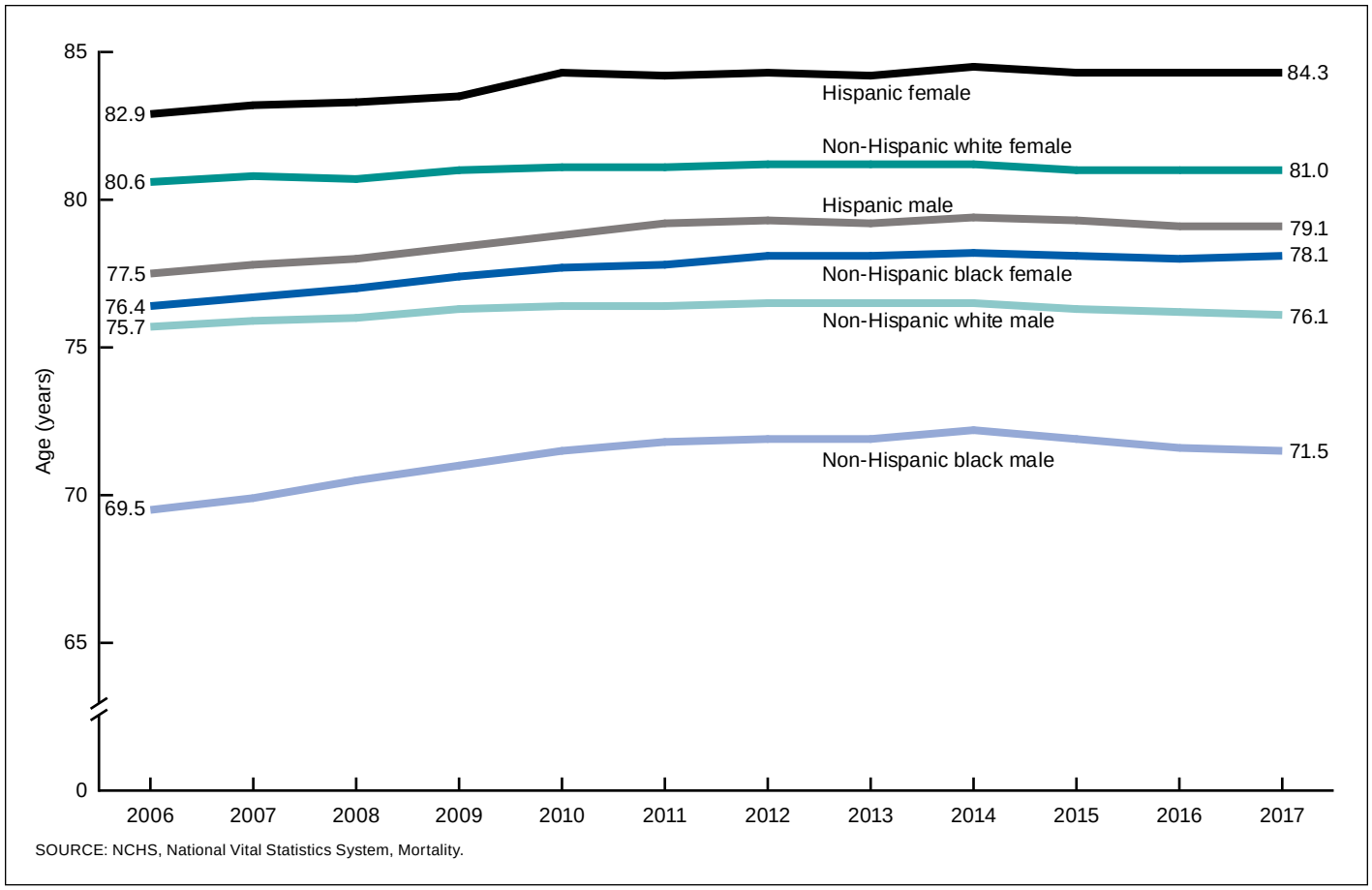

Figure 2. Life expectancy at birth, by Hispanic origin, race, and sex: United States, 2006–2017

Life expectancy by Hispanic origin

Between 2016 and 2017, life expectancy decreased by 0.1 year for the non-Hispanic white population (78.6 to 78.5). It remained unchanged for the Hispanic population (81.8) and the non-Hispanic black population (74.9) (Table 19). In 2017, the Hispanic population had a life expectancy advantage at birth of 3.3 years over the non-Hispanic white population and 6.9 years over the non-Hispanic black population. The U.S. life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates (see Technical Notes for a detailed description of the methodology).

Among the six Hispanic-origin race–sex groups (Figure 2), Hispanic females continued to have the highest life expectancy at birth (84.3 years), followed by non-Hispanic white females (81.0), Hispanic males (79.1), non-Hispanic black females (78.1), non-Hispanic white males (76.1), and non-Hispanic black males (71.5). The smallest difference is between Hispanic males and non-Hispanic black females, with Hispanic males having an advantage of 1.0 year. The largest difference is between Hispanic females and non-Hispanic black males, with Hispanic females having a life expectancy at birth 12.8 years greater.

The Hispanic mortality advantage is also evident in the effect produced on life expectancy at birth when race and Hispanic origin are considered separately. Until 2006, U.S. life tables were produced only by race (white and black), irrespective of Hispanic origin. When the Hispanic population is excluded from the two race groups and only the non-Hispanic black and non-Hispanic white populations are included, life expectancy at birth declines. For example, for the black population, irrespective of Hispanic origin, life expectancy at birth was 75.3 years in 2017 but was 74.9 years when only the non-Hispanic segment of the black population was included. Similarly, life expectancy for the white population, irrespective of Hispanic origin, was 78.8 years in 2017, but was 78.5 years when only the non-Hispanic segment of the white population was included. The effect of the Hispanic mortality advantage on race-specific life expectancy was also observed for each race–sex group. (See Technical Notes for a detailed description of the methodology used to estimate the Hispanic-origin life tables.)

Survivorship in the United States

Table B summarizes the number of survivors out of 100,000 persons born alive (l_x) by age, race, Hispanic origin, and sex for 2017. Table 20 shows trends in survivorship from 1900 to 2017. In 2017, 99.4% of all infants born in the United States survived the first year of life. In contrast, only 87.6% of infants born in 1900 survived the first year. Of the 2017 period life table cohort, 57.8% survived to age 80 and 1.9% survived to age 100. In 1900, 13.5% of the life table cohort survived to age 80 and only 0.03% survived to age 100 (Table 20).

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Survivorship by race

Among the four race–sex groups, white females have the highest median age at death, with about 49.4% surviving to age 85 (Tables 4–9). Of the original hypothetical cohort of 100,000 infant white females, 99.2% survive to age 20, 88.0% survive to age 65, and 49.4% survive to age 85 (Table 6). White males have slightly higher survival rates than black females at the younger ages, with 98.9% surviving to age 20 compared with 98.6% of black females (Tables 5 and 9). At the older ages, however, black female survival surpasses white male survival. By age 85, white male survival is 35.8% compared with 42.2% for black females. The median age at death for black males is close to 76 years, about 9 years less than that for white females (Tables 6 and 8). Among black males, 97.9% survive to age 20, 71.9% to age 65, and 26.0% to age 85. By age 100, there is very little difference between the white and black populations in terms of survival. For example, 1.0% of white males, 1.1% of black males, 2.5% of white females, and 3.3% of black females survive to age 100.

Survivorship by Hispanic origin

In 2017, 99.5% of Hispanic and non-Hispanic white infants survived the first year of life, compared with 98.9% of non-Hispanic black infants (Tables 10–19). For both the Hispanic and non-Hispanic white populations, 99.1% survived to age 20, while 98.1% of the non-Hispanic black population survived to age 20. By age 65, the Hispanic population has a clear survival advantage compared with the other two populations. Overall, 87.7% of the Hispanic population survived to age 65 compared with 83.6% of the non-Hispanic white and 76.6% of the non-Hispanic black populations. The Hispanic survival advantage increases with age so that by age 85, 52.2% of the Hispanic population has survived compared with 42.0% of the non-Hispanic white and 33.6% of the non-Hispanic black populations.

Among the six Hispanic-origin race–sex groups, Hispanic females have the highest median age at death, with 48.8% surviving to age 88 (Figure 3). The group with the next highest median age at death is non-Hispanic white females, with 48.8% surviving to age 85. Hispanic males had 50.7% surviving to age 83; followed by non-Hispanic black females, with 50.1% surviving to age 82; non-Hispanic white males, with 48.2% surviving to age 81; and non-Hispanic black males, with 48.5% surviving to age 76 (see Technical Notes).

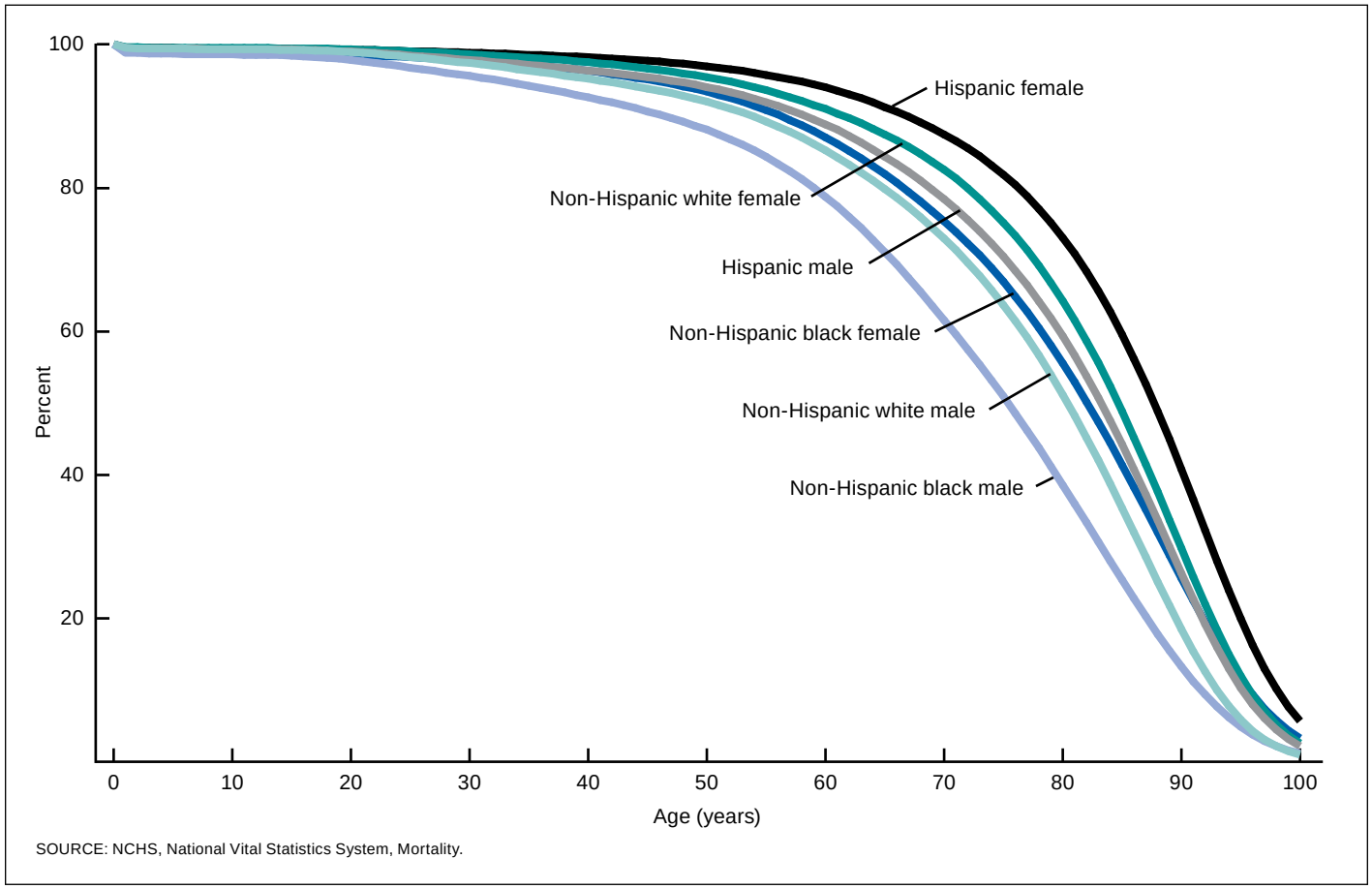

Figure 3. Percentage surviving, by Hispanic origin, race, age, and sex: United States, 2017

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Table 1. Life table for the total population: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005777	100,000	578	99,493	7,860,752	78.6
1–2	0.000382	99,422	38	99,403	7,761,259	78.1
2–3	0.000248	99,384	25	99,372	7,661,855	77.1
3–4	0.000193	99,360	19	99,350	7,562,483	76.1
4–5	0.000149	99,341	15	99,333	7,463,133	75.1
5–6	0.000141	99,326	14	99,319	7,363,800	74.1
6–7	0.000126	99,312	13	99,305	7,264,481	73.1
7–8	0.000114	99,299	11	99,294	7,165,176	72.2
8–9	0.000104	99,288	10	99,283	7,065,882	71.2
9–10	0.000095	99,278	9	99,273	6,966,600	70.2
10–11	0.000093	99,268	9	99,264	6,867,327	69.2
11–12	0.000103	99,259	10	99,254	6,768,063	68.2
12–13	0.000133	99,249	13	99,242	6,668,809	67.2
13–14	0.000186	99,236	18	99,226	6,569,567	66.2
14–15	0.000258	99,217	26	99,204	6,470,341	65.2
15–16	0.000338	99,191	34	99,175	6,371,137	64.2
16–17	0.000421	99,158	42	99,137	6,271,962	63.3
17–18	0.000510	99,116	51	99,091	6,172,825	62.3
18–19	0.000603	99,066	60	99,036	6,073,734	61.3
19–20	0.000698	99,006	69	98,971	5,974,699	60.3
20–21	0.000795	98,937	79	98,897	5,875,727	59.4
21–22	0.000889	98,858	88	98,814	5,776,830	58.4
22–23	0.000970	98,770	96	98,722	5,678,016	57.5
23–24	0.001032	98,674	102	98,623	5,579,293	56.5
24–25	0.001080	98,573	106	98,519	5,480,670	55.6
25–26	0.001123	98,466	111	98,411	5,382,151	54.7
26–27	0.001165	98,355	115	98,298	5,283,740	53.7
27–28	0.001207	98,241	119	98,182	5,185,442	52.8
28–29	0.001252	98,122	123	98,061	5,087,260	51.8
29–30	0.001300	97,999	127	97,936	4,989,199	50.9
30–31	0.001351	97,872	132	97,806	4,891,263	50.0
31–32	0.001402	97,740	137	97,671	4,793,457	49.0
32–33	0.001454	97,603	142	97,532	4,695,786	48.1
33–34	0.001506	97,461	147	97,388	4,598,254	47.2
34–35	0.001556	97,314	151	97,238	4,500,867	46.3
35–36	0.001615	97,163	157	97,084	4,403,628	45.3
36–37	0.001679	97,006	163	96,924	4,306,544	44.4
37–38	0.001740	96,843	168	96,759	4,209,619	43.5
38–39	0.001798	96,674	174	96,588	4,112,861	42.5
39–40	0.001860	96,501	179	96,411	4,016,273	41.6
40–41	0.001936	96,321	186	96,228	3,919,862	40.7
41–42	0.002036	96,135	196	96,037	3,823,634	39.8
42–43	0.002160	95,939	207	95,835	3,727,597	38.9
43–44	0.002306	95,732	221	95,621	3,631,762	37.9
44–45	0.002470	95,511	236	95,393	3,536,140	37.0
45–46	0.002647	95,275	252	95,149	3,440,747	36.1
46–47	0.002846	95,023	270	94,888	3,345,598	35.2
47–48	0.003079	94,753	292	94,607	3,250,710	34.3
48–49	0.003357	94,461	317	94,302	3,156,104	33.4
49–50	0.003682	94,144	347	93,970	3,061,801	32.5
50–51	0.004030	93,797	378	93,608	2,967,831	31.6
51–52	0.004401	93,419	411	93,214	2,874,223	30.8
52–53	0.004820	93,008	448	92,784	2,781,009	29.9
53–54	0.005285	92,560	489	92,315	2,688,226	29.0
54–55	0.005778	92,070	532	91,804	2,595,911	28.2
55–56	0.006284	91,538	575	91,251	2,504,106	27.4
56–57	0.006794	90,963	618	90,654	2,412,855	26.5
57–58	0.007319	90,345	661	90,015	2,322,201	25.7
58–59	0.007869	89,684	706	89,331	2,232,186	24.9
59–60	0.008456	88,978	752	88,602	2,142,855	24.1
60–61	0.009093	88,226	802	87,825	2,054,253	23.3

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Table 1. Life table for the total population: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.009768	87,424	854	86,997	1,966,428	22.5
62–63	0.010467	86,570	906	86,117	1,879,431	21.7
63–64	0.011181	85,664	958	85,185	1,793,315	20.9
64–65	0.011922	84,706	1,010	84,201	1,708,130	20.2
65–66	0.012710	83,696	1,064	83,164	1,623,929	19.4
66–67	0.013621	82,632	1,126	82,069	1,540,765	18.6
67–68	0.014620	81,507	1,192	80,911	1,458,695	17.9
68–69	0.015770	80,315	1,267	79,682	1,377,785	17.2
69–70	0.017100	79,048	1,352	78,373	1,298,103	16.4
70–71	0.018428	77,697	1,432	76,981	1,219,730	15.7
71–72	0.020317	76,265	1,549	75,490	1,142,750	15.0
72–73	0.022102	74,715	1,651	73,890	1,067,259	14.3
73–74	0.024194	73,064	1,768	72,180	993,370	13.6
74–75	0.026342	71,296	1,878	70,357	921,190	12.9
75–76	0.029042	69,418	2,016	68,410	850,832	12.3
76–77	0.032001	67,402	2,157	66,324	782,422	11.6
77–78	0.035443	65,245	2,313	64,089	716,098	11.0
78–79	0.039257	62,933	2,471	61,698	652,009	10.4
79–80	0.043393	60,462	2,624	59,150	590,312	9.8
80–81	0.048163	57,839	2,786	56,446	531,161	9.2
81–82	0.053216	55,053	2,930	53,588	474,715	8.6
82–83	0.059240	52,123	3,088	50,579	421,127	8.1
83–84	0.066564	49,035	3,264	47,403	370,548	7.6
84–85	0.074045	45,771	3,389	44,077	323,145	7.1
85–86	0.081954	42,382	3,473	40,646	279,068	6.6
86–87	0.090879	38,909	3,536	37,141	238,422	6.1
87–88	0.101938	35,373	3,606	33,570	201,281	5.7
88–89	0.114075	31,767	3,624	29,955	167,711	5.3
89–90	0.127331	28,143	3,584	26,352	137,756	4.9
90–91	0.141733	24,560	3,481	22,819	111,405	4.5
91–92	0.157289	21,079	3,315	19,421	88,585	4.2
92–93	0.173986	17,763	3,091	16,218	69,164	3.9
93–94	0.191788	14,673	2,814	13,266	52,946	3.6
94–95	0.210633	11,859	2,498	10,610	39,680	3.3
95–96	0.230432	9,361	2,157	8,282	29,071	3.1
96–97	0.251066	7,204	1,809	6,300	20,788	2.9
97–98	0.272395	5,395	1,470	4,660	14,489	2.7
98–99	0.294253	3,926	1,155	3,348	9,828	2.5
99–100	0.316456	2,770	877	2,332	6,480	2.3
100 and over	1.000000	1,894	1,894	4,148	4,148	2.2

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 2. Life table for males: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.006302	100,000	630	99,449	7,610,075	76.1
1–2	0.000423	99,370	42	99,349	7,510,627	75.6
2–3	0.000287	99,328	29	99,313	7,411,278	74.6
3–4	0.000225	99,299	22	99,288	7,311,964	73.6
4–5	0.000158	99,277	16	99,269	7,212,676	72.7
5–6	0.000156	99,261	15	99,253	7,113,407	71.7
6–7	0.000138	99,246	14	99,239	7,014,154	70.7
7–8	0.000124	99,232	12	99,226	6,914,915	69.7
8–9	0.000110	99,220	11	99,214	6,815,689	68.7
9–10	0.000098	99,209	10	99,204	6,716,475	67.7
10–11	0.000094	99,199	9	99,194	6,617,271	66.7
11–12	0.000108	99,190	11	99,184	6,518,077	65.7
12–13	0.000152	99,179	15	99,171	6,418,893	64.7
13–14	0.000232	99,164	23	99,152	6,319,721	63.7
14–15	0.000341	99,141	34	99,124	6,220,569	62.7
15–16	0.000461	99,107	46	99,084	6,121,445	61.8
16–17	0.000584	99,061	58	99,032	6,022,360	60.8
17–18	0.000718	99,003	71	98,968	5,923,328	59.8
18–19	0.000859	98,932	85	98,890	5,824,360	58.9
19–20	0.001001	98,848	99	98,798	5,725,470	57.9
20–21	0.001147	98,749	113	98,692	5,626,672	57.0
21–22	0.001286	98,635	127	98,572	5,527,980	56.0
22–23	0.001403	98,508	138	98,439	5,429,408	55.1
23–24	0.001490	98,370	147	98,297	5,330,969	54.2
24–25	0.001554	98,224	153	98,147	5,232,672	53.3
25–26	0.001609	98,071	158	97,992	5,134,525	52.4
26–27	0.001664	97,913	163	97,832	5,036,533	51.4
27–28	0.001713	97,750	167	97,667	4,938,701	50.5
28–29	0.001762	97,583	172	97,497	4,841,034	49.6
29–30	0.001810	97,411	176	97,323	4,743,537	48.7
30–31	0.001859	97,235	181	97,144	4,646,215	47.8
31–32	0.001907	97,054	185	96,961	4,549,070	46.9
32–33	0.001959	96,869	190	96,774	4,452,109	46.0
33–34	0.002014	96,679	195	96,582	4,355,335	45.0
34–35	0.002072	96,484	200	96,384	4,258,754	44.1
35–36	0.002139	96,284	206	96,181	4,162,369	43.2
36–37	0.002211	96,078	212	95,972	4,066,188	42.3
37–38	0.002277	95,866	218	95,757	3,970,216	41.4
38–39	0.002333	95,648	223	95,536	3,874,459	40.5
39–40	0.002390	95,425	228	95,311	3,778,923	39.6
40–41	0.002463	95,196	234	95,079	3,683,612	38.7
41–42	0.002566	94,962	244	94,840	3,588,533	37.8
42–43	0.002701	94,718	256	94,591	3,493,693	36.9
43–44	0.002870	94,463	271	94,327	3,399,102	36.0
44–45	0.003066	94,192	289	94,047	3,304,775	35.1
45–46	0.003280	93,903	308	93,749	3,210,728	34.2
46–47	0.003520	93,595	329	93,430	3,116,979	33.3
47–48	0.003804	93,265	355	93,088	3,023,549	32.4
48–49	0.004146	92,910	385	92,718	2,930,462	31.5
49–50	0.004547	92,525	421	92,315	2,837,744	30.7
50–51	0.004978	92,105	459	91,875	2,745,429	29.8
51–52	0.005441	91,646	499	91,397	2,653,554	29.0
52–53	0.005965	91,147	544	90,876	2,562,157	28.1
53–54	0.006549	90,604	593	90,307	2,471,281	27.3
54–55	0.007170	90,010	645	89,688	2,380,974	26.5
55–56	0.007803	89,365	697	89,016	2,291,287	25.6
56–57	0.008445	88,668	749	88,293	2,202,270	24.8
57–58	0.009116	87,919	801	87,518	2,113,977	24.0
58–59	0.009838	87,117	857	86,689	2,026,459	23.3
59–60	0.010619	86,260	916	85,802	1,939,770	22.5
60–61	0.011470	85,344	979	84,855	1,853,967	21.7

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Table 2. Life table for males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.012361	84,365	1,043	83,844	1,769,113	21.0
62–63	0.013260	83,323	1,105	82,770	1,685,269	20.2
63–64	0.014140	82,218	1,163	81,636	1,602,498	19.5
64–65	0.015019	81,055	1,217	80,446	1,520,862	18.8
65–66	0.015942	79,838	1,273	79,201	1,440,416	18.0
66–67	0.017026	78,565	1,338	77,896	1,361,214	17.3
67–68	0.018189	77,227	1,405	76,525	1,283,318	16.6
68–69	0.019483	75,823	1,477	75,084	1,206,793	15.9
69–70	0.020990	74,345	1,561	73,565	1,131,709	15.2
70–71	0.022448	72,785	1,634	71,968	1,058,144	14.5
71–72	0.024631	71,151	1,753	70,275	986,176	13.9
72–73	0.026570	69,399	1,844	68,477	915,901	13.2
73–74	0.029040	67,555	1,962	66,574	847,424	12.5
74–75	0.031539	65,593	2,069	64,558	780,851	11.9
75–76	0.034644	63,524	2,201	62,424	716,292	11.3
76–77	0.038148	61,323	2,339	60,154	653,869	10.7
77–78	0.042250	58,984	2,492	57,738	593,715	10.1
78–79	0.046522	56,492	2,628	55,178	535,977	9.5
79–80	0.051401	53,864	2,769	52,479	480,799	8.9
80–81	0.056783	51,095	2,901	49,644	428,320	8.4
81–82	0.062514	48,194	3,013	46,687	378,675	7.9
82–83	0.069452	45,181	3,138	43,612	331,988	7.3
83–84	0.077622	42,043	3,263	40,411	288,376	6.9
84–85	0.086155	38,780	3,341	37,109	247,965	6.4
85–86	0.095450	35,439	3,383	33,747	210,855	5.9
86–87	0.105788	32,056	3,391	30,360	177,108	5.5
87–88	0.118527	28,665	3,398	26,966	146,748	5.1
88–89	0.132437	25,267	3,346	23,594	119,782	4.7
89–90	0.147541	21,921	3,234	20,304	96,188	4.4
90–91	0.163839	18,687	3,062	17,156	75,884	4.1
91–92	0.181308	15,625	2,833	14,209	58,728	3.8
92–93	0.199900	12,792	2,557	11,514	44,519	3.5
93–94	0.219535	10,235	2,247	9,112	33,006	3.2
94–95	0.240108	7,988	1,918	7,029	23,894	3.0
95–96	0.261480	6,070	1,587	5,276	16,865	2.8
96–97	0.283491	4,483	1,271	3,847	11,589	2.6
97–98	0.305955	3,212	983	2,721	7,741	2.4
98–99	0.328673	2,229	733	1,863	5,021	2.3
99–100	0.351434	1,497	526	1,234	3,158	2.1
100 and over	1.000000	971	971	1,924	1,924	2.0

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 3. Life table for females: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005226	100,000	523	99,541	8,110,475	81.1
1–2	0.000339	99,477	34	99,461	8,010,934	80.5
2–3	0.000208	99,444	21	99,433	7,911,474	79.6
3–4	0.000159	99,423	16	99,415	7,812,040	78.6
4–5	0.000139	99,407	14	99,400	7,712,625	77.6
5–6	0.000126	99,393	12	99,387	7,613,225	76.6
6–7	0.000113	99,381	11	99,375	7,513,838	75.6
7–8	0.000104	99,370	10	99,365	7,414,463	74.6
8–9	0.000097	99,359	10	99,355	7,315,098	73.6
9–10	0.000092	99,350	9	99,345	7,215,744	72.6
10–11	0.000092	99,341	9	99,336	7,116,398	71.6
11–12	0.000098	99,331	10	99,327	7,017,062	70.6
12–13	0.000113	99,322	11	99,316	6,917,736	69.6
13–14	0.000138	99,311	14	99,304	6,818,420	68.7
14–15	0.000172	99,297	17	99,288	6,719,116	67.7
15–16	0.000210	99,280	21	99,269	6,619,828	66.7
16–17	0.000250	99,259	25	99,247	6,520,559	65.7
17–18	0.000293	99,234	29	99,220	6,421,312	64.7
18–19	0.000336	99,205	33	99,188	6,322,092	63.7
19–20	0.000379	99,172	38	99,153	6,222,904	62.7
20–21	0.000424	99,134	42	99,113	6,123,751	61.8
21–22	0.000471	99,092	47	99,069	6,024,638	60.8
22–23	0.000513	99,045	51	99,020	5,925,569	59.8
23–24	0.000550	98,995	54	98,967	5,826,549	58.9
24–25	0.000583	98,940	58	98,911	5,727,582	57.9
25–26	0.000613	98,883	61	98,852	5,628,670	56.9
26–27	0.000646	98,822	64	98,790	5,529,818	56.0
27–28	0.000682	98,758	67	98,724	5,431,028	55.0
28–29	0.000724	98,691	72	98,655	5,332,304	54.0
29–30	0.000774	98,619	76	98,581	5,233,649	53.1
30–31	0.000828	98,543	82	98,502	5,135,068	52.1
31–32	0.000885	98,461	87	98,418	5,036,566	51.2
32–33	0.000940	98,374	92	98,328	4,938,148	50.2
33–34	0.000989	98,282	97	98,233	4,839,820	49.2
34–35	0.001036	98,185	102	98,134	4,741,587	48.3
35–36	0.001087	98,083	107	98,030	4,643,453	47.3
36–37	0.001144	97,976	112	97,920	4,545,423	46.4
37–38	0.001203	97,864	118	97,805	4,447,503	45.4
38–39	0.001264	97,746	124	97,685	4,349,698	44.5
39–40	0.001332	97,623	130	97,558	4,252,013	43.6
40–41	0.001414	97,493	138	97,424	4,154,455	42.6
41–42	0.001513	97,355	147	97,281	4,057,031	41.7
42–43	0.001626	97,208	158	97,129	3,959,750	40.7
43–44	0.001750	97,050	170	96,965	3,862,621	39.8
44–45	0.001883	96,880	182	96,788	3,765,657	38.9
45–46	0.002025	96,697	196	96,599	3,668,868	37.9
46–47	0.002183	96,501	211	96,396	3,572,269	37.0
47–48	0.002366	96,291	228	96,177	3,475,873	36.1
48–49	0.002584	96,063	248	95,939	3,379,696	35.2
49–50	0.002836	95,815	272	95,679	3,283,757	34.3
50–51	0.003105	95,543	297	95,395	3,188,078	33.4
51–52	0.003391	95,246	323	95,085	3,092,683	32.5
52–53	0.003711	94,923	352	94,747	2,997,598	31.6
53–54	0.004066	94,571	385	94,379	2,902,851	30.7
54–55	0.004441	94,187	418	93,977	2,808,472	29.8
55–56	0.004829	93,768	453	93,542	2,714,495	28.9
56–57	0.005221	93,315	487	93,072	2,620,953	28.1
57–58	0.005613	92,828	521	92,568	2,527,881	27.2
58–59	0.006011	92,307	555	92,030	2,435,313	26.4
59–60	0.006429	91,752	590	91,457	2,343,284	25.5
60–61	0.006880	91,162	627	90,849	2,251,826	24.7

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Table 3. Life table for females: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.007371	90,535	667	90,202	2,160,977	23.9
62–63	0.007903	89,868	710	89,513	2,070,776	23.0
63–64	0.008481	89,158	756	88,780	1,981,263	22.2
64–65	0.009111	88,401	805	87,999	1,892,484	21.4
65–66	0.009793	87,596	858	87,167	1,804,485	20.6
66–67	0.010568	86,738	917	86,280	1,717,318	19.8
67–68	0.011436	85,822	981	85,331	1,631,038	19.0
68–69	0.012474	84,840	1,058	84,311	1,545,707	18.2
69–70	0.013659	83,782	1,144	83,210	1,461,396	17.4
70–71	0.014881	82,637	1,230	82,023	1,378,187	16.7
71–72	0.016529	81,408	1,346	80,735	1,296,164	15.9
72–73	0.018210	80,062	1,458	79,333	1,215,429	15.2
73–74	0.020011	78,604	1,573	77,818	1,136,096	14.5
74–75	0.021903	77,031	1,687	76,188	1,058,278	13.7
75–76	0.024322	75,344	1,833	74,428	982,091	13.0
76–77	0.026899	73,511	1,977	72,523	907,663	12.3
77–78	0.029886	71,534	2,138	70,465	835,141	11.7
78–79	0.033413	69,396	2,319	68,237	764,675	11.0
79–80	0.037065	67,078	2,486	65,834	696,439	10.4
80–81	0.041478	64,591	2,679	63,252	630,604	9.8
81–82	0.046150	61,912	2,857	60,484	567,352	9.2
82–83	0.051681	59,055	3,052	57,529	506,869	8.6
83–84	0.058587	56,003	3,281	54,362	449,340	8.0
84–85	0.065586	52,722	3,458	50,993	394,978	7.5
85–86	0.072855	49,264	3,589	47,469	343,985	7.0
86–87	0.081115	45,675	3,705	43,822	296,515	6.5
87–88	0.091618	41,970	3,845	40,047	252,693	6.0
88–89	0.103241	38,125	3,936	36,157	212,645	5.6
89–90	0.116041	34,189	3,967	32,205	176,488	5.2
90–91	0.130061	30,222	3,931	28,256	144,283	4.8
91–92	0.145329	26,291	3,821	24,380	116,027	4.4
92–93	0.161848	22,470	3,637	20,652	91,647	4.1
93–94	0.179598	18,833	3,382	17,142	70,995	3.8
94–95	0.198530	15,451	3,067	13,917	53,853	3.5
95–96	0.218561	12,383	2,707	11,030	39,936	3.2
96–97	0.239579	9,677	2,318	8,518	28,906	3.0
97–98	0.261439	7,359	1,924	6,397	20,388	2.8
98–99	0.283967	5,435	1,543	4,663	13,991	2.6
99–100	0.306967	3,891	1,195	3,294	9,328	2.4
100 and over	1.000000	2,697	2,697	6,034	6,034	2.2

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 4. Life table for the white population: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.004835	100,000	484	99,574	7,879,015	78.8
1–2	0.000343	99,516	34	99,499	7,779,442	78.2
2–3	0.000228	99,482	23	99,471	7,679,942	77.2
3–4	0.000176	99,460	17	99,451	7,580,471	76.2
4–5	0.000132	99,442	13	99,436	7,481,020	75.2
5–6	0.000128	99,429	13	99,423	7,381,585	74.2
6–7	0.000114	99,416	11	99,411	7,282,162	73.2
7–8	0.000104	99,405	10	99,400	7,182,751	72.3
8–9	0.000095	99,395	9	99,390	7,083,351	71.3
9–10	0.000088	99,385	9	99,381	6,983,961	70.3
10–11	0.000087	99,377	9	99,372	6,884,580	69.3
11–12	0.000098	99,368	10	99,363	6,785,208	68.3
12–13	0.000126	99,358	13	99,352	6,685,845	67.3
13–14	0.000175	99,346	17	99,337	6,586,493	66.3
14–15	0.000241	99,328	24	99,316	6,487,156	65.3
15–16	0.000315	99,304	31	99,289	6,387,840	64.3
16–17	0.000391	99,273	39	99,254	6,288,551	63.3
17–18	0.000474	99,234	47	99,211	6,189,297	62.4
18–19	0.000564	99,187	56	99,159	6,090,087	61.4
19–20	0.000657	99,131	65	99,099	5,990,928	60.4
20–21	0.000753	99,066	75	99,029	5,891,829	59.5
21–22	0.000847	98,991	84	98,950	5,792,800	58.5
22–23	0.000930	98,908	92	98,862	5,693,851	57.6
23–24	0.000996	98,816	98	98,766	5,594,989	56.6
24–25	0.001050	98,717	104	98,665	5,496,223	55.7
25–26	0.001098	98,613	108	98,559	5,397,557	54.7
26–27	0.001147	98,505	113	98,449	5,298,998	53.8
27–28	0.001195	98,392	118	98,334	5,200,549	52.9
28–29	0.001245	98,275	122	98,214	5,102,216	51.9
29–30	0.001299	98,152	127	98,089	5,004,002	51.0
30–31	0.001355	98,025	133	97,959	4,905,914	50.0
31–32	0.001410	97,892	138	97,823	4,807,955	49.1
32–33	0.001463	97,754	143	97,683	4,710,132	48.2
33–34	0.001512	97,611	148	97,537	4,612,449	47.3
34–35	0.001557	97,464	152	97,388	4,514,912	46.3
35–36	0.001609	97,312	157	97,233	4,417,525	45.4
36–37	0.001667	97,155	162	97,074	4,320,291	44.5
37–38	0.001722	96,993	167	96,910	4,223,217	43.5
38–39	0.001775	96,826	172	96,740	4,126,307	42.6
39–40	0.001833	96,654	177	96,566	4,029,567	41.7
40–41	0.001906	96,477	184	96,385	3,933,001	40.8
41–42	0.002003	96,293	193	96,197	3,836,616	39.8
42–43	0.002123	96,100	204	95,998	3,740,419	38.9
43–44	0.002264	95,896	217	95,788	3,644,421	38.0
44–45	0.002423	95,679	232	95,563	3,548,633	37.1
45–46	0.002594	95,447	248	95,323	3,453,070	36.2
46–47	0.002787	95,200	265	95,067	3,357,747	35.3
47–48	0.003013	94,934	286	94,791	3,262,680	34.4
48–49	0.003286	94,648	311	94,493	3,167,888	33.5
49–50	0.003605	94,337	340	94,167	3,073,395	32.6
50–51	0.003946	93,997	371	93,812	2,979,228	31.7
51–52	0.004309	93,626	403	93,425	2,885,416	30.8
52–53	0.004717	93,223	440	93,003	2,791,992	29.9
53–54	0.005166	92,783	479	92,544	2,698,989	29.1
54–55	0.005640	92,304	521	92,044	2,606,445	28.2
55–56	0.006124	91,783	562	91,502	2,514,402	27.4
56–57	0.006613	91,221	603	90,920	2,422,899	26.6
57–58	0.007114	90,618	645	90,296	2,331,980	25.7
58–59	0.007640	89,973	687	89,630	2,241,684	24.9
59–60	0.008202	89,286	732	88,920	2,152,055	24.1
60–61	0.008815	88,554	781	88,163	2,063,135	23.3

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Table 4. Life table for the white population: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.009470	87,773	831	87,357	1,974,972	22.5
62–63	0.010149	86,942	882	86,501	1,887,615	21.7
63–64	0.010844	86,059	933	85,593	1,801,114	20.9
64–65	0.011569	85,126	985	84,634	1,715,521	20.2
65–66	0.012336	84,141	1,038	83,622	1,630,887	19.4
66–67	0.013237	83,103	1,100	82,553	1,547,265	18.6
67–68	0.014258	82,003	1,169	81,419	1,464,712	17.9
68–69	0.015458	80,834	1,250	80,209	1,383,293	17.1
69–70	0.016875	79,585	1,343	78,913	1,303,083	16.4
70–71	0.018271	78,242	1,430	77,527	1,224,170	15.6
71–72	0.020244	76,812	1,555	76,035	1,146,643	14.9
72–73	0.022047	75,257	1,659	74,427	1,070,609	14.2
73–74	0.024143	73,598	1,777	72,709	996,181	13.5
74–75	0.026293	71,821	1,888	70,877	923,472	12.9
75–76	0.029041	69,933	2,031	68,917	852,595	12.2
76–77	0.032057	67,902	2,177	66,813	783,678	11.5
77–78	0.035546	65,725	2,336	64,557	716,864	10.9
78–79	0.039397	63,389	2,497	62,140	652,307	10.3
79–80	0.043588	60,891	2,654	59,564	590,167	9.7
80–81	0.048462	58,237	2,822	56,826	530,603	9.1
81–82	0.053604	55,415	2,970	53,930	473,777	8.5
82–83	0.059712	52,445	3,132	50,879	419,847	8.0
83–84	0.067186	49,313	3,313	47,656	368,968	7.5
84–85	0.074810	46,000	3,441	44,279	321,312	7.0
85–86	0.083033	42,559	3,534	40,792	277,032	6.5
86–87	0.091708	39,025	3,579	37,235	236,241	6.1
87–88	0.103100	35,446	3,654	33,619	199,005	5.6
88–89	0.115622	31,791	3,676	29,954	165,387	5.2
89–90	0.129315	28,116	3,636	26,298	135,433	4.8
90–91	0.144206	24,480	3,530	22,715	109,135	4.5
91–92	0.160301	20,950	3,358	19,271	86,421	4.1
92–93	0.177581	17,591	3,124	16,030	67,150	3.8
93–94	0.196002	14,468	2,836	13,050	51,120	3.5
94–95	0.215493	11,632	2,507	10,379	38,071	3.3
95–96	0.235950	9,125	2,153	8,049	27,692	3.0
96–97	0.257243	6,972	1,794	6,075	19,643	2.8
97–98	0.279210	5,179	1,446	4,456	13,568	2.6
98–99	0.301672	3,733	1,126	3,170	9,112	2.4
99–100	0.324428	2,607	846	2,184	5,943	2.3
100 and over	1.000000	1,761	1,761	3,759	3,759	2.1

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 5. Life table for white males: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005273	100,000	527	99,536	7,637,059	76.4
1–2	0.000389	99,473	39	99,453	7,537,523	75.8
2–3	0.000273	99,434	27	99,420	7,438,070	74.8
3–4	0.000199	99,407	20	99,397	7,338,650	73.8
4–5	0.000147	99,387	15	99,380	7,239,253	72.8
5–6	0.000143	99,373	14	99,365	7,139,873	71.8
6–7	0.000126	99,358	12	99,352	7,040,507	70.9
7–8	0.000112	99,346	11	99,340	6,941,155	69.9
8–9	0.000100	99,335	10	99,330	6,841,815	68.9
9–10	0.000091	99,325	9	99,320	6,742,485	67.9
10–11	0.000090	99,316	9	99,311	6,643,165	66.9
11–12	0.000105	99,307	10	99,302	6,543,853	65.9
12–13	0.000145	99,296	14	99,289	6,444,552	64.9
13–14	0.000215	99,282	21	99,271	6,345,263	63.9
14–15	0.000309	99,261	31	99,245	6,245,991	62.9
15–16	0.000412	99,230	41	99,209	6,146,746	61.9
16–17	0.000520	99,189	52	99,163	6,047,537	61.0
17–18	0.000642	99,137	64	99,106	5,948,373	60.0
18–19	0.000778	99,074	77	99,035	5,849,268	59.0
19–20	0.000921	98,997	91	98,951	5,750,233	58.1
20–21	0.001068	98,906	106	98,853	5,651,282	57.1
21–22	0.001209	98,800	119	98,740	5,552,429	56.2
22–23	0.001330	98,680	131	98,615	5,453,689	55.3
23–24	0.001424	98,549	140	98,479	5,355,074	54.3
24–25	0.001497	98,409	147	98,335	5,256,595	53.4
25–26	0.001561	98,262	153	98,185	5,158,260	52.5
26–27	0.001624	98,108	159	98,029	5,060,075	51.6
27–28	0.001682	97,949	165	97,866	4,962,046	50.7
28–29	0.001737	97,784	170	97,699	4,864,180	49.7
29–30	0.001792	97,614	175	97,527	4,766,481	48.8
30–31	0.001847	97,439	180	97,349	4,668,954	47.9
31–32	0.001900	97,259	185	97,167	4,571,605	47.0
32–33	0.001952	97,075	190	96,980	4,474,438	46.1
33–34	0.002003	96,885	194	96,788	4,377,458	45.2
34–35	0.002053	96,691	198	96,592	4,280,670	44.3
35–36	0.002111	96,493	204	96,391	4,184,078	43.4
36–37	0.002174	96,289	209	96,184	4,087,688	42.5
37–38	0.002233	96,079	215	95,972	3,991,503	41.5
38–39	0.002285	95,865	219	95,755	3,895,531	40.6
39–40	0.002340	95,646	224	95,534	3,799,776	39.7
40–41	0.002413	95,422	230	95,307	3,704,242	38.8
41–42	0.002516	95,192	239	95,072	3,608,935	37.9
42–43	0.002649	94,952	252	94,827	3,513,863	37.0
43–44	0.002811	94,701	266	94,568	3,419,036	36.1
44–45	0.002999	94,435	283	94,293	3,324,469	35.2
45–46	0.003203	94,151	302	94,001	3,230,176	34.3
46–47	0.003433	93,850	322	93,689	3,136,175	33.4
47–48	0.003709	93,528	347	93,354	3,042,486	32.5
48–49	0.004047	93,181	377	92,992	2,949,132	31.6
49–50	0.004445	92,804	413	92,597	2,856,140	30.8
50–51	0.004874	92,391	450	92,166	2,763,542	29.9
51–52	0.005331	91,941	490	91,696	2,671,377	29.1
52–53	0.005844	91,451	534	91,183	2,579,681	28.2
53–54	0.006408	90,916	583	90,625	2,488,497	27.4
54–55	0.007003	90,334	633	90,017	2,397,873	26.5
55–56	0.007607	89,701	682	89,360	2,307,855	25.7
56–57	0.008219	89,018	732	88,653	2,218,496	24.9
57–58	0.008857	88,287	782	87,896	2,129,843	24.1
58–59	0.009542	87,505	835	87,087	2,041,947	23.3
59–60	0.010285	86,670	891	86,224	1,954,860	22.6
60–61	0.011098	85,778	952	85,303	1,868,635	21.8

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Table 5. Life table for white males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.011952	84,827	1,014	84,320	1,783,333	21.0
62–63	0.012814	83,813	1,074	83,276	1,699,013	20.3
63–64	0.013657	82,739	1,130	82,174	1,615,738	19.5
64–65	0.014502	81,609	1,183	81,017	1,533,564	18.8
65–66	0.015384	80,425	1,237	79,807	1,452,547	18.1
66–67	0.016444	79,188	1,302	78,537	1,372,741	17.3
67–68	0.017624	77,886	1,373	77,199	1,294,204	16.6
68–69	0.018968	76,513	1,451	75,788	1,217,004	15.9
69–70	0.020586	75,062	1,545	74,289	1,141,217	15.2
70–71	0.022109	73,517	1,625	72,704	1,066,927	14.5
71–72	0.024359	71,891	1,751	71,016	994,223	13.8
72–73	0.026347	70,140	1,848	69,216	923,208	13.2
73–74	0.028810	68,292	1,967	67,308	853,992	12.5
74–75	0.031309	66,325	2,077	65,286	786,683	11.9
75–76	0.034486	64,248	2,216	63,140	721,397	11.2
76–77	0.038026	62,032	2,359	60,853	658,257	10.6
77–78	0.042286	59,674	2,523	58,412	597,404	10.0
78–79	0.046547	57,150	2,660	55,820	538,992	9.4
79–80	0.051534	54,490	2,808	53,086	483,172	8.9
80–81	0.057008	51,682	2,946	50,209	430,086	8.3
81–82	0.062923	48,736	3,067	47,202	379,877	7.8
82–83	0.069911	45,669	3,193	44,073	332,675	7.3
83–84	0.078099	42,476	3,317	40,818	288,602	6.8
84–85	0.086754	39,159	3,397	37,460	247,784	6.3
85–86	0.096549	35,762	3,453	34,035	210,324	5.9
86–87	0.106472	32,309	3,440	30,589	176,289	5.5
87–88	0.119677	28,869	3,455	27,141	145,700	5.0
88–89	0.134128	25,414	3,409	23,710	118,558	4.7
89–90	0.149846	22,005	3,297	20,357	94,849	4.3
90–91	0.166829	18,708	3,121	17,147	74,492	4.0
91–92	0.185047	15,587	2,884	14,145	57,345	3.7
92–93	0.204441	12,703	2,597	11,404	43,200	3.4
93–94	0.224919	10,106	2,273	8,969	31,796	3.1
94–95	0.246354	7,833	1,930	6,868	22,827	2.9
95–96	0.268590	5,903	1,586	5,110	15,959	2.7
96–97	0.291442	4,318	1,258	3,688	10,849	2.5
97–98	0.314700	3,059	963	2,578	7,160	2.3
98–99	0.338142	2,096	709	1,742	4,582	2.2
99–100	0.361537	1,388	502	1,137	2,840	2.0
100 and over	1.000000	886	886	1,703	1,703	1.9

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 6. Life table for white females: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.004376	100,000	438	99,613	8,123,536	81.2
1–2	0.000296	99,562	29	99,548	8,023,923	80.6
2–3	0.000180	99,533	18	99,524	7,924,375	79.6
3–4	0.000151	99,515	15	99,508	7,824,851	78.6
4–5	0.000116	99,500	11	99,494	7,725,344	77.6
5–6	0.000112	99,489	11	99,483	7,625,849	76.7
6–7	0.000102	99,477	10	99,472	7,526,366	75.7
7–8	0.000095	99,467	9	99,463	7,426,894	74.7
8–9	0.000089	99,458	9	99,453	7,327,432	73.7
9–10	0.000085	99,449	8	99,445	7,227,978	72.7
10–11	0.000085	99,440	8	99,436	7,128,534	71.7
11–12	0.000090	99,432	9	99,428	7,029,097	70.7
12–13	0.000106	99,423	11	99,418	6,929,670	69.7
13–14	0.000134	99,413	13	99,406	6,830,252	68.7
14–15	0.000170	99,399	17	99,391	6,730,846	67.7
15–16	0.000212	99,382	21	99,372	6,631,455	66.7
16–17	0.000255	99,361	25	99,349	6,532,084	65.7
17–18	0.000298	99,336	30	99,321	6,432,735	64.8
18–19	0.000339	99,306	34	99,289	6,333,414	63.8
19–20	0.000379	99,273	38	99,254	6,234,124	62.8
20–21	0.000420	99,235	42	99,214	6,134,871	61.8
21–22	0.000464	99,193	46	99,170	6,035,657	60.8
22–23	0.000504	99,147	50	99,122	5,936,486	59.9
23–24	0.000542	99,097	54	99,070	5,837,364	58.9
24–25	0.000576	99,044	57	99,015	5,738,294	57.9
25–26	0.000609	98,987	60	98,956	5,639,279	57.0
26–27	0.000643	98,926	64	98,894	5,540,322	56.0
27–28	0.000682	98,863	67	98,829	5,441,428	55.0
28–29	0.000728	98,795	72	98,759	5,342,599	54.1
29–30	0.000781	98,723	77	98,685	5,243,840	53.1
30–31	0.000839	98,646	83	98,605	5,145,155	52.2
31–32	0.000898	98,564	88	98,519	5,046,550	51.2
32–33	0.000953	98,475	94	98,428	4,948,031	50.2
33–34	0.001000	98,381	98	98,332	4,849,602	49.3
34–35	0.001043	98,283	102	98,232	4,751,270	48.3
35–36	0.001089	98,180	107	98,127	4,653,039	47.4
36–37	0.001143	98,073	112	98,017	4,554,912	46.4
37–38	0.001197	97,961	117	97,903	4,456,895	45.5
38–39	0.001252	97,844	122	97,783	4,358,992	44.6
39–40	0.001313	97,722	128	97,657	4,261,209	43.6
40–41	0.001388	97,593	135	97,526	4,163,551	42.7
41–42	0.001480	97,458	144	97,386	4,066,026	41.7
42–43	0.001589	97,314	155	97,236	3,968,640	40.8
43–44	0.001709	97,159	166	97,076	3,871,404	39.8
44–45	0.001840	96,993	178	96,904	3,774,328	38.9
45–46	0.001979	96,814	192	96,719	3,677,425	38.0
46–47	0.002133	96,623	206	96,520	3,580,706	37.1
47–48	0.002311	96,417	223	96,305	3,484,186	36.1
48–49	0.002520	96,194	242	96,073	3,387,881	35.2
49–50	0.002762	95,952	265	95,819	3,291,808	34.3
50–51	0.003018	95,687	289	95,542	3,195,989	33.4
51–52	0.003292	95,398	314	95,241	3,100,447	32.5
52–53	0.003600	95,084	342	94,913	3,005,206	31.6
53–54	0.003941	94,741	373	94,555	2,910,294	30.7
54–55	0.004301	94,368	406	94,165	2,815,739	29.8
55–56	0.004674	93,962	439	93,743	2,721,574	29.0
56–57	0.005050	93,523	472	93,287	2,627,831	28.1
57–58	0.005425	93,051	505	92,798	2,534,544	27.2
58–59	0.005806	92,546	537	92,277	2,441,746	26.4
59–60	0.006206	92,009	571	91,723	2,349,468	25.5
60–61	0.006644	91,438	607	91,134	2,257,745	24.7

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Table 6. Life table for white females: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.007124	90,830	647	90,507	2,166,611	23.9
62–63	0.007647	90,183	690	89,838	2,076,105	23.0
63–64	0.008217	89,493	735	89,126	1,986,266	22.2
64–65	0.008842	88,758	785	88,366	1,897,141	21.4
65–66	0.009515	87,973	837	87,555	1,808,775	20.6
66–67	0.010293	87,136	897	86,688	1,721,220	19.8
67–68	0.011188	86,239	965	85,757	1,634,532	19.0
68–69	0.012280	85,275	1,047	84,751	1,548,775	18.2
69–70	0.013537	84,227	1,140	83,657	1,464,024	17.4
70–71	0.014827	83,087	1,232	82,471	1,380,367	16.6
71–72	0.016570	81,855	1,356	81,177	1,297,896	15.9
72–73	0.018235	80,499	1,468	79,765	1,216,719	15.1
73–74	0.020046	79,031	1,584	78,239	1,136,954	14.4
74–75	0.021938	77,447	1,699	76,597	1,058,715	13.7
75–76	0.024382	75,748	1,847	74,824	982,118	13.0
76–77	0.027026	73,901	1,997	72,902	907,293	12.3
77–78	0.029965	71,904	2,155	70,826	834,391	11.6
78–79	0.033566	69,749	2,341	68,578	763,565	10.9
79–80	0.037224	67,408	2,509	66,153	694,987	10.3
80–81	0.041748	64,899	2,709	63,544	628,833	9.7
81–82	0.046426	62,189	2,887	60,746	565,290	9.1
82–83	0.052066	59,302	3,088	57,758	504,544	8.5
83–84	0.059213	56,214	3,329	54,550	446,786	7.9
84–85	0.066359	52,886	3,509	51,131	392,236	7.4
85–86	0.073798	49,376	3,644	47,554	341,105	6.9
86–87	0.081793	45,732	3,741	43,862	293,550	6.4
87–88	0.092586	41,992	3,888	40,048	249,688	5.9
88–89	0.104549	38,104	3,984	36,112	209,640	5.5
89–90	0.117741	34,120	4,017	32,112	173,528	5.1
90–91	0.132206	30,103	3,980	28,113	141,417	4.7
91–92	0.147969	26,123	3,865	24,190	113,304	4.3
92–93	0.165031	22,258	3,673	20,421	89,114	4.0
93–94	0.183365	18,584	3,408	16,881	68,692	3.7
94–95	0.202911	15,177	3,080	13,637	51,812	3.4
95–96	0.223578	12,097	2,705	10,745	38,175	3.2
96–97	0.245236	9,393	2,303	8,241	27,430	2.9
97–98	0.267725	7,089	1,898	6,140	19,189	2.7
98–99	0.290853	5,191	1,510	4,436	13,049	2.5
99–100	0.314404	3,681	1,157	3,103	8,613	2.3
100 and over	1.000000	2,524	2,524	5,510	5,510	2.2

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 7. Life table for the black population: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.010796	100,000	1,080	99,064	7,530,675	75.3
1–2	0.000605	98,920	60	98,890	7,431,612	75.1
2–3	0.000381	98,861	38	98,842	7,332,721	74.2
3–4	0.000281	98,823	28	98,809	7,233,879	73.2
4–5	0.000240	98,795	24	98,783	7,135,070	72.2
5–6	0.000214	98,771	21	98,761	7,036,287	71.2
6–7	0.000191	98,750	19	98,741	6,937,526	70.3
7–8	0.000172	98,731	17	98,723	6,838,786	69.3
8–9	0.000154	98,714	15	98,707	6,740,063	68.3
9–10	0.000138	98,699	14	98,692	6,641,356	67.3
10–11	0.000129	98,686	13	98,679	6,542,663	66.3
11–12	0.000140	98,673	14	98,666	6,443,984	65.3
12–13	0.000183	98,659	18	98,650	6,345,318	64.3
13–14	0.000265	98,641	26	98,628	6,246,668	63.3
14–15	0.000376	98,615	37	98,596	6,148,040	62.3
15–16	0.000499	98,578	49	98,553	6,049,444	61.4
16–17	0.000621	98,529	61	98,498	5,950,891	60.4
17–18	0.000750	98,467	74	98,430	5,852,393	59.4
18–19	0.000879	98,394	87	98,350	5,753,962	58.5
19–20	0.001007	98,307	99	98,258	5,655,612	57.5
20–21	0.001134	98,208	111	98,152	5,557,354	56.6
21–22	0.001256	98,097	123	98,035	5,459,202	55.7
22–23	0.001358	97,973	133	97,907	5,361,167	54.7
23–24	0.001433	97,840	140	97,770	5,263,260	53.8
24–25	0.001488	97,700	145	97,627	5,165,490	52.9
25–26	0.001536	97,555	150	97,480	5,067,862	51.9
26–27	0.001583	97,405	154	97,328	4,970,382	51.0
27–28	0.001628	97,251	158	97,172	4,873,055	50.1
28–29	0.001672	97,092	162	97,011	4,775,883	49.2
29–30	0.001721	96,930	167	96,847	4,678,872	48.3
30–31	0.001774	96,763	172	96,677	4,582,025	47.4
31–32	0.001834	96,592	177	96,503	4,485,348	46.4
32–33	0.001908	96,414	184	96,323	4,388,845	45.5
33–34	0.001998	96,231	192	96,134	4,292,522	44.6
34–35	0.002096	96,038	201	95,938	4,196,388	43.7
35–36	0.002204	95,837	211	95,731	4,100,450	42.8
36–37	0.002317	95,626	222	95,515	4,004,719	41.9
37–38	0.002425	95,404	231	95,289	3,909,204	41.0
38–39	0.002529	95,173	241	95,052	3,813,915	40.1
39–40	0.002638	94,932	250	94,807	3,718,863	39.2
40–41	0.002769	94,682	262	94,551	3,624,056	38.3
41–42	0.002929	94,419	277	94,281	3,529,505	37.4
42–43	0.003111	94,143	293	93,997	3,435,224	36.5
43–44	0.003310	93,850	311	93,695	3,341,228	35.6
44–45	0.003525	93,539	330	93,375	3,247,533	34.7
45–46	0.003757	93,210	350	93,035	3,154,158	33.8
46–47	0.004020	92,860	373	92,673	3,061,124	33.0
47–48	0.004329	92,486	400	92,286	2,968,451	32.1
48–49	0.004697	92,086	433	91,870	2,876,165	31.2
49–50	0.005125	91,653	470	91,418	2,784,295	30.4
50–51	0.005575	91,184	508	90,929	2,692,877	29.5
51–52	0.006061	90,675	550	90,400	2,601,947	28.7
52–53	0.006637	90,126	598	89,827	2,511,547	27.9
53–54	0.007319	89,527	655	89,200	2,421,720	27.1
54–55	0.008078	88,872	718	88,513	2,332,520	26.2
55–56	0.008864	88,154	781	87,764	2,244,007	25.5
56–57	0.009654	87,373	844	86,951	2,156,243	24.7
57–58	0.010475	86,529	906	86,076	2,069,292	23.9
58–59	0.011343	85,623	971	85,137	1,983,216	23.2
59–60	0.012267	84,652	1,038	84,133	1,898,079	22.4
60–61	0.013259	83,613	1,109	83,059	1,813,946	21.7

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Table 7. Life table for the black population: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.014298	82,505	1,180	81,915	1,730,887	21.0
62–63	0.015359	81,325	1,249	80,700	1,648,972	20.3
63–64	0.016417	80,076	1,315	79,419	1,568,272	19.6
64–65	0.017481	78,761	1,377	78,073	1,488,853	18.9
65–66	0.018635	77,385	1,442	76,664	1,410,780	18.2
66–67	0.019883	75,943	1,510	75,188	1,334,117	17.6
67–68	0.021127	74,433	1,573	73,646	1,258,929	16.9
68–69	0.022301	72,860	1,625	72,048	1,185,283	16.3
69–70	0.023515	71,235	1,675	70,398	1,113,235	15.6
70–71	0.024681	69,560	1,717	68,702	1,042,837	15.0
71–72	0.026448	67,843	1,794	66,946	974,136	14.4
72–73	0.028366	66,049	1,874	65,112	907,190	13.7
73–74	0.030734	64,175	1,972	63,189	842,077	13.1
74–75	0.033216	62,203	2,066	61,170	778,888	12.5
75–76	0.035961	60,137	2,163	59,056	717,718	11.9
76–77	0.038913	57,974	2,256	56,846	658,663	11.4
77–78	0.042338	55,718	2,359	54,539	601,816	10.8
78–79	0.046375	53,359	2,475	52,122	547,277	10.3
79–80	0.050161	50,885	2,552	49,609	495,155	9.7
80–81	0.054637	48,332	2,641	47,012	445,547	9.2
81–82	0.059225	45,692	2,706	44,339	398,535	8.7
82–83	0.064820	42,986	2,786	41,592	354,196	8.2
83–84	0.071047	40,199	2,856	38,771	312,604	7.8
84–85	0.077250	37,343	2,885	35,901	273,833	7.3
85–86	0.084677	34,458	2,918	33,000	237,932	6.9
86–87	0.092722	31,541	2,925	30,078	204,932	6.5
87–88	0.101399	28,616	2,902	27,165	174,854	6.1
88–89	0.110731	25,714	2,847	24,291	147,689	5.7
89–90	0.120738	22,867	2,761	21,487	123,398	5.4
90–91	0.131436	20,106	2,643	18,785	101,911	5.1
91–92	0.142834	17,463	2,494	16,216	83,127	4.8
92–93	0.154934	14,969	2,319	13,809	66,910	4.5
93–94	0.167731	12,650	2,122	11,589	53,101	4.2
94–95	0.181210	10,528	1,908	9,574	41,512	3.9
95–96	0.195349	8,620	1,684	7,778	31,938	3.7
96–97	0.210113	6,936	1,457	6,208	24,159	3.5
97–98	0.225460	5,479	1,235	4,861	17,952	3.3
98–99	0.241335	4,244	1,024	3,732	13,090	3.1
99–100	0.257674	3,220	830	2,805	9,359	2.9
100 and over	1.000000	2,390	2,390	6,554	6,554	2.7

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 8. Life table for black males: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.011882	100,000	1,188	98,973	7,194,460	71.9
1–2	0.000622	98,812	61	98,781	7,095,487	71.8
2–3	0.000406	98,750	40	98,730	6,996,706	70.9
3–4	0.000347	98,710	34	98,693	6,897,976	69.9
4–5	0.000231	98,676	23	98,665	6,799,283	68.9
5–6	0.000231	98,653	23	98,642	6,700,618	67.9
6–7	0.000211	98,630	21	98,620	6,601,976	66.9
7–8	0.000192	98,610	19	98,600	6,503,356	66.0
8–9	0.000169	98,591	17	98,582	6,404,756	65.0
9–10	0.000142	98,574	14	98,567	6,306,173	64.0
10–11	0.000125	98,560	12	98,554	6,207,606	63.0
11–12	0.000140	98,548	14	98,541	6,109,052	62.0
12–13	0.000211	98,534	21	98,524	6,010,512	61.0
13–14	0.000352	98,513	35	98,496	5,911,988	60.0
14–15	0.000546	98,478	54	98,452	5,813,492	59.0
15–16	0.000757	98,425	75	98,387	5,715,041	58.1
16–17	0.000965	98,350	95	98,303	5,616,654	57.1
17–18	0.001172	98,255	115	98,198	5,518,351	56.2
18–19	0.001370	98,140	134	98,073	5,420,153	55.2
19–20	0.001554	98,006	152	97,929	5,322,080	54.3
20–21	0.001736	97,853	170	97,768	5,224,151	53.4
21–22	0.001909	97,683	186	97,590	5,126,383	52.5
22–23	0.002051	97,497	200	97,397	5,028,792	51.6
23–24	0.002154	97,297	210	97,192	4,931,396	50.7
24–25	0.002225	97,087	216	96,979	4,834,203	49.8
25–26	0.002287	96,871	222	96,761	4,737,224	48.9
26–27	0.002346	96,650	227	96,537	4,640,463	48.0
27–28	0.002397	96,423	231	96,308	4,543,927	47.1
28–29	0.002444	96,192	235	96,074	4,447,619	46.2
29–30	0.002494	95,957	239	95,837	4,351,545	45.3
30–31	0.002543	95,718	243	95,596	4,255,708	44.5
31–32	0.002598	95,474	248	95,350	4,160,111	43.6
32–33	0.002675	95,226	255	95,099	4,064,761	42.7
33–34	0.002779	94,972	264	94,840	3,969,662	41.8
34–35	0.002899	94,708	275	94,570	3,874,823	40.9
35–36	0.003034	94,433	287	94,290	3,780,252	40.0
36–37	0.003172	94,147	299	93,997	3,685,963	39.2
37–38	0.003292	93,848	309	93,693	3,591,965	38.3
38–39	0.003391	93,539	317	93,380	3,498,272	37.4
39–40	0.003483	93,222	325	93,059	3,404,891	36.5
40–41	0.003593	92,897	334	92,730	3,311,832	35.7
41–42	0.003742	92,563	346	92,390	3,219,102	34.8
42–43	0.003932	92,217	363	92,036	3,126,712	33.9
43–44	0.004165	91,854	383	91,663	3,034,676	33.0
44–45	0.004434	91,472	406	91,269	2,943,013	32.2
45–46	0.004731	91,066	431	90,851	2,851,744	31.3
46–47	0.005061	90,635	459	90,406	2,760,893	30.5
47–48	0.005438	90,177	490	89,931	2,670,487	29.6
48–49	0.005874	89,686	527	89,423	2,580,556	28.8
49–50	0.006376	89,159	569	88,875	2,491,133	27.9
50–51	0.006905	88,591	612	88,285	2,402,258	27.1
51–52	0.007485	87,979	659	87,650	2,313,973	26.3
52–53	0.008192	87,321	715	86,963	2,226,323	25.5
53–54	0.009050	86,605	784	86,214	2,139,360	24.7
54–55	0.010020	85,822	860	85,392	2,053,146	23.9
55–56	0.011026	84,962	937	84,493	1,967,755	23.2
56–57	0.012041	84,025	1,012	83,519	1,883,261	22.4
57–58	0.013122	83,013	1,089	82,468	1,799,742	21.7
58–59	0.014298	81,924	1,171	81,338	1,717,274	21.0
59–60	0.015581	80,752	1,258	80,123	1,635,936	20.3

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Table 8. Life table for black males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
60–61	0.016979	79,494	1,350	78,819	1,555,812	19.6
61–62	0.018443	78,144	1,441	77,424	1,476,993	18.9
62–63	0.019920	76,703	1,528	75,939	1,399,569	18.2
63–64	0.021354	75,175	1,605	74,373	1,323,630	17.6
64–65	0.022760	73,570	1,674	72,733	1,249,257	17.0
65–66	0.024279	71,895	1,746	71,023	1,176,525	16.4
66–67	0.025931	70,150	1,819	69,240	1,105,502	15.8
67–68	0.027551	68,331	1,883	67,390	1,036,262	15.2
68–69	0.029041	66,448	1,930	65,483	968,872	14.6
69–70	0.030501	64,519	1,968	63,535	903,388	14.0
70–71	0.031843	62,551	1,992	61,555	839,854	13.4
71–72	0.034142	60,559	2,068	59,525	778,299	12.9
72–73	0.036113	58,491	2,112	57,435	718,774	12.3
73–74	0.039043	56,379	2,201	55,278	661,339	11.7
74–75	0.041873	54,178	2,269	53,044	606,060	11.2
75–76	0.044907	51,909	2,331	50,744	553,017	10.7
76–77	0.048772	49,578	2,418	48,369	502,273	10.1
77–78	0.052158	47,160	2,460	45,930	453,904	9.6
78–79	0.057218	44,700	2,558	43,422	407,974	9.1
79–80	0.062038	42,143	2,614	40,835	364,552	8.7
80–81	0.066654	39,528	2,635	38,211	323,717	8.2
81–82	0.072113	36,894	2,660	35,563	285,506	7.7
82–83	0.079691	34,233	2,728	32,869	249,942	7.3
83–84	0.087605	31,505	2,760	30,125	217,073	6.9
84–85	0.094030	28,745	2,703	27,394	186,948	6.5
85–86	0.100906	26,042	2,628	24,728	159,555	6.1
86–87	0.110227	23,414	2,581	22,124	134,827	5.8
87–88	0.120226	20,833	2,505	19,581	112,703	5.4
88–89	0.130918	18,329	2,400	17,129	93,122	5.1
89–90	0.142314	15,929	2,267	14,796	75,993	4.8
90–91	0.154416	13,662	2,110	12,607	61,197	4.5
91–92	0.167219	11,553	1,932	10,587	48,590	4.2
92–93	0.180709	9,621	1,739	8,751	38,003	4.0
93–94	0.194863	7,882	1,536	7,114	29,252	3.7
94–95	0.209647	6,346	1,330	5,681	22,138	3.5
95–96	0.225017	5,016	1,129	4,451	16,457	3.3
96–97	0.240921	3,887	936	3,419	12,005	3.1
97–98	0.257294	2,951	759	2,571	8,586	2.9
98–99	0.274063	2,191	601	1,891	6,015	2.7
99–100	0.291147	1,591	463	1,359	4,124	2.6
100 and over	1.000000	1,128	1,128	2,765	2,765	2.5

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 9. Life table for black females: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.009674	100,000	967	99,157	7,845,941	78.5
1–2	0.000588	99,033	58	99,003	7,746,784	78.2
2–3	0.000355	98,974	35	98,957	7,647,780	77.3
3–4	0.000214	98,939	21	98,929	7,548,824	76.3
4–5	0.000248	98,918	25	98,906	7,449,895	75.3
5–6	0.000197	98,894	19	98,884	7,350,989	74.3
6–7	0.000171	98,874	17	98,866	7,252,105	73.3
7–8	0.000151	98,857	15	98,850	7,153,239	72.4
8–9	0.000139	98,842	14	98,835	7,054,390	71.4
9–10	0.000133	98,829	13	98,822	6,955,554	70.4
10–11	0.000133	98,815	13	98,809	6,856,732	69.4
11–12	0.000140	98,802	14	98,795	6,757,923	68.4
12–13	0.000154	98,788	15	98,781	6,659,128	67.4
13–14	0.000174	98,773	17	98,765	6,560,347	66.4
14–15	0.000201	98,756	20	98,746	6,461,583	65.4
15–16	0.000231	98,736	23	98,725	6,362,837	64.4
16–17	0.000267	98,713	26	98,700	6,264,112	63.5
17–18	0.000313	98,687	31	98,671	6,165,412	62.5
18–19	0.000372	98,656	37	98,638	6,066,740	61.5
19–20	0.000438	98,619	43	98,598	5,968,103	60.5
20–21	0.000508	98,576	50	98,551	5,869,505	59.5
21–22	0.000576	98,526	57	98,498	5,770,954	58.6
22–23	0.000637	98,469	63	98,438	5,672,456	57.6
23–24	0.000688	98,407	68	98,373	5,574,018	56.6
24–25	0.000731	98,339	72	98,303	5,475,646	55.7
25–26	0.000772	98,267	76	98,229	5,377,343	54.7
26–27	0.000815	98,191	80	98,151	5,279,114	53.8
27–28	0.000859	98,111	84	98,069	5,180,963	52.8
28–29	0.000908	98,027	89	97,982	5,082,893	51.9
29–30	0.000965	97,938	94	97,891	4,984,911	50.9
30–31	0.001030	97,843	101	97,793	4,887,020	49.9
31–32	0.001105	97,743	108	97,689	4,789,227	49.0
32–33	0.001186	97,635	116	97,577	4,691,539	48.1
33–34	0.001269	97,519	124	97,457	4,593,962	47.1
34–35	0.001353	97,395	132	97,329	4,496,505	46.2
35–36	0.001440	97,263	140	97,193	4,399,176	45.2
36–37	0.001536	97,123	149	97,049	4,301,983	44.3
37–38	0.001637	96,974	159	96,895	4,204,934	43.4
38–39	0.001750	96,815	169	96,731	4,108,039	42.4
39–40	0.001880	96,646	182	96,555	4,011,309	41.5
40–41	0.002033	96,464	196	96,366	3,914,754	40.6
41–42	0.002206	96,268	212	96,162	3,818,387	39.7
42–43	0.002383	96,056	229	95,941	3,722,226	38.8
43–44	0.002553	95,827	245	95,704	3,626,284	37.8
44–45	0.002721	95,582	260	95,452	3,530,580	36.9
45–46	0.002895	95,322	276	95,184	3,435,128	36.0
46–47	0.003099	95,046	295	94,899	3,339,944	35.1
47–48	0.003347	94,752	317	94,593	3,245,045	34.2
48–49	0.003655	94,434	345	94,262	3,150,452	33.4
49–50	0.004018	94,089	378	93,900	3,056,190	32.5
50–51	0.004400	93,711	412	93,505	2,962,290	31.6
51–52	0.004802	93,299	448	93,075	2,868,785	30.7
52–53	0.005266	92,851	489	92,606	2,775,710	29.9
53–54	0.005797	92,362	535	92,094	2,683,104	29.0
54–55	0.006375	91,826	585	91,534	2,591,009	28.2
55–56	0.006974	91,241	636	90,923	2,499,476	27.4
56–57	0.007576	90,605	686	90,262	2,408,553	26.6
57–58	0.008184	89,918	736	89,550	2,318,291	25.8
58–59	0.008803	89,182	785	88,790	2,228,741	25.0
59–60	0.009446	88,397	835	87,980	2,139,951	24.2
60–61	0.010126	87,562	887	87,119	2,051,971	23.4

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Table 9. Life table for black females: United States, 2017—Con.

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table09.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.010845	86,676	940	86,206	1,964,852	22.7
62–63	0.011602	85,736	995	85,238	1,878,646	21.9
63–64	0.012397	84,741	1,051	84,216	1,793,408	21.2
64–65	0.013231	83,691	1,107	83,137	1,709,192	20.4
65–66	0.014149	82,583	1,169	81,999	1,626,055	19.7
66–67	0.015137	81,415	1,232	80,799	1,544,056	19.0
67–68	0.016142	80,182	1,294	79,535	1,463,257	18.2
68–69	0.017121	78,888	1,351	78,213	1,383,722	17.5
69–70	0.018187	77,537	1,410	76,832	1,305,509	16.8
70–71	0.019264	76,127	1,467	75,394	1,228,677	16.1
71–72	0.020677	74,661	1,544	73,889	1,153,283	15.4
72–73	0.022638	73,117	1,655	72,289	1,079,394	14.8
73–74	0.024656	71,462	1,762	70,581	1,007,105	14.1
74–75	0.026985	69,700	1,881	68,759	936,524	13.4
75–76	0.029625	67,819	2,009	66,814	867,765	12.8
76–77	0.032101	65,810	2,113	64,754	800,950	12.2
77–78	0.035679	63,697	2,273	62,561	736,197	11.6
78–79	0.039136	61,425	2,404	60,223	673,636	11.0
79–80	0.042432	59,021	2,504	57,769	613,413	10.4
80–81	0.047008	56,516	2,657	55,188	555,644	9.8
81–82	0.051308	53,860	2,763	52,478	500,456	9.3
82–83	0.055972	51,096	2,860	49,666	447,979	8.8
83–84	0.061447	48,236	2,964	46,754	398,312	8.3
84–85	0.067875	45,272	3,073	43,736	351,558	7.8
85–86	0.073825	42,199	3,115	40,642	307,822	7.3
86–87	0.081779	39,084	3,196	37,486	267,180	6.8
87–88	0.090536	35,888	3,249	34,263	229,694	6.4
88–89	0.100072	32,639	3,266	31,006	195,431	6.0
89–90	0.110418	29,372	3,243	27,751	164,426	5.6
90–91	0.121605	26,129	3,177	24,540	136,675	5.2
91–92	0.133654	22,952	3,068	21,418	112,134	4.9
92–93	0.146574	19,884	2,915	18,427	90,716	4.6
93–94	0.160368	16,970	2,721	15,609	72,289	4.3
94–95	0.175024	14,248	2,494	13,001	56,680	4.0
95–96	0.190515	11,754	2,239	10,635	43,679	3.7
96–97	0.206800	9,515	1,968	8,531	33,044	3.5
97–98	0.223822	7,547	1,689	6,703	24,513	3.2
98–99	0.241511	5,858	1,415	5,151	17,810	3.0
99–100	0.259776	4,443	1,154	3,866	12,659	2.8
100 and over	1.000000	3,289	3,289	8,793	8,793	2.7

SOURCE: NCHS, National Vital Statistics System, Mortality.

Table 10. Life table for the Hispanic population: United States, 2017

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table10.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005088	100,000	509	99,549	8,181,661	81.8
1–2	0.000312	99,491	31	99,476	8,082,112	81.2
2–3	0.000186	99,460	18	99,451	7,982,637	80.3
3–4	0.000162	99,442	16	99,434	7,883,186	79.3
4–5	0.000107	99,426	11	99,420	7,783,752	78.3
5–6	0.000114	99,415	11	99,409	7,684,332	77.3
6–7	0.000106	99,404	11	99,398	7,584,922	76.3
7–8	0.000099	99,393	10	99,388	7,485,524	75.3
8–9	0.000090	99,383	9	99,379	7,386,136	74.3
9–10	0.000081	99,374	8	99,370	7,286,757	73.3
10–11	0.000076	99,366	8	99,362	7,187,387	72.3
11–12	0.000080	99,359	8	99,355	7,088,024	71.3
12–13	0.000103	99,351	10	99,346	6,988,670	70.3
13–14	0.000149	99,341	15	99,333	6,889,324	69.4
14–15	0.000213	99,326	21	99,315	6,789,991	68.4
15–16	0.000286	99,305	28	99,290	6,690,676	67.4
16–17	0.000361	99,276	36	99,258	6,591,385	66.4
17–18	0.000435	99,240	43	99,219	6,492,127	65.4
18–19	0.000503	99,197	50	99,172	6,392,908	64.4
19–20	0.000566	99,147	56	99,119	6,293,736	63.5
20–21	0.000629	99,091	62	99,060	6,194,617	62.5
21–22	0.000692	99,029	68	98,995	6,095,557	61.6
22–23	0.000745	98,960	74	98,923	5,996,562	60.6
23–24	0.000788	98,887	78	98,848	5,897,639	59.6
24–25	0.000822	98,809	81	98,768	5,798,791	58.7
25–26	0.000853	98,727	84	98,685	5,700,023	57.7
26–27	0.000882	98,643	87	98,600	5,601,338	56.8
27–28	0.000906	98,556	89	98,511	5,502,738	55.8
28–29	0.000923	98,467	91	98,421	5,404,227	54.9
29–30	0.000936	98,376	92	98,330	5,305,805	53.9
30–31	0.000946	98,284	93	98,237	5,207,475	53.0
31–32	0.000959	98,191	94	98,144	5,109,238	52.0
32–33	0.000979	98,097	96	98,049	5,011,094	51.1
33–34	0.001011	98,001	99	97,951	4,913,045	50.1
34–35	0.001050	97,902	103	97,850	4,815,094	49.2
35–36	0.001097	97,799	107	97,745	4,717,244	48.2
36–37	0.001144	97,692	112	97,636	4,619,499	47.3
37–38	0.001188	97,580	116	97,522	4,521,863	46.3
38–39	0.001227	97,464	120	97,404	4,424,341	45.4
39–40	0.001266	97,344	123	97,283	4,326,937	44.4
40–41	0.001309	97,221	127	97,157	4,229,655	43.5
41–42	0.001367	97,094	133	97,027	4,132,497	42.6
42–43	0.001448	96,961	140	96,891	4,035,470	41.6
43–44	0.001558	96,821	151	96,745	3,938,579	40.7
44–45	0.001694	96,670	164	96,588	3,841,834	39.7
45–46	0.001843	96,506	178	96,417	3,745,247	38.8
46–47	0.002004	96,328	193	96,232	3,648,830	37.9
47–48	0.002192	96,135	211	96,030	3,552,598	37.0
48–49	0.002414	95,924	232	95,808	3,456,569	36.0
49–50	0.002666	95,693	255	95,565	3,360,760	35.1
50–51	0.002947	95,438	281	95,297	3,265,195	34.2
51–52	0.003245	95,156	309	95,002	3,169,898	33.3
52–53	0.003546	94,848	336	94,679	3,074,896	32.4
53–54	0.003839	94,511	363	94,330	2,980,217	31.5
54–55	0.004133	94,148	389	93,954	2,885,887	30.7
55–56	0.004434	93,759	416	93,551	2,791,933	29.8
56–57	0.004767	93,344	445	93,121	2,698,382	28.9
57–58	0.005158	92,899	479	92,659	2,605,261	28.0
58–59	0.005628	92,419	520	92,159	2,512,602	27.2
59–60	0.006172	91,899	567	91,616	2,420,442	26.3
60–61	0.006785	91,332	620	91,022	2,328,827	25.5

See footnotes at end of table.

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Table 10. Life table for the Hispanic population: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.007429	90,712	674	90,376	2,237,804	24.7
62–63	0.008057	90,039	725	89,676	2,147,429	23.9
63–64	0.008628	89,313	771	88,928	2,057,753	23.0
64–65	0.009164	88,543	811	88,137	1,968,825	22.2
65–66	0.009723	87,731	853	87,305	1,880,688	21.4
66–67	0.010364	86,878	900	86,428	1,793,384	20.6
67–68	0.011096	85,978	954	85,501	1,706,956	19.9
68–69	0.011955	85,024	1,016	84,515	1,621,455	19.1
69–70	0.012947	84,007	1,088	83,463	1,536,940	18.3
70–71	0.014059	82,920	1,166	82,337	1,453,476	17.5
71–72	0.015290	81,754	1,250	81,129	1,371,140	16.8
72–73	0.016675	80,504	1,342	79,833	1,290,011	16.0
73–74	0.018233	79,161	1,443	78,440	1,210,178	15.3
74–75	0.019990	77,718	1,554	76,941	1,131,739	14.6
75–76	0.021952	76,164	1,672	75,328	1,054,797	13.8
76–77	0.024206	74,492	1,803	73,591	979,469	13.1
77–78	0.026847	72,689	1,952	71,714	905,878	12.5
78–79	0.029863	70,738	2,112	69,682	834,164	11.8
79–80	0.033182	68,625	2,277	67,487	764,483	11.1
80–81	0.036963	66,348	2,452	65,122	696,996	10.5
81–82	0.041047	63,896	2,623	62,584	631,874	9.9
82–83	0.045819	61,273	2,807	59,869	569,289	9.3
83–84	0.051689	58,466	3,022	56,955	509,420	8.7
84–85	0.057707	55,444	3,199	53,844	452,465	8.2
85–86	0.064217	52,244	3,355	50,567	398,622	7.6
86–87	0.071074	48,889	3,475	47,152	348,055	7.1
87–88	0.080180	45,414	3,641	43,594	300,903	6.6
88–89	0.090255	41,773	3,770	39,888	257,309	6.2
89–90	0.101352	38,003	3,852	36,077	217,421	5.7
90–91	0.113511	34,151	3,877	32,213	181,344	5.3
91–92	0.126761	30,275	3,838	28,356	149,131	4.9
92–93	0.141114	26,437	3,731	24,572	120,776	4.6
93–94	0.156560	22,706	3,555	20,929	96,204	4.2
94–95	0.173066	19,151	3,314	17,494	75,275	3.9
95–96	0.190573	15,837	3,018	14,328	57,781	3.6
96–97	0.208996	12,819	2,679	11,479	43,453	3.4
97–98	0.228221	10,140	2,314	8,983	31,973	3.2
98–99	0.248109	7,826	1,942	6,855	22,991	2.9
99–100	0.268499	5,884	1,580	5,094	16,136	2.7
100 and over	1.000000	4,304	4,304	11,042	11,042	2.6

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

Table 11. Life table for Hispanic males: United States, 2017

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table11.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005387	100,000	539	99,525	7,909,651	79.1
1–2	0.000317	99,461	32	99,445	7,810,126	78.5
2–3	0.000206	99,430	20	99,420	7,710,681	77.5
3–4	0.000193	99,409	19	99,400	7,611,261	76.6
4–5	0.000113	99,390	11	99,384	7,511,862	75.6
5–6	0.000122	99,379	12	99,373	7,412,477	74.6
6–7	0.000111	99,367	11	99,361	7,313,104	73.6
7–8	0.000102	99,356	10	99,351	7,213,743	72.6
8–9	0.000092	99,346	9	99,341	7,114,393	71.6
9–10	0.000082	99,337	8	99,332	7,015,051	70.6
10–11	0.000077	99,328	8	99,325	6,915,719	69.6
11–12	0.000085	99,321	8	99,317	6,816,394	68.6
12–13	0.000118	99,312	12	99,307	6,717,078	67.6
13–14	0.000181	99,301	18	99,292	6,617,771	66.6
14–15	0.000269	99,283	27	99,269	6,518,479	65.7
15–16	0.000369	99,256	37	99,238	6,419,210	64.7
16–17	0.000471	99,219	47	99,196	6,319,972	63.7
17–18	0.000578	99,173	57	99,144	6,220,776	62.7
18–19	0.000684	99,115	68	99,081	6,121,632	61.8
19–20	0.000786	99,048	78	99,009	6,022,551	60.8
20–21	0.000888	98,970	88	98,926	5,923,542	59.9
21–22	0.000987	98,882	98	98,833	5,824,616	58.9
22–23	0.001074	98,784	106	98,731	5,725,783	58.0
23–24	0.001145	98,678	113	98,622	5,627,052	57.0
24–25	0.001201	98,565	118	98,506	5,528,431	56.1
25–26	0.001254	98,447	123	98,385	5,429,925	55.2
26–27	0.001303	98,323	128	98,259	5,331,540	54.2
27–28	0.001334	98,195	131	98,130	5,233,281	53.3
28–29	0.001347	98,064	132	97,998	5,135,151	52.4
29–30	0.001346	97,932	132	97,866	5,037,153	51.4
30–31	0.001336	97,800	131	97,735	4,939,287	50.5
31–32	0.001331	97,670	130	97,605	4,841,552	49.6
32–33	0.001344	97,540	131	97,474	4,743,948	48.6
33–34	0.001384	97,408	135	97,341	4,646,474	47.7
34–35	0.001444	97,274	140	97,203	4,549,133	46.8
35–36	0.001515	97,133	147	97,060	4,451,929	45.8
36–37	0.001584	96,986	154	96,909	4,354,870	44.9
37–38	0.001646	96,833	159	96,753	4,257,960	44.0
38–39	0.001697	96,673	164	96,591	4,161,207	43.0
39–40	0.001744	96,509	168	96,425	4,064,616	42.1
40–41	0.001798	96,341	173	96,254	3,968,191	41.2
41–42	0.001871	96,168	180	96,078	3,871,937	40.3
42–43	0.001964	95,988	189	95,893	3,775,859	39.3
43–44	0.002081	95,799	199	95,699	3,679,966	38.4
44–45	0.002222	95,600	212	95,494	3,584,267	37.5
45–46	0.002373	95,387	226	95,274	3,488,773	36.6
46–47	0.002543	95,161	242	95,040	3,393,499	35.7
47–48	0.002763	94,919	262	94,788	3,298,459	34.8
48–49	0.003049	94,657	289	94,512	3,203,671	33.8
49–50	0.003393	94,368	320	94,208	3,109,159	32.9
50–51	0.003780	94,048	356	93,870	3,014,951	32.1
51–52	0.004184	93,692	392	93,496	2,921,081	31.2
52–53	0.004590	93,300	428	93,086	2,827,584	30.3
53–54	0.004979	92,872	462	92,641	2,734,498	29.4
54–55	0.005364	92,410	496	92,162	2,641,857	28.6
55–56	0.005761	91,914	530	91,649	2,549,695	27.7
56–57	0.006203	91,384	567	91,101	2,458,046	26.9
57–58	0.006711	90,818	609	90,513	2,366,945	26.1
58–59	0.007311	90,208	660	89,878	2,276,432	25.2
59–60	0.007999	89,549	716	89,190	2,186,554	24.4
60–61	0.008775	88,832	779	88,443	2,097,363	23.6

See footnotes at end of table.

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Table 11. Life table for Hispanic males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.009595	88,053	845	87,630	2,008,921	22.8
62–63	0.010403	87,208	907	86,754	1,921,290	22.0
63–64	0.011144	86,301	962	85,820	1,834,536	21.3
64–65	0.011838	85,339	1,010	84,834	1,748,716	20.5
65–66	0.012554	84,329	1,059	83,800	1,663,882	19.7
66–67	0.013367	83,270	1,113	82,714	1,580,082	19.0
67–68	0.014291	82,157	1,174	81,570	1,497,369	18.2
68–69	0.015373	80,983	1,245	80,361	1,415,799	17.5
69–70	0.016623	79,738	1,325	79,075	1,335,438	16.7
70–71	0.018020	78,413	1,413	77,706	1,256,363	16.0
71–72	0.019554	77,000	1,506	76,247	1,178,657	15.3
72–73	0.021258	75,494	1,605	74,692	1,102,410	14.6
73–74	0.023142	73,889	1,710	73,034	1,027,719	13.9
74–75	0.025233	72,179	1,821	71,268	954,685	13.2
75–76	0.027550	70,358	1,938	69,389	883,416	12.6
76–77	0.030165	68,419	2,064	67,388	814,027	11.9
77–78	0.033304	66,356	2,210	65,251	746,640	11.3
78–79	0.036803	64,146	2,361	62,965	681,389	10.6
79–80	0.040844	61,785	2,524	60,523	618,424	10.0
80–81	0.045361	59,261	2,688	57,917	557,901	9.4
81–82	0.050408	56,573	2,852	55,147	499,983	8.8
82–83	0.056135	53,722	3,016	52,214	444,836	8.3
83–84	0.062884	50,706	3,189	49,112	392,622	7.7
84–85	0.070055	47,517	3,329	45,853	343,510	7.2
85–86	0.078199	44,188	3,456	42,461	297,658	6.7
86–87	0.086479	40,733	3,523	38,972	255,197	6.3
87–88	0.097531	37,210	3,629	35,396	216,225	5.8
88–89	0.109702	33,581	3,684	31,739	180,829	5.4
89–90	0.123030	29,897	3,678	28,058	149,090	5.0
90–91	0.137538	26,219	3,606	24,416	121,032	4.6
91–92	0.153223	22,613	3,465	20,881	96,616	4.3
92–93	0.170062	19,148	3,256	17,520	75,735	4.0
93–94	0.187999	15,892	2,988	14,398	58,215	3.7
94–95	0.206950	12,904	2,671	11,569	43,817	3.4
95–96	0.226800	10,234	2,321	9,073	32,248	3.2
96–97	0.247404	7,913	1,958	6,934	23,175	2.9
97–98	0.268590	5,955	1,599	5,155	16,241	2.7
98–99	0.290167	4,356	1,264	3,724	11,086	2.5
99–100	0.311925	3,092	964	2,610	7,362	2.4
100 and over	1.000000	2,127	2,127	4,753	4,753	2.2

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

Table 12. Life table for Hispanic females: United States, 2017

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table12.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.004774	100,000	477	99,575	8,430,736	84.3
1–2	0.000302	99,523	30	99,508	8,331,161	83.7
2–3	0.000161	99,493	16	99,485	8,231,654	82.7
3–4	0.000126	99,477	13	99,470	8,132,169	81.7
4–5	0.000099	99,464	10	99,459	8,032,699	80.8
5–6	0.000103	99,454	10	99,449	7,933,240	79.8
6–7	0.000099	99,444	10	99,439	7,833,791	78.8
7–8	0.000094	99,434	9	99,429	7,734,352	77.8
8–9	0.000087	99,425	9	99,420	7,634,923	76.8
9–10	0.000079	99,416	8	99,412	7,535,502	75.8
10–11	0.000072	99,408	7	99,405	7,436,090	74.8
11–12	0.000071	99,401	7	99,397	7,336,686	73.8
12–13	0.000083	99,394	8	99,390	7,237,288	72.8
13–14	0.000112	99,386	11	99,380	7,137,898	71.8
14–15	0.000154	99,374	15	99,367	7,038,518	70.8
15–16	0.000203	99,359	20	99,349	6,939,152	69.8
16–17	0.000250	99,339	25	99,327	6,839,802	68.9
17–18	0.000289	99,314	29	99,300	6,740,476	67.9
18–19	0.000317	99,285	31	99,270	6,641,176	66.9
19–20	0.000334	99,254	33	99,237	6,541,906	65.9
20–21	0.000350	99,221	35	99,204	6,442,669	64.9
21–22	0.000368	99,186	37	99,168	6,343,465	64.0
22–23	0.000384	99,150	38	99,131	6,244,297	63.0
23–24	0.000395	99,112	39	99,092	6,145,167	62.0
24–25	0.000405	99,072	40	99,052	6,046,075	61.0
25–26	0.000413	99,032	41	99,012	5,947,023	60.1
26–27	0.000422	98,991	42	98,970	5,848,011	59.1
27–28	0.000436	98,950	43	98,928	5,749,040	58.1
28–29	0.000456	98,906	45	98,884	5,650,112	57.1
29–30	0.000483	98,861	48	98,837	5,551,229	56.2
30–31	0.000514	98,814	51	98,788	5,452,391	55.2
31–32	0.000545	98,763	54	98,736	5,353,603	54.2
32–33	0.000574	98,709	57	98,681	5,254,867	53.2
33–34	0.000599	98,652	59	98,623	5,156,187	52.3
34–35	0.000621	98,593	61	98,563	5,057,564	51.3
35–36	0.000647	98,532	64	98,500	4,959,001	50.3
36–37	0.000677	98,468	67	98,435	4,860,501	49.4
37–38	0.000707	98,402	70	98,367	4,762,066	48.4
38–39	0.000737	98,332	73	98,296	4,663,699	47.4
39–40	0.000771	98,259	76	98,222	4,565,403	46.5
40–41	0.000806	98,184	79	98,144	4,467,182	45.5
41–42	0.000852	98,105	84	98,063	4,369,038	44.5
42–43	0.000923	98,021	90	97,976	4,270,975	43.6
43–44	0.001025	97,931	100	97,880	4,172,999	42.6
44–45	0.001154	97,830	113	97,774	4,075,119	41.7
45–46	0.001299	97,717	127	97,654	3,977,345	40.7
46–47	0.001449	97,590	141	97,520	3,879,691	39.8
47–48	0.001602	97,449	156	97,371	3,782,172	38.8
48–49	0.001757	97,293	171	97,207	3,684,801	37.9
49–50	0.001915	97,122	186	97,029	3,587,594	36.9
50–51	0.002089	96,936	202	96,835	3,490,565	36.0
51–52	0.002279	96,733	220	96,623	3,393,730	35.1
52–53	0.002477	96,513	239	96,393	3,297,107	34.2
53–54	0.002681	96,274	258	96,145	3,200,714	33.2
54–55	0.002894	96,016	278	95,877	3,104,569	32.3
55–56	0.003113	95,738	298	95,589	3,008,692	31.4
56–57	0.003355	95,440	320	95,280	2,913,103	30.5
57–58	0.003648	95,120	347	94,946	2,817,824	29.6
58–59	0.004011	94,773	380	94,583	2,722,877	28.7
59–60	0.004436	94,393	419	94,183	2,628,295	27.8
60–61	0.004920	93,974	462	93,743	2,534,111	27.0

See footnotes at end of table.

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Table 12. Life table for Hispanic females: United States, 2017—Con.

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table12.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.005425	93,512	507	93,258	2,440,369	26.1
62–63	0.005918	93,004	550	92,729	2,347,111	25.2
63–64	0.006368	92,454	589	92,159	2,254,382	24.4
64–65	0.006795	91,865	624	91,553	2,162,222	23.5
65–66	0.007248	91,241	661	90,910	2,070,669	22.7
66–67	0.007776	90,580	704	90,227	1,979,759	21.9
67–68	0.008380	89,875	753	89,499	1,889,532	21.0
68–69	0.009085	89,122	810	88,717	1,800,033	20.2
69–70	0.009898	88,312	874	87,875	1,711,316	19.4
70–71	0.010815	87,438	946	86,965	1,623,440	18.6
71–72	0.011844	86,493	1,024	85,980	1,536,475	17.8
72–73	0.013022	85,468	1,113	84,912	1,450,494	17.0
73–74	0.014375	84,355	1,213	83,749	1,365,583	16.2
74–75	0.015930	83,143	1,324	82,480	1,281,834	15.4
75–76	0.017681	81,818	1,447	81,095	1,199,354	14.7
76–77	0.019721	80,371	1,585	79,579	1,118,259	13.9
77–78	0.022072	78,787	1,739	77,917	1,038,680	13.2
78–79	0.024839	77,048	1,914	76,091	960,763	12.5
79–80	0.027773	75,134	2,087	74,090	884,672	11.8
80–81	0.031224	73,047	2,281	71,907	810,582	11.1
81–82	0.034877	70,766	2,468	69,532	738,675	10.4
82–83	0.039288	68,298	2,683	66,956	669,143	9.8
83–84	0.044922	65,615	2,948	64,141	602,186	9.2
84–85	0.050596	62,667	3,171	61,082	538,045	8.6
85–86	0.056531	59,497	3,363	57,815	476,963	8.0
86–87	0.062902	56,133	3,531	54,368	419,148	7.5
87–88	0.071652	52,602	3,769	50,718	364,781	6.9
88–89	0.081436	48,833	3,977	46,845	314,063	6.4
89–90	0.092327	44,856	4,141	42,786	267,218	6.0
90–91	0.104388	40,715	4,250	38,590	224,433	5.5
91–92	0.117666	36,465	4,291	34,319	185,843	5.1
92–93	0.132193	32,174	4,253	30,048	151,523	4.7
93–94	0.147978	27,921	4,132	25,855	121,476	4.4
94–95	0.165001	23,789	3,925	21,827	95,620	4.0
95–96	0.183214	19,864	3,639	18,044	73,794	3.7
96–97	0.202533	16,225	3,286	14,582	55,749	3.4
97–98	0.222840	12,939	2,883	11,497	41,168	3.2
98–99	0.243984	10,055	2,453	8,829	29,671	3.0
99–100	0.265783	7,602	2,020	6,592	20,842	2.7
100 and over	1.000000	5,582	5,582	14,250	14,250	2.6

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 13. Life table for the non-Hispanic white population: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.004671	100,000	467	99,590	7,851,964	78.5
1–2	0.000344	99,533	34	99,516	7,752,373	77.9
2–3	0.000239	99,499	24	99,487	7,652,858	76.9
3–4	0.000173	99,475	17	99,466	7,553,371	75.9
4–5	0.000137	99,458	14	99,451	7,453,904	74.9
5–6	0.000129	99,444	13	99,438	7,354,453	74.0
6–7	0.000114	99,431	11	99,426	7,255,016	73.0
7–8	0.000102	99,420	10	99,415	7,155,590	72.0
8–9	0.000093	99,410	9	99,405	7,056,175	71.0
9–10	0.000088	99,401	9	99,396	6,956,770	70.0
10–11	0.000089	99,392	9	99,387	6,857,374	69.0
11–12	0.000101	99,383	10	99,378	6,757,986	68.0
12–13	0.000130	99,373	13	99,367	6,658,608	67.0
13–14	0.000178	99,360	18	99,351	6,559,242	66.0
14–15	0.000242	99,342	24	99,330	6,459,890	65.0
15–16	0.000312	99,318	31	99,303	6,360,560	64.0
16–17	0.000387	99,287	38	99,268	6,261,257	63.1
17–18	0.000470	99,249	47	99,226	6,161,989	62.1
18–19	0.000564	99,202	56	99,174	6,062,764	61.1
19–20	0.000663	99,146	66	99,113	5,963,590	60.1
20–21	0.000766	99,080	76	99,043	5,864,476	59.2
21–22	0.000867	99,005	86	98,962	5,765,434	58.2
22–23	0.000959	98,919	95	98,871	5,666,472	57.3
23–24	0.001036	98,824	102	98,773	5,567,601	56.3
24–25	0.001101	98,722	109	98,667	5,468,828	55.4
25–26	0.001160	98,613	114	98,556	5,370,161	54.5
26–27	0.001220	98,499	120	98,438	5,271,605	53.5
27–28	0.001279	98,378	126	98,315	5,173,166	52.6
28–29	0.001340	98,253	132	98,187	5,074,851	51.7
29–30	0.001406	98,121	138	98,052	4,976,664	50.7
30–31	0.001474	97,983	144	97,911	4,878,612	49.8
31–32	0.001542	97,839	151	97,763	4,780,702	48.9
32–33	0.001604	97,688	157	97,609	4,682,939	47.9
33–34	0.001657	97,531	162	97,450	4,585,329	47.0
34–35	0.001702	97,369	166	97,286	4,487,879	46.1
35–36	0.001754	97,204	170	97,118	4,390,593	45.2
36–37	0.001812	97,033	176	96,945	4,293,474	44.2
37–38	0.001870	96,857	181	96,767	4,196,529	43.3
38–39	0.001927	96,676	186	96,583	4,099,762	42.4
39–40	0.001992	96,490	192	96,394	4,003,179	41.5
40–41	0.002076	96,298	200	96,198	3,906,786	40.6
41–42	0.002185	96,098	210	95,993	3,810,588	39.7
42–43	0.002315	95,888	222	95,777	3,714,595	38.7
43–44	0.002458	95,666	235	95,548	3,618,818	37.8
44–45	0.002613	95,431	249	95,306	3,523,270	36.9
45–46	0.002780	95,181	265	95,049	3,427,964	36.0
46–47	0.002969	94,917	282	94,776	3,332,915	35.1
47–48	0.003194	94,635	302	94,484	3,238,140	34.2
48–49	0.003467	94,333	327	94,169	3,143,656	33.3
49–50	0.003788	94,006	356	93,828	3,049,487	32.4
50–51	0.004129	93,649	387	93,456	2,955,659	31.6
51–52	0.004492	93,263	419	93,053	2,862,203	30.7
52–53	0.004908	92,844	456	92,616	2,769,150	29.8
53–54	0.005373	92,388	496	92,140	2,676,534	29.0
54–55	0.005864	91,892	539	91,622	2,584,394	28.1
55–56	0.006363	91,353	581	91,062	2,492,772	27.3
56–57	0.006859	90,772	623	90,460	2,401,709	26.5
57–58	0.007361	90,149	664	89,817	2,311,249	25.6
58–59	0.007881	89,485	705	89,133	2,221,432	24.8
59–60	0.008434	88,780	749	88,406	2,132,299	24.0
60–61	0.009037	88,032	796	87,634	2,043,893	23.2

See footnotes at end of table.

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Table 13. Life table for the non-Hispanic white population: United States, 2017—Con.

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table13.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.009682	87,236	845	86,814	1,956,259	22.4
62–63	0.010352	86,391	894	85,944	1,869,445	21.6
63–64	0.011039	85,497	944	85,025	1,783,501	20.9
64–65	0.011757	84,553	994	84,056	1,698,476	20.1
65–66	0.012517	83,559	1,046	83,036	1,614,420	19.3
66–67	0.013406	82,513	1,106	81,960	1,531,384	18.6
67–68	0.014422	81,407	1,174	80,820	1,449,423	17.8
68–69	0.015627	80,233	1,254	79,606	1,368,603	17.1
69–70	0.017055	78,979	1,347	78,306	1,288,997	16.3
70–71	0.018465	77,632	1,433	76,915	1,210,692	15.6
71–72	0.020450	76,199	1,558	75,420	1,133,776	14.9
72–73	0.022267	74,640	1,662	73,809	1,058,357	14.2
73–74	0.024381	72,978	1,779	72,089	984,547	13.5
74–75	0.026555	71,199	1,891	70,254	912,458	12.8
75–76	0.029340	69,308	2,034	68,292	842,204	12.2
76–77	0.032400	67,275	2,180	66,185	773,913	11.5
77–78	0.035929	65,095	2,339	63,926	707,728	10.9
78–79	0.039801	62,756	2,498	61,508	643,802	10.3
79–80	0.043997	60,259	2,651	58,933	582,294	9.7
80–81	0.048869	57,607	2,815	56,200	523,361	9.1
81–82	0.054019	54,792	2,960	53,312	467,161	8.5
82–83	0.060143	51,832	3,117	50,274	413,849	8.0
83–84	0.067643	48,715	3,295	47,067	363,575	7.5
84–85	0.075294	45,420	3,420	43,710	316,508	7.0
85–86	0.083530	42,000	3,508	40,246	272,798	6.5
86–87	0.092160	38,492	3,547	36,718	232,552	6.0
87–88	0.103553	34,944	3,619	33,135	195,834	5.6
88–89	0.116069	31,326	3,636	29,508	162,699	5.2
89–90	0.129750	27,690	3,593	25,893	133,191	4.8
90–91	0.144619	24,097	3,485	22,355	107,298	4.5
91–92	0.160683	20,612	3,312	18,956	84,943	4.1
92–93	0.177923	17,300	3,078	15,761	65,987	3.8
93–94	0.196295	14,222	2,792	12,826	50,226	3.5
94–95	0.215726	11,430	2,466	10,197	37,400	3.3
95–96	0.236116	8,964	2,117	7,906	27,203	3.0
96–97	0.257333	6,848	1,762	5,967	19,297	2.8
97–98	0.279220	5,086	1,420	4,376	13,330	2.6
98–99	0.301597	3,666	1,106	3,113	8,954	2.4
99–100	0.324266	2,560	830	2,145	5,841	2.3
100 and over	1.000000	1,730	1,730	3,696	3,696	2.1

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 14. Life table for non-Hispanic white males: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005168	100,000	517	99,547	7,608,533	76.1
1–2	0.000436	99,483	43	99,462	7,508,986	75.5
2–3	0.000319	99,440	32	99,424	7,409,524	74.5
3–4	0.000204	99,408	20	99,398	7,310,100	73.5
4–5	0.000165	99,388	16	99,380	7,210,702	72.6
5–6	0.000157	99,371	16	99,364	7,111,322	71.6
6–7	0.000135	99,356	13	99,349	7,011,959	70.6
7–8	0.000120	99,342	12	99,336	6,912,610	69.6
8–9	0.000108	99,331	11	99,325	6,813,273	68.6
9–10	0.000102	99,320	10	99,315	6,713,948	67.6
10–11	0.000105	99,310	10	99,304	6,614,633	66.6
11–12	0.000124	99,299	12	99,293	6,515,329	65.6
12–13	0.000165	99,287	16	99,279	6,416,036	64.6
13–14	0.000231	99,271	23	99,259	6,316,757	63.6
14–15	0.000319	99,248	32	99,232	6,217,498	62.6
15–16	0.000415	99,216	41	99,195	6,118,266	61.7
16–17	0.000517	99,175	51	99,149	6,019,071	60.7
17–18	0.000637	99,123	63	99,092	5,919,922	59.7
18–19	0.000774	99,060	77	99,022	5,820,830	58.8
19–20	0.000922	98,984	91	98,938	5,721,808	57.8
20–21	0.001076	98,892	106	98,839	5,622,870	56.9
21–22	0.001224	98,786	121	98,726	5,524,031	55.9
22–23	0.001356	98,665	134	98,598	5,425,305	55.0
23–24	0.001464	98,531	144	98,459	5,326,707	54.1
24–25	0.001554	98,387	153	98,311	5,228,248	53.1
25–26	0.001636	98,234	161	98,154	5,129,937	52.2
26–27	0.001715	98,073	168	97,989	5,031,784	51.3
27–28	0.001790	97,905	175	97,818	4,933,794	50.4
28–29	0.001861	97,730	182	97,639	4,835,977	49.5
29–30	0.001932	97,548	188	97,454	4,738,337	48.6
30–31	0.002004	97,360	195	97,262	4,640,884	47.7
31–32	0.002075	97,164	202	97,064	4,543,622	46.8
32–33	0.002139	96,963	207	96,859	4,446,558	45.9
33–34	0.002192	96,755	212	96,649	4,349,699	45.0
34–35	0.002239	96,543	216	96,435	4,253,049	44.1
35–36	0.002292	96,327	221	96,217	4,156,614	43.2
36–37	0.002353	96,106	226	95,993	4,060,397	42.2
37–38	0.002410	95,880	231	95,765	3,964,404	41.3
38–39	0.002464	95,649	236	95,531	3,868,639	40.4
39–40	0.002525	95,414	241	95,293	3,773,108	39.5
40–41	0.002607	95,173	248	95,049	3,677,815	38.6
41–42	0.002721	94,924	258	94,795	3,582,766	37.7
42–43	0.002862	94,666	271	94,531	3,487,971	36.8
43–44	0.003024	94,395	285	94,252	3,393,440	35.9
44–45	0.003204	94,110	302	93,959	3,299,188	35.1
45–46	0.003400	93,808	319	93,649	3,205,229	34.2
46–47	0.003625	93,489	339	93,320	3,111,580	33.3
47–48	0.003896	93,150	363	92,969	3,018,260	32.4
48–49	0.004229	92,788	392	92,591	2,925,291	31.5
49–50	0.004624	92,395	427	92,182	2,832,700	30.7
50–51	0.005046	91,968	464	91,736	2,740,518	29.8
51–52	0.005497	91,504	503	91,252	2,648,782	28.9
52–53	0.006017	91,001	548	90,727	2,557,530	28.1
53–54	0.006601	90,453	597	90,155	2,466,803	27.3
54–55	0.007220	89,856	649	89,532	2,376,648	26.4
55–56	0.007844	89,207	700	88,857	2,287,117	25.6
56–57	0.008465	88,508	749	88,133	2,198,259	24.8
57–58	0.009105	87,758	799	87,359	2,110,126	24.0
58–59	0.009785	86,959	851	86,534	2,022,767	23.3
59–60	0.010517	86,108	906	85,656	1,936,233	22.5
60–61	0.011317	85,203	964	84,721	1,850,578	21.7

See footnotes at end of table.

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Table 14. Life table for non-Hispanic white males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.012157	84,239	1,024	83,727	1,765,857	21.0
62–63	0.013005	83,215	1,082	82,673	1,682,130	20.2
63–64	0.013837	82,132	1,136	81,564	1,599,457	19.5
64–65	0.014674	80,996	1,189	80,402	1,517,893	18.7
65–66	0.015549	79,807	1,241	79,187	1,437,491	18.0
66–67	0.016597	78,566	1,304	77,914	1,358,304	17.3
67–68	0.017770	77,262	1,373	76,576	1,280,390	16.6
68–69	0.019113	75,890	1,450	75,164	1,203,814	15.9
69–70	0.020735	74,439	1,544	73,667	1,128,650	15.2
70–71	0.022262	72,896	1,623	72,084	1,054,982	14.5
71–72	0.024516	71,273	1,747	70,399	982,898	13.8
72–73	0.026511	69,525	1,843	68,604	912,499	13.1
73–74	0.028989	67,682	1,962	66,701	843,895	12.5
74–75	0.031512	65,720	2,071	64,685	777,194	11.8
75–76	0.034727	63,649	2,210	62,544	712,510	11.2
76–77	0.038315	61,439	2,354	60,262	649,966	10.6
77–78	0.042619	59,085	2,518	57,826	589,704	10.0
78–79	0.046908	56,567	2,653	55,240	531,878	9.4
79–80	0.051904	53,913	2,798	52,514	476,638	8.8
80–81	0.057383	51,115	2,933	49,648	424,124	8.3
81–82	0.063313	48,182	3,051	46,657	374,476	7.8
82–83	0.070328	45,131	3,174	43,544	327,819	7.3
83–84	0.078560	41,957	3,296	40,309	284,275	6.8
84–85	0.087267	38,661	3,374	36,974	243,966	6.3
85–86	0.097106	35,287	3,427	33,574	206,992	5.9
86–87	0.107057	31,861	3,411	30,155	173,418	5.4
87–88	0.120262	28,450	3,421	26,739	143,263	5.0
88–89	0.134704	25,028	3,371	23,343	116,524	4.7
89–90	0.150403	21,657	3,257	20,028	93,181	4.3
90–91	0.167356	18,400	3,079	16,860	73,153	4.0
91–92	0.185533	15,320	2,842	13,899	56,293	3.7
92–93	0.204874	12,478	2,556	11,200	42,394	3.4
93–94	0.225287	9,922	2,235	8,804	31,194	3.1
94–95	0.246647	7,686	1,896	6,738	22,390	2.9
95–96	0.268800	5,791	1,556	5,012	15,652	2.7
96–97	0.291561	4,234	1,234	3,617	10,640	2.5
97–98	0.314725	3,000	944	2,528	7,023	2.3
98–99	0.338071	2,056	695	1,708	4,495	2.2
99–100	0.361370	1,361	492	1,115	2,787	2.0
100 and over	1.000000	869	869	1,672	1,672	1.9

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 15. Life table for non-Hispanic white females: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.004148	100,000	415	99,636	8,098,114	81.0
1–2	0.000250	99,585	25	99,573	7,998,478	80.3
2–3	0.000160	99,560	16	99,552	7,898,906	79.3
3–4	0.000138	99,544	14	99,538	7,799,353	78.4
4–5	0.000107	99,531	11	99,525	7,699,816	77.4
5–6	0.000099	99,520	10	99,515	7,600,290	76.4
6–7	0.000089	99,510	9	99,506	7,500,775	75.4
7–8	0.000082	99,501	8	99,497	7,401,269	74.4
8–9	0.000076	99,493	8	99,489	7,301,772	73.4
9–10	0.000073	99,486	7	99,482	7,202,283	72.4
10–11	0.000073	99,478	7	99,475	7,102,801	71.4
11–12	0.000079	99,471	8	99,467	7,003,326	70.4
12–13	0.000096	99,463	10	99,458	6,903,859	69.4
13–14	0.000124	99,454	12	99,447	6,804,401	68.4
14–15	0.000162	99,441	16	99,433	6,704,953	67.4
15–16	0.000205	99,425	20	99,415	6,605,520	66.4
16–17	0.000249	99,405	25	99,392	6,506,105	65.5
17–18	0.000295	99,380	29	99,365	6,406,713	64.5
18–19	0.000342	99,351	34	99,334	6,307,347	63.5
19–20	0.000389	99,317	39	99,297	6,208,014	62.5
20–21	0.000438	99,278	43	99,256	6,108,716	61.5
21–22	0.000489	99,235	48	99,210	6,009,460	60.6
22–23	0.000538	99,186	53	99,160	5,910,249	59.6
23–24	0.000583	99,133	58	99,104	5,811,090	58.6
24–25	0.000625	99,075	62	99,044	5,711,986	57.7
25–26	0.000664	99,013	66	98,980	5,612,941	56.7
26–27	0.000705	98,947	70	98,913	5,513,961	55.7
27–28	0.000750	98,878	74	98,841	5,415,048	54.8
28–29	0.000803	98,804	79	98,764	5,316,208	53.8
29–30	0.000863	98,724	85	98,682	5,217,444	52.8
30–31	0.000930	98,639	92	98,593	5,118,762	51.9
31–32	0.000996	98,547	98	98,498	5,020,169	50.9
32–33	0.001058	98,449	104	98,397	4,921,671	50.0
33–34	0.001110	98,345	109	98,290	4,823,274	49.0
34–35	0.001156	98,236	114	98,179	4,724,983	48.1
35–36	0.001206	98,122	118	98,063	4,626,804	47.2
36–37	0.001264	98,004	124	97,942	4,528,741	46.2
37–38	0.001323	97,880	129	97,815	4,430,799	45.3
38–39	0.001384	97,751	135	97,683	4,332,984	44.3
39–40	0.001453	97,615	142	97,544	4,235,301	43.4
40–41	0.001538	97,473	150	97,398	4,137,757	42.5
41–42	0.001643	97,324	160	97,244	4,040,358	41.5
42–43	0.001762	97,164	171	97,078	3,943,115	40.6
43–44	0.001887	96,992	183	96,901	3,846,036	39.7
44–45	0.002018	96,809	195	96,712	3,749,135	38.7
45–46	0.002155	96,614	208	96,510	3,652,424	37.8
46–47	0.002309	96,406	223	96,295	3,555,914	36.9
47–48	0.002488	96,183	239	96,064	3,459,619	36.0
48–49	0.002704	95,944	259	95,814	3,363,555	35.1
49–50	0.002955	95,685	283	95,543	3,267,741	34.2
50–51	0.003219	95,402	307	95,248	3,172,198	33.3
51–52	0.003498	95,095	333	94,929	3,076,950	32.4
52–53	0.003815	94,762	362	94,581	2,982,021	31.5
53–54	0.004167	94,401	393	94,204	2,887,440	30.6
54–55	0.004538	94,007	427	93,794	2,793,236	29.7
55–56	0.004919	93,581	460	93,351	2,699,442	28.8
56–57	0.005298	93,120	493	92,874	2,606,091	28.0
57–58	0.005671	92,627	525	92,364	2,513,217	27.1
58–59	0.006045	92,102	557	91,823	2,420,853	26.3
59–60	0.006436	91,545	589	91,250	2,329,030	25.4
60–61	0.006864	90,956	624	90,644	2,237,779	24.6

See footnotes at end of table.

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Table 15. Life table for non-Hispanic white females: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.007336	90,331	663	90,000	2,147,136	23.8
62–63	0.007851	89,669	704	89,317	2,057,135	22.9
63–64	0.008413	88,965	748	88,591	1,967,819	22.1
64–65	0.009031	88,216	797	87,818	1,879,228	21.3
65–66	0.009695	87,420	848	86,996	1,791,410	20.5
66–67	0.010459	86,572	905	86,119	1,704,414	19.7
67–68	0.011350	85,667	972	85,180	1,618,295	18.9
68–69	0.012450	84,694	1,054	84,167	1,533,114	18.1
69–70	0.013722	83,640	1,148	83,066	1,448,947	17.3
70–71	0.015033	82,492	1,240	81,872	1,365,881	16.6
71–72	0.016793	81,252	1,364	80,570	1,284,009	15.8
72–73	0.018476	79,888	1,476	79,150	1,203,439	15.1
73–74	0.020306	78,412	1,592	77,616	1,124,290	14.3
74–75	0.022219	76,819	1,707	75,966	1,046,674	13.6
75–76	0.024696	75,113	1,855	74,185	970,708	12.9
76–77	0.027380	73,258	2,006	72,255	896,523	12.2
77–78	0.030353	71,252	2,163	70,170	824,268	11.6
78–79	0.033969	69,089	2,347	67,916	754,098	10.9
79–80	0.037628	66,742	2,511	65,486	686,182	10.3
80–81	0.042146	64,231	2,707	62,877	620,696	9.7
81–82	0.046826	61,524	2,881	60,083	557,819	9.1
82–83	0.052476	58,643	3,077	57,104	497,735	8.5
83–84	0.059639	55,565	3,314	53,909	440,631	7.9
84–85	0.066801	52,252	3,490	50,506	386,723	7.4
85–86	0.074238	48,761	3,620	46,951	336,216	6.9
86–87	0.082165	45,141	3,709	43,287	289,265	6.4
87–88	0.092963	41,432	3,852	39,506	245,979	5.9
88–89	0.104924	37,581	3,943	35,609	206,472	5.5
89–90	0.118108	33,637	3,973	31,651	170,863	5.1
90–91	0.132557	29,665	3,932	27,698	139,212	4.7
91–92	0.148296	25,732	3,816	23,824	111,514	4.3
92–93	0.165326	21,916	3,623	20,105	87,690	4.0
93–94	0.183618	18,293	3,359	16,613	67,585	3.7
94–95	0.203115	14,934	3,033	13,417	50,972	3.4
95–96	0.223722	11,901	2,662	10,569	37,554	3.2
96–97	0.245314	9,238	2,266	8,105	26,985	2.9
97–98	0.267731	6,972	1,867	6,039	18,880	2.7
98–99	0.290782	5,105	1,485	4,363	12,841	2.5
99–100	0.314254	3,621	1,138	3,052	8,478	2.3
100 and over	1.000000	2,483	2,483	5,426	5,426	2.2

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 16. Life table for the non-Hispanic black population: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.010888	100,000	1,089	99,056	7,488,072	74.9
1–2	0.000661	98,911	65	98,878	7,389,016	74.7
2–3	0.000413	98,846	41	98,825	7,290,138	73.8
3–4	0.000312	98,805	31	98,790	7,191,312	72.8
4–5	0.000266	98,774	26	98,761	7,092,523	71.8
5–6	0.000234	98,748	23	98,736	6,993,761	70.8
6–7	0.000208	98,725	21	98,715	6,895,025	69.8
7–8	0.000188	98,704	19	98,695	6,796,310	68.9
8–9	0.000168	98,686	17	98,678	6,697,615	67.9
9–10	0.000150	98,669	15	98,662	6,598,938	66.9
10–11	0.000141	98,654	14	98,647	6,500,276	65.9
11–12	0.000154	98,641	15	98,633	6,401,628	64.9
12–13	0.000201	98,625	20	98,615	6,302,996	63.9
13–14	0.000291	98,605	29	98,591	6,204,380	62.9
14–15	0.000413	98,577	41	98,556	6,105,789	61.9
15–16	0.000544	98,536	54	98,509	6,007,233	61.0
16–17	0.000675	98,483	67	98,449	5,908,723	60.0
17–18	0.000814	98,416	80	98,376	5,810,274	59.0
18–19	0.000955	98,336	94	98,289	5,711,898	58.1
19–20	0.001095	98,242	108	98,188	5,613,609	57.1
20–21	0.001236	98,134	121	98,074	5,515,421	56.2
21–22	0.001369	98,013	134	97,946	5,417,347	55.3
22–23	0.001474	97,879	144	97,807	5,319,401	54.3
23–24	0.001541	97,735	151	97,659	5,221,594	53.4
24–25	0.001580	97,584	154	97,507	5,123,934	52.5
25–26	0.001611	97,430	157	97,351	5,026,427	51.6
26–27	0.001646	97,273	160	97,193	4,929,076	50.7
27–28	0.001682	97,113	163	97,031	4,831,883	49.8
28–29	0.001726	96,949	167	96,866	4,734,852	48.8
29–30	0.001781	96,782	172	96,696	4,637,986	47.9
30–31	0.001841	96,610	178	96,521	4,541,290	47.0
31–32	0.001909	96,432	184	96,340	4,444,769	46.1
32–33	0.001996	96,248	192	96,152	4,348,429	45.2
33–34	0.002101	96,056	202	95,955	4,252,277	44.3
34–35	0.002218	95,854	213	95,748	4,156,322	43.4
35–36	0.002346	95,641	224	95,529	4,060,575	42.5
36–37	0.002478	95,417	236	95,299	3,965,045	41.6
37–38	0.002602	95,181	248	95,057	3,869,747	40.7
38–39	0.002717	94,933	258	94,804	3,774,690	39.8
39–40	0.002834	94,675	268	94,541	3,679,886	38.9
40–41	0.002973	94,407	281	94,266	3,585,345	38.0
41–42	0.003141	94,126	296	93,978	3,491,078	37.1
42–43	0.003328	93,830	312	93,674	3,397,100	36.2
43–44	0.003527	93,518	330	93,353	3,303,426	35.3
44–45	0.003739	93,188	348	93,014	3,210,073	34.4
45–46	0.003965	92,840	368	92,656	3,117,059	33.6
46–47	0.004225	92,472	391	92,276	3,024,403	32.7
47–48	0.004535	92,081	418	91,872	2,932,126	31.8
48–49	0.004912	91,663	450	91,438	2,840,254	31.0
49–50	0.005356	91,213	489	90,969	2,748,816	30.1
50–51	0.005823	90,725	528	90,461	2,657,847	29.3
51–52	0.006325	90,196	570	89,911	2,567,386	28.5
52–53	0.006917	89,626	620	89,316	2,477,475	27.6
53–54	0.007612	89,006	678	88,667	2,388,159	26.8
54–55	0.008381	88,328	740	87,958	2,299,492	26.0
55–56	0.009175	87,588	804	87,186	2,211,534	25.2
56–57	0.009974	86,785	866	86,352	2,124,347	24.5
57–58	0.010805	85,919	928	85,455	2,037,996	23.7
58–59	0.011687	84,991	993	84,494	1,952,541	23.0
59–60	0.012631	83,997	1,061	83,467	1,868,047	22.2
60–61	0.013643	82,936	1,131	82,371	1,784,580	21.5

See footnotes at end of table.

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Table 16. Life table for the non-Hispanic black population: United States, 2017—Con.

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table16.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.014703	81,805	1,203	81,204	1,702,209	20.8
62–63	0.015794	80,602	1,273	79,966	1,621,006	20.1
63–64	0.016895	79,329	1,340	78,659	1,541,040	19.4
64–65	0.018011	77,989	1,405	77,287	1,462,381	18.8
65–66	0.019228	76,584	1,473	75,848	1,385,094	18.1
66–67	0.020519	75,112	1,541	74,341	1,309,246	17.4
67–68	0.021793	73,570	1,603	72,769	1,234,905	16.8
68–69	0.022978	71,967	1,654	71,140	1,162,136	16.1
69–70	0.024190	70,314	1,701	69,463	1,090,996	15.5
70–71	0.025353	68,613	1,740	67,743	1,021,533	14.9
71–72	0.027123	66,873	1,814	65,966	953,790	14.3
72–73	0.029047	65,059	1,890	64,114	887,824	13.6
73–74	0.031425	63,170	1,985	62,177	823,709	13.0
74–75	0.033919	61,184	2,075	60,147	761,532	12.4
75–76	0.036674	59,109	2,168	58,025	701,386	11.9
76–77	0.039635	56,941	2,257	55,813	643,360	11.3
77–78	0.043069	54,684	2,355	53,507	587,548	10.7
78–79	0.047116	52,329	2,466	51,096	534,041	10.2
79–80	0.050914	49,864	2,539	48,594	482,944	9.7
80–81	0.055397	47,325	2,622	46,014	434,350	9.2
81–82	0.059988	44,703	2,682	43,362	388,336	8.7
82–83	0.065589	42,022	2,756	40,644	344,973	8.2
83–84	0.071831	39,265	2,820	37,855	304,330	7.8
84–85	0.078054	36,445	2,845	35,023	266,475	7.3
85–86	0.083913	33,600	2,820	32,191	231,452	6.9
86–87	0.092092	30,781	2,835	29,363	199,261	6.5
87–88	0.100992	27,946	2,822	26,535	169,898	6.1
88–89	0.110586	25,124	2,778	23,735	143,363	5.7
89–90	0.120897	22,345	2,702	20,995	119,628	5.4
90–91	0.131942	19,644	2,592	18,348	98,634	5.0
91–92	0.143730	17,052	2,451	15,827	80,286	4.7
92–93	0.156263	14,601	2,282	13,460	64,459	4.4
93–94	0.169534	12,320	2,089	11,275	50,999	4.1
94–95	0.183528	10,231	1,878	9,292	39,723	3.9
95–96	0.198216	8,353	1,656	7,525	30,431	3.6
96–97	0.213560	6,698	1,430	5,982	22,906	3.4
97–98	0.229509	5,267	1,209	4,663	16,923	3.2
98–99	0.246003	4,058	998	3,559	12,261	3.0
99–100	0.262970	3,060	805	2,658	8,701	2.8
100 and over	1.000000	2,255	2,255	6,044	6,044	2.7

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 17. Life table for non-Hispanic black males: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.011878	100,000	1,188	98,974	7,151,020	71.5
1–2	0.000624	98,812	62	98,781	7,052,046	71.4
2–3	0.000395	98,751	39	98,731	6,953,264	70.4
3–4	0.000354	98,712	35	98,694	6,854,533	69.4
4–5	0.000239	98,677	24	98,665	6,755,839	68.5
5–6	0.000232	98,653	23	98,642	6,657,174	67.5
6–7	0.000214	98,630	21	98,620	6,558,533	66.5
7–8	0.000196	98,609	19	98,599	6,459,913	65.5
8–9	0.000169	98,590	17	98,581	6,361,314	64.5
9–10	0.000137	98,573	13	98,566	6,262,732	63.5
10–11	0.000114	98,560	11	98,554	6,164,166	62.5
11–12	0.000126	98,548	12	98,542	6,065,612	61.5
12–13	0.000204	98,536	20	98,526	5,967,070	60.6
13–14	0.000363	98,516	36	98,498	5,868,544	59.6
14–15	0.000582	98,480	57	98,451	5,770,047	58.6
15–16	0.000817	98,423	80	98,383	5,671,595	57.6
16–17	0.001045	98,342	103	98,291	5,573,213	56.7
17–18	0.001273	98,240	125	98,177	5,474,922	55.7
18–19	0.001490	98,114	146	98,041	5,376,745	54.8
19–20	0.001691	97,968	166	97,886	5,278,703	53.9
20–21	0.001891	97,803	185	97,710	5,180,818	53.0
21–22	0.002078	97,618	203	97,516	5,083,108	52.1
22–23	0.002221	97,415	216	97,307	4,985,591	51.2
23–24	0.002309	97,198	224	97,086	4,888,285	50.3
24–25	0.002354	96,974	228	96,860	4,791,198	49.4
25–26	0.002386	96,746	231	96,630	4,694,338	48.5
26–27	0.002421	96,515	234	96,398	4,597,708	47.6
27–28	0.002456	96,281	236	96,163	4,501,310	46.8
28–29	0.002499	96,045	240	95,925	4,405,147	45.9
29–30	0.002554	95,805	245	95,682	4,309,222	45.0
30–31	0.002611	95,560	249	95,435	4,213,540	44.1
31–32	0.002674	95,311	255	95,183	4,118,105	43.2
32–33	0.002768	95,056	263	94,924	4,022,921	42.3
33–34	0.002899	94,793	275	94,655	3,927,997	41.4
34–35	0.003051	94,518	288	94,374	3,833,342	40.6
35–36	0.003224	94,229	304	94,077	3,738,969	39.7
36–37	0.003396	93,926	319	93,766	3,644,891	38.8
37–38	0.003543	93,607	332	93,441	3,551,125	37.9
38–39	0.003654	93,275	341	93,105	3,457,684	37.1
39–40	0.003751	92,934	349	92,760	3,364,580	36.2
40–41	0.003863	92,586	358	92,407	3,271,820	35.3
41–42	0.004016	92,228	370	92,043	3,179,413	34.5
42–43	0.004208	91,858	386	91,664	3,087,370	33.6
43–44	0.004440	91,471	406	91,268	2,995,706	32.8
44–45	0.004708	91,065	429	90,851	2,904,438	31.9
45–46	0.004999	90,636	453	90,410	2,813,588	31.0
46–47	0.005326	90,183	480	89,943	2,723,178	30.2
47–48	0.005705	89,703	512	89,447	2,633,235	29.4
48–49	0.006153	89,191	549	88,917	2,543,788	28.5
49–50	0.006674	88,642	592	88,346	2,454,872	27.7
50–51	0.007225	88,051	636	87,733	2,366,525	26.9
51–52	0.007826	87,414	684	87,072	2,278,793	26.1
52–53	0.008547	86,730	741	86,360	2,191,720	25.3
53–54	0.009409	85,989	809	85,585	2,105,360	24.5
54–55	0.010374	85,180	884	84,738	2,019,776	23.7
55–56	0.011371	84,296	959	83,817	1,935,038	23.0
56–57	0.012380	83,338	1,032	82,822	1,851,220	22.2
57–58	0.013461	82,306	1,108	81,752	1,768,398	21.5
58–59	0.014649	81,198	1,189	80,603	1,686,646	20.8
59–60	0.015956	80,009	1,277	79,370	1,606,043	20.1
60–61	0.017379	78,732	1,368	78,048	1,526,672	19.4

See footnotes at end of table.

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Table 17. Life table for non-Hispanic black males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.018871	77,364	1,460	76,634	1,448,624	18.7
62–63	0.020392	75,904	1,548	75,130	1,371,991	18.1
63–64	0.021894	74,356	1,628	73,542	1,296,861	17.4
64–65	0.023383	72,728	1,701	71,878	1,223,319	16.8
65–66	0.025004	71,027	1,776	70,139	1,151,441	16.2
66–67	0.026733	69,251	1,851	68,326	1,081,301	15.6
67–68	0.028404	67,400	1,914	66,443	1,012,976	15.0
68–69	0.029906	65,486	1,958	64,506	946,533	14.5
69–70	0.031347	63,527	1,991	62,532	882,026	13.9
70–71	0.032661	61,536	2,010	60,531	819,495	13.3
71–72	0.034939	59,526	2,080	58,486	758,964	12.8
72–73	0.036901	57,446	2,120	56,386	700,477	12.2
73–74	0.039841	55,326	2,204	54,224	644,091	11.6
74–75	0.042695	53,122	2,268	51,988	589,867	11.1
75–76	0.045755	50,854	2,327	49,691	537,878	10.6
76–77	0.049642	48,527	2,409	47,323	488,188	10.1
77–78	0.053051	46,118	2,447	44,895	440,865	9.6
78–79	0.058131	43,672	2,539	42,402	395,970	9.1
79–80	0.062970	41,133	2,590	39,838	353,567	8.6
80–81	0.067600	38,543	2,605	37,240	313,729	8.1
81–82	0.073070	35,937	2,626	34,624	276,489	7.7
82–83	0.080664	33,311	2,687	31,968	241,865	7.3
83–84	0.088605	30,624	2,713	29,268	209,897	6.9
84–85	0.095065	27,911	2,653	26,584	180,629	6.5
85–86	0.102003	25,258	2,576	23,969	154,045	6.1
86–87	0.111295	22,681	2,524	21,419	130,075	5.7
87–88	0.121252	20,157	2,444	18,935	108,656	5.4
88–89	0.131888	17,713	2,336	16,545	89,722	5.1
89–90	0.143212	15,377	2,202	14,276	73,177	4.8
90–91	0.155226	13,175	2,045	12,152	58,901	4.5
91–92	0.167924	11,130	1,869	10,195	46,749	4.2
92–93	0.181294	9,261	1,679	8,421	36,554	3.9
93–94	0.195311	7,582	1,481	6,841	28,133	3.7
94–95	0.209942	6,101	1,281	5,461	21,291	3.5
95–96	0.225147	4,820	1,085	4,277	15,831	3.3
96–97	0.240871	3,735	900	3,285	11,553	3.1
97–98	0.257055	2,835	729	2,471	8,268	2.9
98–99	0.273627	2,106	576	1,818	5,797	2.8
99–100	0.290510	1,530	444	1,308	3,979	2.6
100 and over	1.000000	1,086	1,086	2,671	2,671	2.5

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 18. Life table for non-Hispanic black females: United States, 2017

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.009865	100,000	987	99,141	7,807,910	78.1
1–2	0.000622	99,013	62	98,983	7,708,769	77.9
2–3	0.000382	98,952	38	98,933	7,609,787	76.9
3–4	0.000228	98,914	23	98,903	7,510,854	75.9
4–5	0.000263	98,892	26	98,879	7,411,951	75.0
5–6	0.000209	98,866	21	98,855	7,313,072	74.0
6–7	0.000180	98,845	18	98,836	7,214,217	73.0
7–8	0.000159	98,827	16	98,819	7,115,381	72.0
8–9	0.000145	98,811	14	98,804	7,016,562	71.0
9–10	0.000138	98,797	14	98,790	6,917,758	70.0
10–11	0.000138	98,783	14	98,777	6,818,968	69.0
11–12	0.000146	98,770	14	98,762	6,720,191	68.0
12–13	0.000162	98,755	16	98,747	6,621,429	67.0
13–14	0.000185	98,739	18	98,730	6,522,681	66.1
14–15	0.000216	98,721	21	98,710	6,423,951	65.1
15–16	0.000250	98,700	25	98,687	6,325,241	64.1
16–17	0.000291	98,675	29	98,661	6,226,554	63.1
17–18	0.000342	98,646	34	98,629	6,127,893	62.1
18–19	0.000407	98,613	40	98,592	6,029,263	61.1
19–20	0.000480	98,572	47	98,549	5,930,671	60.2
20–21	0.000558	98,525	55	98,498	5,832,122	59.2
21–22	0.000633	98,470	62	98,439	5,733,625	58.2
22–23	0.000697	98,408	69	98,373	5,635,186	57.3
23–24	0.000746	98,339	73	98,302	5,536,813	56.3
24–25	0.000784	98,266	77	98,227	5,438,510	55.3
25–26	0.000820	98,189	80	98,148	5,340,283	54.4
26–27	0.000859	98,108	84	98,066	5,242,134	53.4
27–28	0.000902	98,024	88	97,980	5,144,068	52.5
28–29	0.000954	97,936	93	97,889	5,046,089	51.5
29–30	0.001018	97,842	100	97,792	4,948,200	50.6
30–31	0.001092	97,742	107	97,689	4,850,407	49.6
31–32	0.001176	97,636	115	97,578	4,752,718	48.7
32–33	0.001266	97,521	123	97,459	4,655,140	47.7
33–34	0.001357	97,397	132	97,331	4,557,681	46.8
34–35	0.001447	97,265	141	97,195	4,460,349	45.9
35–36	0.001540	97,125	150	97,050	4,363,155	44.9
36–37	0.001642	96,975	159	96,895	4,266,105	44.0
37–38	0.001751	96,816	170	96,731	4,169,209	43.1
38–39	0.001873	96,646	181	96,556	4,072,478	42.1
39–40	0.002013	96,465	194	96,368	3,975,923	41.2
40–41	0.002179	96,271	210	96,166	3,879,555	40.3
41–42	0.002364	96,061	227	95,948	3,783,389	39.4
42–43	0.002549	95,834	244	95,712	3,687,441	38.5
43–44	0.002720	95,590	260	95,460	3,591,729	37.6
44–45	0.002883	95,330	275	95,192	3,496,270	36.7
45–46	0.003051	95,055	290	94,910	3,401,077	35.8
46–47	0.003251	94,765	308	94,611	3,306,167	34.9
47–48	0.003500	94,457	331	94,291	3,211,557	34.0
48–49	0.003815	94,126	359	93,947	3,117,265	33.1
49–50	0.004192	93,767	393	93,570	3,023,319	32.2
50–51	0.004588	93,374	428	93,160	2,929,748	31.4
51–52	0.005004	92,946	465	92,713	2,836,589	30.5
52–53	0.005484	92,480	507	92,227	2,743,876	29.7
53–54	0.006034	91,973	555	91,696	2,651,649	28.8
54–55	0.006632	91,418	606	91,115	2,559,953	28.0
55–56	0.007252	90,812	659	90,483	2,468,838	27.2
56–57	0.007873	90,153	710	89,799	2,378,355	26.4
57–58	0.008498	89,444	760	89,064	2,288,556	25.6
58–59	0.009133	88,684	810	88,279	2,199,493	24.8
59–60	0.009793	87,874	861	87,443	2,111,214	24.0
60–61	0.010488	87,013	913	86,557	2,023,771	23.3

See footnotes at end of table.

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Table 18. Life table for non-Hispanic black females: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.011224	86,100	966	85,617	1,937,214	22.5
62–63	0.012002	85,134	1,022	84,623	1,851,597	21.7
63–64	0.012824	84,112	1,079	83,573	1,766,973	21.0
64–65	0.013689	83,034	1,137	82,465	1,683,401	20.3
65–66	0.014642	81,897	1,199	81,297	1,600,935	19.5
66–67	0.015648	80,698	1,263	80,066	1,519,638	18.8
67–68	0.016670	79,435	1,324	78,773	1,439,571	18.1
68–69	0.017662	78,111	1,380	77,421	1,360,798	17.4
69–70	0.018740	76,731	1,438	76,012	1,283,377	16.7
70–71	0.019833	75,293	1,493	74,547	1,207,365	16.0
71–72	0.021265	73,800	1,569	73,015	1,132,818	15.3
72–73	0.023245	72,231	1,679	71,391	1,059,803	14.7
73–74	0.025275	70,552	1,783	69,660	988,412	14.0
74–75	0.027611	68,769	1,899	67,819	918,751	13.4
75–76	0.030254	66,870	2,023	65,858	850,932	12.7
76–77	0.032734	64,847	2,123	63,785	785,074	12.1
77–78	0.036315	62,724	2,278	61,585	721,289	11.5
78–79	0.039780	60,446	2,405	59,244	659,704	10.9
79–80	0.043086	58,042	2,501	56,791	600,460	10.3
80–81	0.047666	55,541	2,647	54,217	543,668	9.8
81–82	0.051967	52,893	2,749	51,519	489,451	9.3
82–83	0.056636	50,145	2,840	48,725	437,932	8.7
83–84	0.062126	47,305	2,939	45,835	389,207	8.2
84–85	0.068571	44,366	3,042	42,845	343,372	7.7
85–86	0.074538	41,324	3,080	39,784	300,527	7.3
86–87	0.082404	38,244	3,151	36,668	260,744	6.8
87–88	0.091151	35,092	3,199	33,493	224,076	6.4
88–89	0.100667	31,893	3,211	30,288	190,583	6.0
89–90	0.110985	28,683	3,183	27,091	160,295	5.6
90–91	0.122132	25,499	3,114	23,942	133,204	5.2
91–92	0.134128	22,385	3,002	20,884	109,262	4.9
92–93	0.146985	19,383	2,849	17,958	88,378	4.6
93–94	0.160702	16,534	2,657	15,205	70,419	4.3
94–95	0.175268	13,877	2,432	12,661	55,214	4.0
95–96	0.190656	11,445	2,182	10,354	42,554	3.7
96–97	0.206827	9,263	1,916	8,305	32,200	3.5
97–98	0.223725	7,347	1,644	6,525	23,895	3.3
98–99	0.241279	5,703	1,376	5,015	17,370	3.0
99–100	0.259403	4,327	1,122	3,766	12,355	2.9
100 and over	1.000000	3,205	3,205	8,589	8,589	2.7

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 19. Estimated life expectancy at birth, in years, by race, Hispanic origin, and sex: Death-registration states, 1900–1928, and United States, 1929–2017

[For selected years, life table values shown are estimates; see Technical Notes. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Area and year	All races and origins			White			Black[1]			Hispanic[2]			Non-Hispanic white[2]			Non-Hispanic black[2]		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
United States[3]																		
2017[4]	78.6	76.1	81.1	78.8	76.4	81.2	75.3	71.9	78.5	81.8	79.1	84.3	78.5	76.1	81.0	74.9	71.5	78.1
2016[4]	78.7	76.2	81.1	78.9	76.4	81.3	75.3	72.0	78.3	81.8	79.1	84.3	78.6	76.2	81.0	74.9	71.6	78.0
2015[4]	78.7	76.3	81.1	78.9	76.6	81.3	75.5	72.2	78.5	81.9	79.3	84.3	78.7	76.3	81.0	75.1	71.9	78.1
2014[4]	78.9	76.5	81.3	79.1	76.7	81.4	75.6	72.5	78.5	82.1	79.4	84.5	78.8	76.5	81.2	75.3	72.2	78.2
2013[4]	78.8	76.4	81.2	79.0	76.7	81.4	75.5	72.3	78.4	81.9	79.2	84.2	78.8	76.5	81.2	75.1	71.9	78.1
2012[4]	78.8	76.4	81.2	79.1	76.7	81.4	75.5	72.3	78.4	81.9	79.3	84.3	78.9	76.5	81.2	75.1	71.9	78.1
2011[4]	78.7	76.3	81.1	79.0	76.6	81.3	75.3	72.2	78.2	81.8	79.2	84.2	78.7	76.4	81.1	75.0	71.8	77.8
2010[4]	78.7	76.2	81.0	78.9	76.5	81.3	75.1	71.8	78.0	81.7	78.8	84.3	78.8	76.4	81.1	74.7	71.5	77.7
2009[4,5]	78.5	76.0	80.9	78.8	76.4	81.2	74.7	71.4	77.7	81.1	78.4	83.5	78.7	76.3	81.0	74.4	71.0	77.4
2008[4,5]	78.2	75.6	80.6	78.5	76.1	80.9	74.3	70.9	77.3	80.8	78.0	83.3	78.4	76.0	80.7	73.9	70.5	77.0
2007[4,5]	78.1	75.5	80.6	78.5	76.0	80.9	73.8	70.3	77.0	80.7	77.8	83.2	78.4	75.9	80.8	73.5	69.9	76.7
2006[4,5]	77.8	75.2	80.3	78.3	75.8	80.7	73.4	69.9	76.7	80.3	77.5	82.9	78.2	75.7	80.6	73.1	69.5	76.4
2005[4,5]	77.6	75.0	80.1	78.0	75.5	80.5	73.0	69.5	76.2	---	---	---	---	---	---	---	---	---
2004[4,5]	77.6	75.0	80.1	78.1	75.5	80.5	72.9	69.4	76.1	---	---	---	---	---	---	---	---	---
2003[4,5]	77.2	74.5	79.7	77.7	75.1	80.2	72.4	68.9	75.7	---	---	---	---	---	---	---	---	---
2002[4,5]	77.0	74.4	79.6	77.5	74.9	80.1	72.2	68.7	75.4	---	---	---	---	---	---	---	---	---
2001[4,5]	77.0	74.3	79.5	77.5	74.9	80.0	72.0	68.5	75.3	---	---	---	---	---	---	---	---	---
2000	76.8	74.1	79.3	77.3	74.7	79.9	71.8	68.2	75.1	---	---	---	---	---	---	---	---	---
1999	76.7	73.9	79.4	77.3	74.6	79.9	71.4	67.8	74.7	---	---	---	---	---	---	---	---	---
1998	76.7	73.8	79.5	77.3	74.5	80.0	71.3	67.6	74.8	---	---	---	---	---	---	---	---	---
1997	76.5	73.6	79.4	77.1	74.3	79.9	71.1	67.2	74.7	---	---	---	---	---	---	---	---	---
1996	76.1	73.1	79.1	76.8	73.9	79.7	70.2	66.1	74.2	---	---	---	---	---	---	---	---	---
1995	75.8	72.5	78.9	76.5	73.4	79.6	69.6	65.2	73.9	---	---	---	---	---	---	---	---	---
1994	75.7	72.4	79.0	76.5	73.3	79.6	69.5	64.9	73.9	---	---	---	---	---	---	---	---	---
1993	75.5	72.2	78.8	76.3	73.1	79.5	69.2	64.6	73.7	---	---	---	---	---	---	---	---	---
1992	75.8	72.3	79.1	76.5	73.2	79.8	69.6	65.0	73.9	---	---	---	---	---	---	---	---	---
1991	75.5	72.0	78.9	76.3	72.9	79.6	69.3	64.6	73.8	---	---	---	---	---	---	---	---	---
1990	75.4	71.8	78.8	76.1	72.7	79.4	69.1	64.5	73.6	---	---	---	---	---	---	---	---	---
1989	75.1	71.7	78.5	75.9	72.5	79.2	68.8	64.3	73.3	---	---	---	---	---	---	---	---	---
1988	74.9	71.4	78.3	75.6	72.2	78.9	68.9	64.4	73.2	---	---	---	---	---	---	---	---	---
1987	74.9	71.4	78.3	75.6	72.1	78.9	69.1	64.7	73.4	---	---	---	---	---	---	---	---	---
1986	74.7	71.2	78.2	75.4	71.9	78.8	69.1	64.8	73.4	---	---	---	---	---	---	---	---	---
1985	74.7	71.1	78.2	75.3	71.8	78.7	69.3	65.0	73.4	---	---	---	---	---	---	---	---	---
1984	74.7	71.1	78.2	75.3	71.8	78.7	69.5	65.3	73.6	---	---	---	---	---	---	---	---	---
1983	74.6	71.0	78.1	75.2	71.6	78.7	69.4	65.2	73.5	---	---	---	---	---	---	---	---	---
1982	74.5	70.8	78.1	75.1	71.5	78.7	69.4	65.1	73.6	---	---	---	---	---	---	---	---	---
1981	74.1	70.4	77.8	74.8	71.1	78.4	68.9	64.5	73.2	---	---	---	---	---	---	---	---	---
1980	73.7	70.0	77.4	74.4	70.7	78.1	68.1	63.8	72.5	---	---	---	---	---	---	---	---	---
1979	73.9	70.0	77.8	74.6	70.8	78.4	68.5	64.0	72.9	---	---	---	---	---	---	---	---	---
1978	73.5	69.6	77.3	74.1	70.4	78.0	68.1	63.7	72.4	---	---	---	---	---	---	---	---	---
1977	73.3	69.5	77.2	74.0	70.2	77.9	67.7	63.4	72.0	---	---	---	---	---	---	---	---	---
1976	72.9	69.1	76.8	73.6	69.9	77.5	67.2	62.9	71.6	---	---	---	---	---	---	---	---	---
1975	72.6	68.8	76.6	73.4	69.5	77.3	66.8	62.4	71.3	---	---	---	---	---	---	---	---	---
1974	72.0	68.2	75.9	72.8	69.0	76.7	66.0	61.7	70.3	---	---	---	---	---	---	---	---	---
1973	71.4	67.6	75.3	72.2	68.5	76.1	65.0	60.9	69.3	---	---	---	---	---	---	---	---	---
1972[6]	71.2	67.4	75.1	72.0	68.3	75.9	64.7	60.4	69.1	---	---	---	---	---	---	---	---	---
1971	71.1	67.4	75.0	72.0	68.3	75.8	64.6	60.5	68.9	---	---	---	---	---	---	---	---	---
1970	70.8	67.1	74.7	71.7	68.0	75.6	64.1	60.0	68.3	---	---	---	---	---	---	---	---	---
1969	70.5	66.8	74.4	71.4	67.7	75.3	64.5	60.6	68.6	---	---	---	---	---	---	---	---	---
1968	70.2	66.6	74.1	71.1	67.5	75.0	64.1	60.4	67.9	---	---	---	---	---	---	---	---	---
1967	70.5	67.0	74.3	71.4	67.8	75.2	64.9	61.4	68.5	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

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Table 19. Estimated life expectancy at birth, in years, by race, Hispanic origin, and sex: Death-registration states, 1900–1928, and United States, 1929–2017—Con.

[For selected years, life table values shown are estimates; see Technical Notes. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Area and year	All races and origins			White			Black[1]			Hispanic[2]			Non-Hispanic white[2]			Non-Hispanic black[2]		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
United States[3]—Con.																		
1966	70.2	66.7	73.9	71.1	67.5	74.8	64.2	60.9	67.6	---	---	---	---	---	---	---	---	---
1965	70.2	66.8	73.8	71.1	67.6	74.8	64.3	61.2	67.6	---	---	---	---	---	---	---	---	---
1964	70.2	66.8	73.7	71.0	67.7	74.7	64.2	61.3	67.3	---	---	---	---	---	---	---	---	---
1963[7]	69.9	66.6	73.4	70.8	67.4	74.4	63.7	61.0	66.6	---	---	---	---	---	---	---	---	---
1962[7]	70.1	66.9	73.5	70.9	67.7	74.5	64.2	61.6	66.9	---	---	---	---	---	---	---	---	---
1961	70.2	67.1	73.6	71.0	67.8	74.6	64.5	62.0	67.1	---	---	---	---	---	---	---	---	---
1960	69.7	66.6	73.1	70.6	67.4	74.1	63.6	61.1	66.3	---	---	---	---	---	---	---	---	---
1959	69.9	66.8	73.2	70.7	67.5	74.2	63.9	61.3	66.5	---	---	---	---	---	---	---	---	---
1958	69.6	66.6	72.9	70.5	67.4	73.9	63.4	61.0	65.8	---	---	---	---	---	---	---	---	---
1957	69.5	66.4	72.7	70.3	67.2	73.7	63.0	60.7	65.5	---	---	---	---	---	---	---	---	---
1956	69.7	66.7	72.9	70.5	67.5	73.9	63.6	61.3	66.1	---	---	---	---	---	---	---	---	---
1955	69.6	66.7	72.8	70.5	67.4	73.7	63.7	61.4	66.1	---	---	---	---	---	---	---	---	---
1954	69.6	66.7	72.8	70.5	67.5	73.7	63.4	61.1	65.9	---	---	---	---	---	---	---	---	---
1953	68.8	66.0	72.0	69.7	66.8	73.0	62.0	59.7	64.5	---	---	---	---	---	---	---	---	---
1952	68.6	65.8	71.6	69.5	66.6	72.6	61.4	59.1	63.8	---	---	---	---	---	---	---	---	---
1951	68.4	65.6	71.4	69.3	66.5	72.4	61.2	59.2	63.4	---	---	---	---	---	---	---	---	---
1950	68.2	65.6	71.1	69.1	66.5	72.2	60.8	59.1	62.9	---	---	---	---	---	---	---	---	---
1949	68.0	65.2	70.7	68.8	66.2	71.9	60.6	58.9	62.7	---	---	---	---	---	---	---	---	---
1948	67.2	64.6	69.9	68.0	65.5	71.0	60.0	58.1	62.5	---	---	---	---	---	---	---	---	---
1947	66.8	64.4	69.7	67.6	65.2	70.5	59.7	57.9	61.9	---	---	---	---	---	---	---	---	---
1946	66.7	64.4	69.4	67.5	65.1	70.3	59.1	57.5	61.0	---	---	---	---	---	---	---	---	---
1945	65.9	63.6	67.9	66.8	64.4	69.5	57.7	56.1	59.6	---	---	---	---	---	---	---	---	---
1944	65.2	63.6	66.8	66.2	64.5	68.4	56.6	55.8	57.7	---	---	---	---	---	---	---	---	---
1943	63.3	62.4	64.4	64.2	63.2	65.7	55.6	55.4	56.1	---	---	---	---	---	---	---	---	---
1942	66.2	64.7	67.9	67.3	65.9	69.4	56.6	55.4	58.2	---	---	---	---	---	---	---	---	---
1941	64.8	63.1	66.8	66.2	64.4	68.5	53.8	52.5	55.3	---	---	---	---	---	---	---	---	---
1940	62.9	60.8	65.2	64.2	62.1	66.6	53.1	51.5	54.9	---	---	---	---	---	---	---	---	---
1939	63.7	62.1	65.4	64.9	63.3	66.6	54.5	53.2	56.0	---	---	---	---	---	---	---	---	---
1938	63.5	61.9	65.3	65.0	63.2	66.8	52.9	51.7	54.3	---	---	---	---	---	---	---	---	---
1937	60.0	58.0	62.4	61.4	59.3	63.8	50.3	48.3	52.5	---	---	---	---	---	---	---	---	---
1936	58.5	56.6	60.6	59.8	58.0	61.9	49.0	47.0	51.4	---	---	---	---	---	---	---	---	---
1935	61.7	59.9	63.9	62.9	61.0	65.0	53.1	51.3	55.2	---	---	---	---	---	---	---	---	---
1934	61.1	59.3	63.3	62.4	60.5	64.6	51.8	50.2	53.7	---	---	---	---	---	---	---	---	---
1933	63.3	61.7	65.1	64.3	62.7	66.3	54.7	53.5	56.0	---	---	---	---	---	---	---	---	---
1932	62.1	61.0	63.5	63.2	62.0	64.5	53.7	52.8	54.6	---	---	---	---	---	---	---	---	---
1931	61.1	59.4	63.1	62.6	60.8	64.7	50.4	49.5	51.5	---	---	---	---	---	---	---	---	---
1930	59.7	58.1	61.6	61.4	59.7	63.5	48.1	47.3	49.2	---	---	---	---	---	---	---	---	---
1929	57.1	55.8	58.7	58.6	57.2	60.3	46.7	45.7	47.8	---	---	---	---	---	---	---	---	---
Death-registration states																		
1928	56.8	55.6	58.3	58.4	57.0	60.0	46.3	45.6	47.0	---	---	---	---	---	---	---	---	---
1927	60.4	59.0	62.1	62.0	60.5	63.9	48.2	47.6	48.9	---	---	---	---	---	---	---	---	---
1926	56.7	55.5	58.0	58.2	57.0	59.6	44.6	43.7	45.6	---	---	---	---	---	---	---	---	---
1925	59.0	57.6	60.6	60.7	59.3	62.4	45.7	44.9	46.7	---	---	---	---	---	---	---	---	---
1924	59.7	58.1	61.5	61.4	59.8	63.4	46.6	45.5	47.8	---	---	---	---	---	---	---	---	---
1923	57.2	56.1	58.5	58.3	57.1	59.6	48.3	47.7	48.9	---	---	---	---	---	---	---	---	---
1922	59.6	58.4	61.0	60.4	59.1	61.9	52.4	51.8	53.0	---	---	---	---	---	---	---	---	---
1921	60.8	60.0	61.8	61.8	60.8	62.9	51.5	51.6	51.3	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

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Table 19. Estimated life expectancy at birth, in years, by race, Hispanic origin, and sex: Death-registration states, 1900–1928, and United States, 1929–2017—Con.

[For selected years, life table values shown are estimates; see Technical Notes. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Area and year	All races and origins			White			Black[1]			Hispanic[2]			Non-Hispanic white[2]			Non-Hispanic black[2]		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Death-registration states—Con.																		
1920	54.1	53.6	54.6	54.9	54.4	55.6	45.3	45.5	45.2	---	---	---	---	---	---	---	---	---
1919	54.7	53.5	56.0	55.8	54.5	57.4	44.5	44.5	44.4	---	---	---	---	---	---	---	---	---
1918	39.1	36.6	42.2	39.8	37.1	43.2	31.1	29.9	32.5	---	---	---	---	---	---	---	---	---
1917	50.9	48.4	54.0	52.0	49.3	55.3	38.8	37.0	40.8	---	---	---	---	---	---	---	---	---
1916	51.7	49.6	54.3	52.5	50.2	55.2	41.3	39.6	43.1	---	---	---	---	---	---	---	---	---
1915	54.5	52.5	56.8	55.1	53.1	57.5	38.9	37.5	40.5	---	---	---	---	---	---	---	---	---
1914	54.2	52.0	56.8	54.9	52.7	57.5	38.9	37.1	40.8	---	---	---	---	---	---	---	---	---
1913	52.5	50.3	55.0	53.0	50.8	55.7	38.4	36.7	40.3	---	---	---	---	---	---	---	---	---
1912	53.5	51.5	55.9	53.9	51.9	56.2	37.9	35.9	40.0	---	---	---	---	---	---	---	---	---
1911	52.6	50.9	54.4	53.0	51.3	54.9	36.4	34.6	38.2	---	---	---	---	---	---	---	---	---
1910	50.0	48.4	51.8	50.3	48.6	52.0	35.6	33.8	37.5	---	---	---	---	---	---	---	---	---
1909	52.1	50.5	53.8	52.5	50.9	54.2	35.7	34.2	37.3	---	---	---	---	---	---	---	---	---
1908	51.1	49.5	52.8	51.5	49.9	53.3	34.9	33.8	36.0	---	---	---	---	---	---	---	---	---
1907	47.6	45.6	49.9	48.1	46.0	50.4	32.5	31.1	34.0	---	---	---	---	---	---	---	---	---
1906	48.7	46.9	50.8	49.3	47.3	51.4	32.9	31.8	33.9	---	---	---	---	---	---	---	---	---
1905	48.7	47.3	50.2	49.1	47.6	50.6	31.3	29.6	33.1	---	---	---	---	---	---	---	---	---
1904	47.6	46.2	49.1	48.0	46.6	49.5	30.8	29.1	32.7	---	---	---	---	---	---	---	---	---
1903	50.5	49.1	52.0	50.9	49.5	52.5	33.1	31.7	34.6	---	---	---	---	---	---	---	---	---
1902	51.5	49.8	53.4	51.9	50.2	53.8	34.6	32.9	36.4	---	---	---	---	---	---	---	---	---
1901	49.1	47.6	50.6	49.4	48.0	51.0	33.7	32.2	35.3	---	---	---	---	---	---	---	---	---
1900	47.3	46.3	48.3	47.6	46.6	48.7	33.0	32.5	33.5	---	---	---	---	---	---	---	---	---

--- Data not available.
[1]Before 1970, data for the black population are not available. Data shown for 1900–1969 are for the nonwhite population. See Technical Notes.
[2]Life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied to data years 2010–2015; see Technical Notes.
[3]Includes Alaska in 1959 and Hawaii in 1960.
[4]Life expectancies for 2001–2017 were calculated using a revised methodology described in the Technical Notes.
[5]Life expectancies for 2001–2009 have been re-estimated using new intercensal population estimates and may differ from data previously published; see Technical Notes.
[6]Deaths based on a 50% sample.
[7]Figures by race exclude data for residents of New Jersey; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 20. Survivorship, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Number of survivors out of 100,000 born alive, l_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
All races												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,422	99,305	99,064	98,740	97,998	97,407	97,024	95,290	94,028	92,515	88,538	87,552
5	99,326	99,176	98,877	98,495	97,668	96,998	96,482	94,220	91,978	83,389	83,887	81,804
10	99,268	99,097	98,766	98,347	97,460	96,765	96,177	93,710	91,106	88,129	82,458	80,052
15	99,191	98,998	98,635	98,196	97,261	96,551	95,885	93,235	90,385	87,144	81,506	78,963
20	98,937	98,664	98,215	97,741	96,716	96,111	95,366	92,435	89,089	85,441	80,074	77,239
25	98,466	98,203	97,671	97,110	96,000	95,517	94,676	91,335	87,269	83,146	78,046	74,768
30	97,872	97,751	97,070	96,477	95,307	94,905	93,919	90,078	85,302	80,642	75,779	72,043
35	97,163	97,201	96,322	95,808	94,482	94,144	92,976	88,573	83,118	77,961	73,127	69,078
40	96,321	96,422	95,373	94,926	93,322	93,064	91,648	86,650	80,557	75,114	70,042	65,890
45	95,275	95,274	94,154	93,599	91,587	91,378	89,634	84,069	77,343	72,036	66,561	62,436
50	93,797	93,601	92,370	91,526	88,972	88,756	86,591	80,487	73,321	68,429	62,460	58,514
55	91,538	91,232	89,658	88,348	85,110	84,711	82,176	75,557	68,182	63,947	57,555	53,852
60	88,226	87,642	85,537	83,726	79,529	79,067	75,921	68,924	61,563	58,079	51,138	47,946
65	83,696	82,330	79,519	77,107	71,933	71,147	67,555	60,366	53,195	50,560	43,194	40,911
70	77,697	74,891	71,357	68,248	61,984	60,857	56,987	49,655	42,768	41,090	33,816	32,390
75	69,418	64,644	60,449	56,799	49,705	48,170	43,903	36,735	30,789	29,729	23,552	22,960
80	57,839	50,885	47,084	43,180	35,285	33,576	29,313	22,883	18,580	18,298	13,712	13,529
85	42,382	34,515	31,770	27,960	20,908	18,542	15,785	11,073	8,542	8,683	6,001	6,053
90	24,560	18,496	17,046	14,154	9,297	7,080	6,144	3,796	2,998	2,941	1,868	1,867
95	9,361	6,879	6,282	5,043	2,786	1,524	1,511	857	636	646	361	344
100	1,894	1,479	1,424	1,150	542	183	199	123	62	67	40	31
Male												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,370	99,239	98,961	98,607	97,755	97,087	96,661	94,762	93,440	91,745	87,505	86,426
5	99,261	99,095	98,754	98,333	97,395	96,643	96,077	93,624	91,294	88,505	82,718	80,548
10	99,199	99,008	98,627	98,160	97,151	96,375	95,726	93,054	90,346	87,184	81,249	78,775
15	99,107	98,890	98,464	97,972	96,904	96,107	95,366	92,508	89,561	86,156	80,261	77,681
20	98,749	98,426	97,854	97,316	96,126	95,491	94,695	91,617	88,220	84,440	78,792	75,984
25	98,071	97,747	97,049	96,361	95,040	94,631	93,791	90,385	86,359	82,252	76,675	73,472
30	97,235	97,114	96,166	95,430	94,072	93,826	92,861	89,009	84,346	79,890	74,378	70,747
35	96,284	96,385	95,091	94,501	92,997	92,889	91,760	87,371	82,075	77,514	71,614	67,752
40	95,196	95,389	93,761	93,345	91,541	91,572	90,207	85,246	79,357	74,432	68,297	64,447
45	93,903	93,940	92,139	91,649	89,369	89,492	87,819	82,336	75,882	71,244	64,518	60,849
50	92,105	91,818	89,865	89,007	86,070	86,199	84,158	78,254	71,518	67,553	60,118	56,736
55	89,365	88,897	86,492	84,936	81,139	81,039	78,781	72,627	65,981	62,965	54,970	51,939
60	85,344	84,551	81,378	79,012	73,958	73,887	71,246	65,142	58,909	56,917	48,343	45,895
65	79,838	78,241	73,971	70,646	64,318	64,177	61,566	55,776	50,154	49,218	40,264	38,736
70	72,785	69,491	64,107	59,681	52,296	52,244	49,950	44,588	39,516	39,668	31,023	30,217
75	63,524	57,688	51,385	46,272	38,797	38,950	36,756	31,864	27,718	28,316	21,213	21,076
80	51,095	42,769	36,749	31,810	24,921	25,300	25,237	18,995	16,172	17,128	11,942	12,084
85	35,439	26,527	21,815	18,020	13,168	12,845	11,750	8,693	7,107	7,920	5,059	5,179
90	18,687	12,473	9,878	7,732	5,107	4,609	4,197	2,787	2,283	2,527	1,502	1,508
95	6,070	3,855	2,927	2,279	1,326	970	955	586	451	556	289	262
100	971	645	529	423	222	117	121	78	40	62	33	22
Female												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,477	99,375	99,172	98,880	98,254	97,744	97,406	95,848	94,728	93,383	89,623	88,733
5	99,393	99,261	99,006	98,666	97,955	97,371	96,908	94,848	92,789	90,380	85,117	83,119
10	99,341	99,190	98,911	98,544	97,784	97,173	96,652	94,402	92,008	89,186	83,728	81,390
15	99,280	99,111	98,814	98,432	97,636	97,016	96,431	94,000	91,364	88,247	82,813	80,307
20	99,134	98,915	98,597	98,184	97,331	96,756	96,066	93,293	90,116	86,556	81,418	78,555
25	98,883	98,682	98,325	97,883	96,966	96,418	95,583	92,322	88,328	84,135	79,481	76,119
30	98,543	98,418	98,013	97,551	96,544	95,996	94,933	91,182	86,398	81,463	77,247	73,394
35	98,083	98,052	97,596	97,140	95,966	95,409	94,206	89,810	84,304	78,713	74,719	70,463
40	97,493	97,493	97,033	96,531	95,097	94,560	93,101	88,092	81,927	75,907	71,894	67,407
45	96,697	96,648	96,222	95,570	93,793	93,265	91,469	85,856	79,041	72,954	68,755	64,121

See footnotes at end of table.

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Table 20. Survivorship, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Number of survivors out of 100,000 born alive, l_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
Female—Con.												
50	95,543	95,425	94,932	94,060	91,852	91,327	89,075	82,828	75,456	69,452	65,001	60,415
55	93,768	93,609	92,881	91,760	89,066	88,451	85,694	78,708	70,832	65,099	60,392	55,908
60	91,162	90,767	89,742	88,414	85,139	84,430	80,890	73,093	64,795	59,438	54,226	50,155
65	87,596	86,433	85,075	83,520	79,698	78,462	74,119	65,523	56,924	52,126	46,438	43,246
70	82,637	80,219	78,522	76,720	71,955	70,100	64,873	55,449	46,774	42,741	36,916	34,721
75	75,344	71,311	69,287	67,186	61,107	58,394	52,111	42,425	34,600	31,344	26,155	24,994
80	64,591	58,455	56,986	54,372	46,445	43,063	36,486	27,524	21,578	19,613	15,682	15,129
85	49,264	41,830	41,115	37,772	29,538	25,269	20,668	13,972	10,322	9,515	7,051	7,063
90	30,222	23,936	23,666	20,578	14,160	10,056	8,548	5,044	3,656	3,314	2,269	2,306
95	12,383	9,560	9,346	7,862	4,565	2,193	2,207	1,195	807	728	441	452
100	2,697	2,183	2,251	1,927	954	264	298	179	82	72	49	43
White												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,516	99,429	99,233	98,898	98,224	97,714	97,278	95,685	94,392	92,780	88,709	87,762
5	99,429	99,313	99,068	98,675	97,930	97,353	96,790	94,713	92,466	89,771	84,147	82,071
10	99,377	99,239	98,966	98,536	97,733	97,131	96,502	94,228	91,627	88,536	82,734	80,371
15	99,304	99,146	98,843	98,391	97,546	96,928	96,228	93,792	90,982	87,633	81,816	79,344
20	99,066	98,826	98,455	97,939	97,036	96,508	95,763	93,117	89,933	86,159	80,407	77,998
25	98,613	98,406	97,972	97,340	96,406	95,965	95,169	92,213	88,454	84,106	78,392	75,202
30	98,025	98,000	97,451	96,774	95,824	95,440	94,536	91,185	86,836	81,787	76,167	72,317
35	97,312	97,506	96,810	96,192	95,152	94,798	93,750	89,941	85,004	79,277	73,568	69,522
40	96,477	96,799	96,000	95,427	94,190	93,870	92,616	88,318	82,803	76,642	70,525	66,082
45	95,447	95,759	94,932	94,257	92,681	92,374	90,847	86,069	79,989	73,705	67,090	62,920
50	93,997	94,242	93,326	92,384	90,306	89,958	88,110	82,833	76,340	70,250	62,994	58,647
55	91,783	92,050	90,833	89,427	86,688	86,173	84,027	78,218	71,551	65,875	58,163	54,450
60	88,554	88,655	86,943	85,031	81,323	80,811	78,066	71,785	65,100	60,013	51,822	48,288
65	84,141	83,518	81,123	78,585	73,889	73,102	69,850	63,201	56,655	52,411	43,904	41,505
70	78,242	76,219	73,106	69,801	63,991	62,834	59,189	52,165	45,841	42,736	34,484	32,902
75	69,933	66,022	62,175	58,299	51,586	49,895	45,688	38,610	33,406	31,086	24,151	23,356
80	58,237	52,160	48,583	44,409	36,659	34,697	30,438	23,976	20,260	19,149	14,100	13,794
85	42,559	35,461	32,850	28,768	21,578	19,017	16,239	11,483	9,325	9,078	6,178	6,192
90	24,480	18,964	17,571	14,471	9,433	7,149	6,201	3,819	3,066	2,991	1,918	1,919
95	9,125	6,971	6,416	5,067	2,743	1,521	1,500	801	636	643	364	355
100	1,761	1,454	1,423	1,105	487	183	196	98	58	62	38	31
White male												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,473	99,373	99,138	98,769	97,994	97,408	96,931	95,188	93,768	91,975	87,674	86,655
5	99,373	99,243	98,956	98,519	97,671	97,015	96,403	94,150	91,738	88,842	82,972	80,864
10	99,316	99,163	98,839	98,357	97,441	96,758	96,069	93,601	90,810	87,530	81,519	79,109
15	99,230	99,052	98,686	98,176	97,208	96,503	95,728	93,089	90,074	86,546	80,549	78,037
20	98,906	98,616	98,134	97,525	96,480	95,908	95,104	92,293	88,904	84,997	79,116	76,376
25	98,262	98,003	97,430	96,616	95,524	95,106	94,294	91,241	87,371	83,061	77,047	73,907
30	97,439	97,436	96,662	95,783	94,716	94,401	93,489	90,092	85,707	80,888	74,810	71,219
35	96,493	96,774	95,731	94,980	93,843	93,589	92,543	88,713	83,812	78,441	72,108	68,245
40	95,422	95,859	94,588	93,984	92,631	92,427	91,173	86,880	81,457	75,733	68,848	64,954
45	94,151	94,530	93,167	92,494	90,725	90,533	89,002	84,285	78,345	72,696	65,115	61,369
50	92,391	92,588	91,124	90,105	87,690	87,424	85,601	80,521	74,288	69,107	60,741	57,274
55	89,701	89,883	88,022	86,303	83,001	82,463	80,496	75,156	68,981	64,574	55,622	52,491
60	85,778	85,773	83,182	80,625	75,969	75,485	73,172	67,787	61,933	58,498	48,987	46,452
65	80,425	79,657	75,962	72,393	66,343	65,834	63,541	58,305	52,964	50,663	40,862	39,245
70	73,517	71,039	66,181	61,384	54,138	53,825	51,735	46,739	41,880	40,873	31,527	30,640
75	64,248	59,245	53,308	47,712	40,324	40,207	38,104	33,404	29,471	29,205	21,585	21,387
80	51,682	44,121	38,245	32,788	25,885	25,993	24,005	19,860	17,221	17,655	12,160	12,266
85	35,762	27,425	22,720	18,538	13,527	13,065	12,015	9,013	7,572	8,154	5,145	5,252
90	18,708	12,840	10,214	7,891	5,125	4,600	4,209	2,812	2,356	2,568	1,523	1,523
95	5,903	3,899	2,988	2,279	1,274	956	942	552	461	556	289	263
100	886	625	523	404	189	115	118	65	40	61	31	22

See footnotes at end of table.

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Table 20. Survivorship, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Number of survivors out of 100,000 born alive, l_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
White female												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,562	99,488	99,333	99,035	98,468	98,036	97,645	96,211	95,037	93,608	89,774	88,939
5	99,489	99,385	99,187	98,841	98,203	97,709	97,199	95,309	93,216	90,721	85,349	83,426
10	99,440	99,319	99,099	98,725	98,042	97,525	96,960	94,890	92,466	89,564	83,979	81,723
15	99,382	99,245	99,007	98,618	97,902	97,375	96,756	94,534	91,894	88,712	83,093	80,680
20	99,235	99,049	98,795	98,374	97,618	97,135	96,454	93,984	90,939	87,281	81,750	78,978
25	98,987	98,835	98,547	98,093	97,299	96,844	96,072	93,228	89,524	85,163	79,865	76,588
30	98,646	98,602	98,283	97,802	96,945	96,499	95,605	92,320	87,972	82,740	77,676	73,887
35	98,180	98,282	97,939	97,445	96,474	96,026	94,977	91,211	86,248	80,206	75,200	70,971
40	97,593	97,790	97,472	96,913	95,762	95,326	94,080	89,805	84,256	77,624	72,425	67,935
45	96,814	97,049	96,768	96,065	94,649	94,228	92,725	87,920	81,780	74,871	69,341	64,677
50	95,687	95,962	95,608	94,710	92,924	92,522	90,685	85,267	78,572	71,547	65,629	61,005
55	93,962	94,293	93,730	92,594	90,383	89,967	87,699	81,520	74,321	67,323	61,053	56,509
60	91,438	91,615	90,789	89,451	86,726	86,339	83,279	76,200	68,462	61,704	54,900	50,752
65	87,973	87,449	86,339	84,764	81,579	80,739	76,773	68,701	60,499	54,299	47,086	43,806
70	83,087	81,400	79,984	78,139	74,101	72,507	67,545	58,363	49,932	44,638	37,482	35,206
75	75,748	72,595	70,834	68,712	63,290	60,461	54,397	44,685	37,024	32,777	26,569	25,362
80	64,899	59,721	58,454	55,770	48,182	44,676	38,026	28,882	23,053	20,492	15,929	15,349
85	49,376	42,848	42,274	38,774	30,490	26,046	21,348	14,487	10,937	9,909	7,152	7,149
90	30,103	24,491	24,270	20,996	14,406	10,219	8,662	5,061	3,719	3,372	2,291	2,322
95	12,097	9,680	9,495	7,900	4,526	2,203	2,200	1,109	797	721	434	448
100	2,524	2,147	2,239	1,858	872	265	294	139	74	63	44	41
Black[1]												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	98,920	98,578	98,187	97,885	96,731	95,732	95,407	92,584	92,035	90,379	79,784	76,609
5	98,771	98,382	97,884	97,522	96,207	95,051	94,482	90,983	89,303	86,174	70,691	66,222
10	98,686	98,271	97,720	97,322	95,928	94,745	94,060	90,339	88,258	84,690	68,437	63,410
15	98,578	98,139	97,539	97,134	95,661	94,460	93,646	89,591	87,156	83,180	66,410	61,060
20	98,208	97,701	96,925	96,652	94,887	93,880	92,738	87,839	84,386	79,641	63,165	57,931
25	97,555	96,946	95,972	95,804	93,513	92,925	91,321	85,210	80,320	74,973	59,608	54,512
30	96,763	96,143	94,809	94,680	91,934	91,699	89,584	82,194	75,962	70,492	56,112	51,287
35	95,837	95,164	93,260	93,288	89,977	90,046	87,402	78,683	71,141	65,865	52,125	48,007
40	94,682	93,809	91,239	91,439	87,304	87,766	84,478	74,466	65,974	61,244	47,866	44,518
45	93,210	91,770	88,689	88,834	83,700	84,501	80,507	69,284	59,827	56,442	43,054	40,628
50	91,184	88,761	85,285	85,044	78,938	80,172	74,976	62,702	53,141	51,422	37,800	36,103
55	88,154	84,657	80,635	79,816	72,826	73,893	67,660	54,846	45,558	45,803	32,233	31,404
60	83,613	79,007	74,335	72,913	65,250	65,795	58,593	46,318	37,654	39,418	26,046	25,698
65	77,385	71,704	66,154	64,391	56,102	56,038	48,649	37,838	30,015	32,738	19,806	20,474
70	69,560	62,349	56,192	54,617	45,785	45,434	38,616	29,654	22,505	25,585	14,021	14,960
75	60,137	50,987	44,872	43,274	34,262	34,531	28,968	21,798	15,546	18,011	9,139	9,956
80	48,332	37,964	33,149	31,711	23,710	24,815	20,003	14,408	9,589	11,376	5,158	5,750
85	34,458	24,677	21,352	19,939	15,044	15,337	12,433	8,326	4,900	5,794	2,414	2,782
90	20,106	13,204	11,646	10,713	8,087	7,195	6,394	4,077	2,044	2,317	913	1,054
95	8,620	5,368	4,729	4,463	3,252	1,777	2,010	1,557	638	689	324	296
100	2,390	1,491	1,376	1,360	1,036	214	301	399	120	129	77	57
Black male[1]												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	98,812	98,437	98,023	97,703	96,394	95,301	94,911	91,772	91,268	89,499	78,065	74,674
5	98,653	98,219	97,688	97,300	95,826	94,570	93,921	90,082	88,412	85,195	68,589	64,385
10	98,560	98,093	97,501	97,061	95,497	94,234	93,453	89,393	87,311	83,768	66,377	61,730
15	98,425	97,930	97,268	96,826	95,161	93,874	92,965	88,610	86,152	82,332	64,478	59,667
20	97,853	97,275	96,301	96,132	94,053	93,108	91,941	86,968	83,621	79,057	61,426	56,733
25	96,871	96,103	94,809	94,827	91,904	91,825	90,285	84,227	79,516	74,540	57,736	53,285
30	95,718	94,940	93,070	93,125	89,584	90,270	88,327	80,979	75,083	70,344	54,073	49,867
35	94,433	93,641	90,827	91,080	86,885	88,331	85,940	77,221	70,049	65,873	49,865	46,541
40	92,897	91,945	87,948	88,490	83,441	85,744	82,832	72,780	64,710	61,353	45,414	42,989
45	91,066	89,439	84,467	84,997	78,976	82,075	78,686	67,346	58,432	56,589	40,563	39,230

See footnotes at end of table.

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Table 20. Survivorship, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Number of survivors out of 100,000 born alive, l_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
Black male[1]—Con.												
50	88,591	85,653	79,984	80,065	73,282	77,239	72,891	60,495	51,748	51,880	35,427	34,766
55	84,962	80,529	74,095	73,413	66,101	70,351	65,122	52,426	44,436	46,581	29,754	29,987
60	79,494	73,588	66,334	64,980	57,457	61,669	55,535	43,833	36,790	40,506	23,750	24,194
65	71,895	64,980	56,795	55,061	47,485	51,392	45,198	35,371	29,314	34,042	17,806	19,015
70	62,551	54,253	45,690	44,213	36,925	39,914	35,018	27,236	21,741	26,923	12,295	13,829
75	51,909	41,693	33,755	32,717	25,921	29,064	25,472	19,456	14,419	18,854	7,494	8,892
80	39,528	28,497	22,549	22,017	16,560	19,994	16,904	12,186	8,239	11,615	3,894	4,831
85	26,042	16,532	12,709	12,383	9,648	11,620	9,898	6,444	3,660	5,605	1,747	2,030
90	13,662	7,625	5,972	5,708	4,696	5,174	4,642	2,836	1,246	2,040	595	634
95	5,016	2,565	1,971	2,009	1,721	1,240	1,342	961	307	552	189	137
100	1,128	563	466	513	489	149	192	209	41	77	40	18
Black female[1]												
0	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1	99,033	98,723	98,356	98,073	97,076	96,172	95,913	93,416	92,796	91,251	81,493	78,525
5	98,894	98,550	98,087	97,751	96,598	95,543	95,055	91,906	90,185	87,149	72,768	68,056
10	98,815	98,456	97,946	97,590	96,369	95,265	94,679	91,308	89,201	85,607	70,508	65,111
15	98,736	98,354	97,818	97,450	96,172	95,057	94,343	90,594	88,088	83,954	68,218	62,384
20	98,576	98,141	97,566	97,180	95,729	94,660	93,544	88,736	85,078	80,154	64,764	59,053
25	98,267	97,785	97,140	96,754	95,035	94,005	92,336	86,198	81,067	75,359	61,430	55,795
30	97,843	97,314	96,514	96,150	94,114	93,070	90,799	83,384	76,816	70,633	58,281	52,773
35	97,263	96,632	95,599	95,338	92,807	91,670	88,805	80,092	72,192	65,857	54,595	49,567
40	96,464	95,588	94,364	94,137	90,817	89,676	86,052	76,084	67,271	61,130	50,568	46,146
45	95,322	93,979	92,676	92,322	88,001	86,793	82,257	71,157	61,365	56,230	45,947	42,279
50	93,711	91,680	90,277	89,563	84,168	82,979	77,007	64,885	54,920	50,780	40,886	37,681
55	91,241	88,517	86,793	85,653	79,177	77,362	70,196	57,314	47,074	44,742	35,415	33,124
60	87,562	84,044	81,886	80,293	72,820	69,941	61,758	48,928	38,761	37,954	28,908	27,524
65	82,583	77,941	75,031	73,266	64,716	60,825	52,358	40,504	30,852	31,044	22,302	21,995
70	76,127	69,778	66,278	64,729	54,873	51,274	42,612	32,354	23,341	24,107	15,871	16,140
75	67,819	59,361	55,684	53,831	43,193	40,540	32,981	24,502	16,576	17,216	10,657	11,066
80	56,516	46,453	43,622	41,686	31,756	30,315	23,712	17,039	10,822	11,151	6,324	6,708
85	42,199	32,053	30,089	28,004	21,358	19,744	15,550	10,622	6,033	5,972	3,029	3,567
90	26,129	18,347	17,536	16,260	12,210	9,675	8,590	5,652	2,774	2,579	1,206	1,492
95	11,754	7,989	7,687	7,312	5,217	2,438	2,875	2,345	941	818	448	462
100	3,289	2,351	2,364	2,398	1,803	293	445	659	193	179	112	97

[1]For 1939–1941 and 1949–1951, data shown are for the entire nonwhite population. During these periods, life tables were not constructed for the black population. See Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Table 21. Life expectancy, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Average number of years of life remaining, e_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
All races												
0	78.61	76.86	75.37	73.88	70.75	69.89	68.07	63.62	59.20	56.40	51.49	49.24
1	78.06	76.40	75.08	73.82	71.19	70.75	69.16	65.76	61.94	59.94	57.11	55.20
5	74.14	72.49	71.22	70.00	67.43	67.04	65.54	62.49	59.29	57.99	56.21	54.98
10	69.18	67.55	66.29	65.10	62.57	62.19	60.74	57.82	54.84	53.79	52.15	51.14
15	64.23	62.61	61.38	60.19	57.69	57.33	55.91	53.10	50.25	49.37	47.73	46.81
20	59.39	57.82	56.63	55.46	53.00	52.58	51.20	48.54	45.94	45.30	43.53	42.79
25	54.66	53.08	51.93	50.81	48.37	47.89	46.56	44.09	41.85	41.47	39.60	39.12
30	49.98	48.31	47.23	46.12	43.71	43.18	41.91	39.67	37.75	37.68	35.70	35.51
35	45.32	43.57	42.58	41.43	39.07	38.51	37.31	35.30	33.68	33.89	31.90	31.92
40	40.70	38.90	37.98	36.79	34.52	33.92	32.81	31.03	29.67	30.08	28.20	28.34
45	36.11	34.34	33.44	32.27	30.12	29.50	28.49	26.90	25.79	26.25	24.54	24.77
50	31.64	29.90	29.03	27.94	25.93	25.29	24.40	22.98	22.06	22.50	20.98	21.26
55	27.36	25.61	24.83	23.85	21.99	21.37	20.57	19.31	18.53	18.90	17.55	17.88
60	23.28	21.55	20.90	20.02	18.34	17.71	17.04	15.91	15.24	15.54	14.42	14.76
65	19.40	17.77	17.28	16.51	15.00	14.39	13.83	12.80	12.23	12.47	11.60	11.86
70	15.70	14.27	13.96	13.32	12.00	11.38	10.92	10.00	9.58	9.74	9.11	9.30
75	12.26	11.12	11.00	10.48	9.32	8.71	8.40	7.62	7.32	7.49	6.99	7.08
80	9.18	8.42	8.40	7.98	7.10	6.39	6.34	5.73	5.50	5.63	5.25	5.30
85	6.58	6.22	6.23	5.96	5.28	4.58	4.69	4.31	4.19	4.21	4.00	3.96
90	4.54	4.49	4.50	4.43	3.94	3.22	3.44	3.30	3.15	3.22	3.03	2.95
95	3.11	3.19	3.29	3.34	3.06	2.43	2.54	2.61	2.26	2.32	2.35	2.18
100	2.19	2.27	2.46	2.73	2.62	1.91	1.92	2.13	1.51	1.53	1.85	1.58
Male												
0	76.10	74.13	71.83	70.11	67.04	66.80	65.47	61.60	57.71	55.50	49.86	47.88
1	75.58	73.70	71.58	70.10	67.58	67.80	66.73	64.00	60.75	59.47	55.95	54.35
5	71.66	69.80	67.73	66.29	63.82	64.10	63.12	60.76	58.14	57.60	55.11	54.22
10	66.71	64.86	62.81	61.41	58.98	59.27	58.35	56.12	53.75	53.44	51.07	50.39
15	61.77	59.94	57.91	56.52	54.12	54.43	53.56	51.43	49.18	49.05	46.66	46.06
20	56.98	55.21	53.25	51.88	49.54	49.77	48.92	46.91	44.88	44.99	42.48	42.03
25	52.36	50.57	48.67	47.37	45.07	45.19	44.36	42.51	40.79	41.11	38.59	38.38
30	47.78	45.89	44.10	42.81	40.51	40.56	39.78	38.13	36.71	37.26	34.70	34.76
35	43.23	41.21	39.57	38.20	35.95	35.94	35.23	33.79	32.65	33.43	30.94	31.19
40	38.69	36.62	35.09	33.64	31.48	31.42	30.79	29.57	28.68	29.63	27.32	27.65
45	34.19	32.14	30.66	29.22	27.18	27.09	26.55	25.52	24.87	25.84	23.77	24.14
50	29.81	27.82	26.37	25.00	23.12	23.02	22.59	21.72	21.25	22.11	20.32	20.70
55	25.64	23.65	22.30	21.08	19.36	19.32	18.96	18.20	17.79	18.53	16.98	17.38
60	21.72	19.73	18.53	17.46	15.99	15.94	15.68	14.99	14.62	15.22	13.95	14.33
65	18.04	16.11	15.12	14.21	12.99	12.95	12.74	12.07	11.72	12.20	11.24	11.50
70	14.54	12.80	12.05	11.35	10.39	10.33	10.11	9.46	9.18	9.52	8.83	9.02
75	11.28	9.89	9.39	8.90	8.13	7.99	7.83	7.22	7.02	7.31	6.75	6.84
80	8.38	7.44	7.12	6.80	6.27	5.95	5.94	5.44	5.27	5.49	5.10	5.11
85	5.95	5.47	5.31	5.13	4.73	4.39	4.41	4.11	4.02	4.10	3.90	3.82
90	4.06	3.95	3.89	3.89	3.60	3.18	3.30	3.17	3.06	3.21	3.01	2.86
95	2.78	2.82	2.92	2.98	2.82	2.43	2.49	2.52	2.21	2.38	2.36	2.13
100	1.98	2.03	2.25	2.49	2.43	1.91	1.92	2.05	1.50	1.58	1.81	1.55
Female												
0	81.10	79.47	78.81	77.62	74.64	73.24	70.96	65.89	60.90	57.40	53.24	50.70
1	80.53	78.97	78.47	77.50	74.97	73.93	71.84	67.73	65.37	60.45	58.37	56.10
5	76.60	75.06	74.60	73.67	71.19	70.21	68.21	64.43	60.66	58.41	57.39	55.80
10	71.64	70.11	69.67	68.75	66.31	65.35	63.38	59.73	56.16	54.16	53.31	51.94
15	66.68	65.16	64.73	63.83	61.41	60.45	58.52	54.97	51.54	49.71	48.87	47.60
20	61.77	60.29	59.87	58.98	56.59	55.60	53.73	50.37	47.21	45.63	44.66	43.60
25	56.92	55.42	55.03	54.16	51.80	50.79	48.99	45.87	43.11	41.86	40.69	39.92
30	52.11	50.57	50.19	49.33	47.01	46.00	44.28	41.41	39.02	38.15	36.79	36.30
35	47.34	45.75	45.40	44.53	42.28	41.27	39.63	37.01	34.92	34.40	32.95	32.71
40	42.61	40.99	40.65	39.80	37.64	36.61	35.06	32.68	30.86	30.58	29.15	29.08
45	37.94	36.33	35.97	35.17	33.13	32.09	30.64	28.46	26.89	26.71	25.36	25.44

See footnotes at end of table.

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Table 21. Life expectancy, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Average number of years of life remaining, e_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
Female–Con.												
50	33.37	31.76	31.42	30.69	28.77	27.71	26.40	24.40	23.05	22.92	21.67	21.84
55	28.95	27.32	27.05	26.39	24.59	23.53	22.33	20.54	19.38	19.28	18.13	18.39
60	24.70	23.10	22.90	22.29	20.60	19.52	18.50	16.92	15.94	15.87	14.90	15.21
65	20.60	19.12	19.02	18.44	16.83	15.80	14.95	13.57	12.78	12.73	11.96	12.22
70	16.68	15.40	15.38	14.84	13.35	12.37	11.71	10.56	9.99	9.96	9.38	9.59
75	13.03	11.99	12.08	11.58	10.26	9.33	8.94	8.01	7.61	7.65	7.20	7.34
80	9.76	9.05	9.13	8.69	7.68	6.72	6.67	5.99	5.70	5.75	5.37	5.51
85	6.98	6.62	6.66	6.38	5.63	4.71	4.90	4.47	4.32	4.30	4.08	4.12
90	4.77	4.71	4.73	4.66	4.14	3.25	3.54	3.39	3.24	3.23	3.05	3.04
95	3.22	3.29	3.40	3.48	3.18	2.43	2.57	2.67	2.30	2.27	2.34	2.24
100	2.24	2.29	2.52	2.81	2.69	1.91	1.93	2.17	1.52	1.48	1.91	1.61
White												
0	78.79	77.43	76.13	74.53	71.62	70.73	69.02	64.92	60.86	57.42	51.90	49.64
1	78.17	76.87	75.72	74.35	71.91	71.38	69.95	66.84	63.46	60.87	57.46	55.47
5	74.24	72.96	71.84	70.52	68.12	67.64	66.29	63.52	60.75	58.86	56.51	55.18
10	69.28	68.01	66.92	65.62	63.26	62.79	61.48	58.83	56.29	54.65	52.43	51.34
15	64.33	63.07	61.99	60.71	58.37	57.92	56.65	54.09	51.69	50.21	48.01	47.01
20	59.47	58.27	57.23	55.98	53.66	53.16	51.91	49.47	47.28	46.04	43.77	43.17
25	54.73	53.51	52.50	51.30	49.00	48.44	47.22	44.92	43.02	42.07	39.79	39.26
30	50.05	48.72	47.76	46.59	44.28	43.69	42.52	40.40	38.76	38.17	35.86	35.51
35	45.40	43.95	43.06	41.86	39.58	38.97	37.86	35.93	34.50	34.27	32.03	32.01
40	40.77	39.25	38.41	37.17	34.95	34.33	33.29	31.54	30.33	30.38	28.29	28.28
45	36.18	34.65	33.81	32.60	30.48	29.84	28.88	27.29	26.29	26.45	24.60	24.82
50	31.69	30.17	29.34	28.21	26.21	25.57	24.70	23.26	22.42	22.64	21.01	21.18
55	27.39	25.82	25.08	24.05	22.19	21.58	20.77	19.47	18.75	18.97	17.57	17.91
60	23.30	21.71	21.08	20.16	18.48	17.84	17.15	15.98	15.37	15.57	14.43	14.73
65	19.38	17.88	17.40	16.59	15.08	14.44	13.86	12.80	12.28	12.47	11.60	11.87
70	15.65	14.34	14.02	13.35	12.01	11.37	10.89	9.96	9.58	9.72	9.10	9.31
75	12.19	11.15	11.03	10.47	9.27	8.65	8.34	7.55	7.30	7.47	6.98	7.08
80	9.11	8.42	8.39	7.95	7.01	6.33	6.27	5.64	5.45	5.59	5.22	5.30
85	6.51	6.19	6.20	5.90	5.19	4.53	4.62	4.20	4.12	4.15	3.97	3.95
90	4.46	4.44	4.46	4.36	3.84	3.20	3.41	3.16	3.10	3.17	3.00	2.93
95	3.03	3.14	3.25	3.25	2.92	2.43	2.53	2.45	2.22	2.28	2.29	2.16
100	2.13	2.22	2.43	2.62	2.41	1.91	1.92	1.95	1.48	1.50	1.71	1.56
White male												
0	76.37	74.78	72.72	70.82	67.94	67.55	66.31	62.81	59.12	56.34	50.23	48.23
1	75.77	74.25	72.35	70.70	68.33	68.34	67.41	64.98	62.04	60.24	56.26	54.61
5	71.85	70.34	68.48	66.87	64.55	64.61	63.77	61.68	59.38	58.31	55.37	54.43
10	66.89	65.40	63.55	61.98	59.69	59.78	58.98	57.03	54.96	54.15	51.32	50.59
15	61.94	60.47	58.65	57.09	54.83	54.93	54.18	52.33	50.39	49.74	46.91	46.25
20	57.14	55.72	53.96	52.45	50.22	50.25	49.52	47.76	46.02	45.60	42.71	42.19
25	52.50	51.05	49.33	47.92	45.70	45.65	44.93	43.28	41.78	41.60	38.79	38.52
30	47.92	46.34	44.71	43.31	41.07	40.97	40.29	38.80	37.54	37.65	34.87	34.88
35	43.36	41.64	40.12	38.66	36.43	36.31	35.68	34.36	33.33	33.74	31.08	31.29
40	38.82	37.01	35.57	34.04	31.87	31.73	31.17	30.03	29.22	29.86	27.43	27.74
45	34.31	32.49	31.07	29.55	27.48	27.34	26.87	25.87	25.28	26.00	23.86	24.21
50	29.91	28.12	26.71	25.26	23.34	23.22	22.83	21.96	21.51	22.22	20.39	20.76
55	25.73	23.88	22.56	21.25	19.51	19.45	19.11	18.34	17.97	18.59	17.03	17.42
60	21.78	19.90	18.71	17.56	16.07	16.01	15.76	15.05	14.72	15.25	13.98	14.35
65	18.06	16.22	15.24	14.26	13.02	12.97	12.75	12.07	11.77	12.21	11.25	11.51
70	14.51	12.87	12.11	11.35	10.38	10.29	10.07	9.42	9.20	9.51	8.83	9.03
75	11.23	9.92	9.40	8.87	8.06	7.92	7.77	7.17	7.02	7.30	6.75	6.84
80	8.32	7.43	7.11	6.76	6.18	5.89	5.88	5.38	5.26	5.47	5.09	5.10
85	5.88	5.43	5.28	5.09	4.63	4.34	4.35	4.02	3.99	4.06	3.88	3.81
90	3.98	3.90	3.85	3.83	3.49	3.16	3.27	3.06	3.03	3.18	2.99	2.85
95	2.70	2.77	2.88	2.91	2.67	2.43	2.48	2.40	2.19	2.36	2.31	2.12
100	1.92	1.98	2.21	2.41	2.20	1.91	1.92	1.96	1.49	1.58	1.68	1.55

See footnotes at end of table.

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Table 21. Life expectancy, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Average number of years of life remaining, e_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
White female												
0	81.24	79.99	79.45	78.22	75.49	74.19	72.03	67.29	62.67	58.53	53.62	51.08
1	80.59	79.40	78.99	77.98	75.66	74.68	72.77	68.93	64.93	61.51	58.69	56.39
5	76.65	75.48	75.10	74.13	71.86	70.92	69.09	65.57	62.17	59.43	57.67	56.03
10	71.69	70.53	70.16	69.21	66.97	66.05	64.26	60.85	57.65	55.17	53.57	52.15
15	66.73	65.58	65.23	64.29	62.07	61.15	59.39	56.07	53.00	50.67	49.12	47.79
20	61.82	60.70	60.36	59.44	57.24	56.29	54.56	51.38	48.52	46.46	44.88	43.77
25	56.97	55.83	55.51	54.60	52.42	51.45	49.77	46.78	44.25	42.55	40.88	40.05
30	52.16	50.95	50.65	49.76	47.60	46.63	45.00	42.21	39.99	38.72	36.96	36.42
35	47.39	46.11	45.82	44.93	42.82	41.84	40.28	37.70	35.73	34.86	33.09	32.82
40	42.66	41.33	41.03	40.16	38.12	37.13	35.64	33.25	31.52	30.94	29.26	29.17
45	37.98	36.62	36.30	35.49	33.54	32.53	31.12	28.90	27.39	26.98	25.45	25.51
50	33.40	32.01	31.71	30.96	29.11	28.08	26.76	24.72	23.41	23.12	21.74	21.89
55	28.96	27.53	27.29	26.61	24.85	23.81	22.58	20.73	19.60	19.40	18.18	18.43
60	24.69	23.25	23.09	22.45	20.79	19.69	18.64	17.00	16.05	15.93	14.92	15.23
65	20.56	19.23	19.14	18.55	16.93	15.88	15.00	13.56	12.81	12.75	11.97	12.23
70	16.61	15.47	15.46	14.89	13.37	12.38	11.68	10.50	9.98	9.94	9.38	9.59
75	12.97	12.02	12.11	11.58	10.21	9.28	8.87	7.92	7.56	7.62	7.20	7.33
80	9.69	9.04	9.12	8.65	7.59	6.67	6.59	5.88	5.63	5.70	5.35	5.50
85	6.91	6.59	6.62	6.32	5.54	4.66	4.83	4.34	4.24	4.24	4.06	4.10
90	4.70	4.67	4.69	4.59	4.05	3.23	3.51	3.24	3.17	3.16	3.00	3.02
95	3.16	3.24	3.36	3.39	3.04	2.43	2.56	2.47	2.24	2.20	2.27	2.21
100	2.18	2.24	2.49	2.70	2.49	1.91	1.92	1.95	1.48	1.42	1.74	1.58
Black[1]												
0	75.31	71.81	69.16	68.52	64.11	63.91	60.73	53.85	48.53	47.03	35.87	33.80
1	75.13	71.84	69.43	68.99	65.27	65.75	62.65	57.15	51.71	51.01	43.84	43.00
5	71.24	67.98	65.64	65.25	61.62	62.21	59.25	54.13	49.25	49.44	45.34	45.55
10	66.30	63.05	60.75	60.38	56.79	57.41	54.50	49.50	44.80	45.26	41.74	42.46
15	61.37	58.13	55.86	55.49	51.94	52.57	49.73	44.89	40.37	41.02	38.02	39.04
20	56.59	53.38	51.19	50.75	47.34	47.88	45.19	40.73	36.62	37.72	34.86	36.03
25	51.95	48.78	46.67	46.18	43.00	43.35	40.85	36.91	33.32	34.91	31.72	33.04
30	47.35	44.16	42.22	41.69	38.70	38.89	36.59	33.17	30.07	31.98	28.43	29.96
35	42.79	39.59	37.87	37.28	34.48	34.56	32.44	29.53	26.94	29.07	25.39	26.82
40	38.28	35.12	33.65	32.98	30.46	30.39	28.48	26.06	23.82	26.07	22.41	23.73
45	33.84	30.84	29.55	28.87	26.65	26.46	24.75	22.82	20.97	23.17	19.58	20.67
50	29.53	26.80	25.62	25.03	23.11	22.74	21.38	19.94	18.22	20.17	16.84	17.95
55	25.46	22.97	21.95	21.50	19.83	19.45	18.41	17.43	15.80	17.33	14.33	15.23
60	21.69	19.43	18.59	18.29	16.83	16.53	15.87	15.18	13.62	14.72	12.16	13.06
65	18.23	16.14	15.56	15.37	14.16	13.96	13.59	13.02	11.49	12.22	10.22	10.87
70	14.99	13.18	12.87	12.67	11.77	11.63	11.48	10.93	9.54	9.90	8.59	8.96
75	11.93	10.54	10.48	10.32	9.89	9.52	9.48	8.97	7.84	8.00	7.08	7.24
80	9.22	8.29	8.30	8.17	8.20	7.28	7.62	7.31	6.19	6.22	5.80	5.79
85	6.90	6.41	6.51	6.54	6.54	5.27	5.79	5.91	4.92	4.88	4.80	4.56
90	5.07	4.90	4.94	5.13	5.09	3.48	3.97	4.64	3.83	3.84	4.26	3.60
95	3.70	3.71	3.82	4.08	4.28	2.43	2.70	3.51	2.83	2.90	3.31	2.82
100	2.74	2.81	2.91	3.58	3.93	1.91	1.94	2.57	1.87	1.94	2.27	2.18
Black male[1]												
0	71.94	68.17	64.47	64.10	60.00	61.48	58.91	52.26	47.55	47.14	34.05	32.54
1	71.81	68.25	64.76	64.60	61.24	63.50	61.06	55.93	51.08	51.63	42.53	42.46
5	67.92	64.40	60.98	60.86	57.60	59.98	57.69	52.95	48.69	50.18	44.25	45.06
10	62.98	59.48	56.09	56.01	52.79	55.19	52.96	48.34	44.27	45.99	40.65	41.90
15	58.07	54.57	51.22	51.14	47.96	50.39	48.23	43.74	39.83	41.75	36.77	38.26
20	53.39	49.92	46.71	46.48	43.49	45.78	43.73	39.52	35.95	38.36	33.46	35.11
25	48.90	45.50	42.40	42.09	39.45	41.38	39.49	35.72	32.67	35.54	30.44	32.21
30	44.46	41.02	38.14	37.81	35.40	37.05	35.31	32.05	29.45	32.51	27.33	29.25
35	40.03	36.56	34.02	33.60	31.42	32.81	31.21	28.48	26.39	29.54	24.42	26.16
40	35.65	32.18	30.05	29.51	27.61	28.72	27.29	25.06	23.36	26.53	21.57	23.12
45	31.32	28.01	26.18	25.61	24.03	24.89	23.59	21.88	20.59	23.55	18.85	20.09

See footnotes at end of table.

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Table 21. Life expectancy, by age, race, and sex: Death-registration states, 1900–1902 to 1919–1921, and United States, 1929–1931 to 2017—Con.

[Includes Alaska and Hawaii beginning in 1959. For decennial periods prior to 1929–1931, data are for groups of registration states as follows: 1900–1902 and 1909–1911, 10 states and the District of Columbia; and 1919–1921, 34 states and the District of Columbia. Beginning in 1970, excludes deaths of nonresidents of the United States; see Technical Notes]

Age (years), race, and sex	Average number of years of life remaining, e_x											
	2017	1999–2001	1989–1991	1979–1981	1969–1971	1959–1961	1949–1951	1939–1941	1929–1931	1919–1921	1909–1911	1900–1902
Black male[1]–Con.												
50	27.12	24.13	22.50	22.03	20.69	21.28	20.25	19.06	17.92	20.47	16.21	17.34
55	23.16	20.50	19.08	18.79	17.66	18.11	17.36	16.60	15.46	17.50	13.82	14.69
60	19.57	17.19	16.01	15.89	14.93	15.29	14.91	14.37	13.15	14.74	11.67	12.62
65	16.36	14.12	13.27	13.29	12.53	12.84	12.75	12.21	10.87	12.07	9.74	10.38
70	13.43	11.40	10.88	10.94	10.40	10.81	10.74	10.11	8.78	9.58	8.00	8.33
75	10.65	9.07	8.84	8.90	8.76	8.93	8.83	8.17	6.99	7.61	6.58	6.60
80	8.19	7.12	7.01	7.03	7.35	6.87	7.07	6.58	5.42	5.83	5.53	5.12
85	6.13	5.52	5.58	5.61	5.92	5.08	5.38	5.34	4.30	4.53	4.48	4.04
90	4.48	4.23	4.24	4.47	4.68	3.42	3.78	4.23	3.42	3.60	4.01	3.21
95	3.28	3.24	3.37	3.62	3.92	2.43	2.64	3.20	2.54	2.61	3.15	2.50
100	2.45	2.48	2.63	3.24	3.61	1.91	1.93	2.29	1.68	1.64	2.14	1.89
Black female[1]												
0	78.46	75.16	73.73	72.88	68.32	66.47	62.70	55.56	49.51	46.92	37.67	35.04
1	78.22	75.13	73.96	73.31	69.37	68.10	64.37	58.46	52.33	50.39	45.15	43.54
5	74.33	71.26	70.16	69.54	65.70	64.54	60.93	55.40	49.81	48.70	46.42	46.04
10	69.39	66.32	65.26	64.65	60.85	59.72	56.17	50.75	45.33	44.54	42.84	43.02
15	64.44	61.39	60.34	59.74	55.97	54.85	51.36	46.13	40.87	40.36	39.18	39.79
20	59.54	56.52	55.49	54.90	51.22	50.07	46.77	42.04	37.22	37.15	36.14	36.89
25	54.72	51.71	50.72	50.13	46.57	45.40	42.35	38.20	33.93	34.35	32.97	33.90
30	49.95	46.95	46.03	45.43	42.00	40.83	38.02	34.40	30.67	31.48	29.61	30.70
35	45.23	42.26	41.45	40.79	37.56	36.41	33.82	30.83	27.47	28.58	26.44	27.52
40	40.58	37.69	36.96	36.28	33.32	32.16	29.82	27.19	24.30	25.60	23.34	24.37
45	36.04	33.29	32.58	31.94	29.31	28.14	26.07	23.89	21.39	22.61	20.43	21.36
50	31.61	29.06	28.38	27.84	25.52	24.31	22.67	20.95	18.60	19.76	17.65	18.67
55	27.39	25.01	24.41	24.00	21.97	20.89	19.62	18.38	16.27	17.09	14.98	15.88
60	23.43	21.20	20.71	20.42	18.66	17.83	16.95	16.10	14.22	14.69	12.78	13.60
65	19.69	17.65	17.37	17.13	15.67	15.12	14.54	13.95	12.24	12.41	10.82	11.38
70	16.14	14.41	14.32	14.05	13.02	12.46	12.29	11.82	10.38	10.25	9.22	9.62
75	12.80	11.49	11.56	11.37	10.85	10.10	10.15	9.81	8.62	8.37	7.55	7.90
80	9.83	8.96	9.05	8.95	8.87	7.66	8.15	8.02	6.90	6.58	6.05	6.48
85	7.29	6.86	6.99	7.09	7.00	5.44	6.15	6.41	5.48	5.22	5.09	5.10
90	5.23	5.16	5.24	5.47	5.41	3.52	4.13	4.96	4.20	4.07	4.50	4.01
95	3.72	3.84	3.97	4.30	4.58	2.43	2.74	3.71	3.09	3.18	3.45	3.15
100	2.67	2.84	2.97	3.69	4.20	1.91	1.94	2.70	2.04	2.23	2.39	2.49

[1]For 1939–1941 and 1949–1951, data shown are for the entire nonwhite population. During these periods, life tables were not constructed for the black population. See Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Technical Notes

The life table program

Two series of complete life tables for the U.S. population are prepared by the National Center for Health Statistics (NCHS). *Decennial life tables* are based on decennial U.S. census data and final deaths for a 3-year period around the census year. *Annual final life tables* (referred to here as "annual life tables") are based on a complete count of all reported deaths.

Available since 1945, the annual life tables are based on deaths occurring during the calendar year and on midyear postcensal population estimates provided by the U.S. Census Bureau. From 1945 to 1996, the annual life tables were abridged life tables, closed at age 85 and over, and were constructed by reference to a standard table (4). Beginning with 1997 mortality data, a new methodology similar to that of the 1989–1991 decennial life tables was employed to estimate annual complete life tables to age 100, with combined life table values presented for ages 100 and over (9). The methodology was again revised for data years 2000–2007 using a methodology similar to that of the 1999–2001 decennial life tables (10). Beginning with data year 2008, the life table methodology was refined by changing the smoothing technique used to estimate the life table functions at the oldest ages (11).

The methodology used to estimate the 2008–2017 life tables is different from that used to estimate the 2000–2007 life tables with respect to the technique used to estimate the probabilities of death for ages over 65. The methodology used to produce the life tables for 2008–2017 does not model the probabilities of death beginning at age 66, as was done for data years 2000–2007, but rather at ages above 85 or so. (The exact ages at which smoothing techniques are used depends on the specific racial and ethnic population.) Research into the methodology developed and used for the 1999–2001 decennial life tables and applied to the annual life tables has revealed that it is not necessary to model (or "smooth") the probabilities of death beginning at age 66. The observed blended vital statistics and Medicare data for ages 66–85 are robust enough and do not require additional smoothing (11). A full description of the methodology used to estimate the 2017 life tables is provided below. See "United States Life Tables, 2005" (10) for a detailed description of the methodology used for data years 2000–2007.

Beginning with 2006 mortality data, life tables by Hispanic origin were added to the annual life table program. Before this time, concerns over data limitations such as racial and ethnic misclassification on U.S. death certificates and lack of Medicare data for older populations other than the white and black populations prevented the estimation of life tables for the Hispanic-origin population. Recent research that identified and quantified these data limitations has led to the development of reliable methodological strategies to address these data problems (5,12–14). The methodology developed to estimate life tables for the Hispanic and non-Hispanic white and black populations is described in detail below and in "United States Life Tables by Hispanic Origin" (12).

Revised intercensal life table values

Life table values for 1960–1969, 1970–1979, and 1980–1989 were constructed using the U.S. decennial life tables for 1959–1961, 1969–1971, and 1979–1981, respectively, as the standard tables. The life table values for years before 1989 appearing in this report are based on revised intercensal estimates of the populations for those years. As a result, the life table values for these years may differ from the life table values for those years published in Vital Statistics of the United States for 1989 and earlier years (https://www.cdc.gov/nchs/products/vsus.htm). Life table values for 1991–1999 presented in this report are based on postcensal population estimates of the population enumerated in the 1990 decennial census. Life table values for 2001–2009 presented in this report are based on revised intercensal population estimates based on the 2010 decennial census and the revised methodology used to estimate the 2008–2017 life tables. As a result, the values may differ from those previously published in annual final mortality and life table reports (15). The revised intercensal life tables for years 2001–2009 can be accessed by links provided under each of the annual life table reports in: https://www.cdc.gov/nchs/products/life_tables.htm.

Geographic coverage

The geographic areas covered in life tables before 1929–1931 were limited to death-registration areas. Life tables for 1900–1902 and 1909–1911 were constructed using mortality data from the 1900 death-registration states (10 states and the District of Columbia), and tables for 1919–1921 used mortality data from the 1920 death-registration states (34 states and the District of Columbia). The tables for 1929–1931 through 1958 cover the coterminous United States. Decennial life table values for the 3-year period 1959–1961 were derived from data that include both Alaska and Hawaii for each year (Tables 20 and 21). Data for each year shown in Table 19 include Alaska beginning in 1959 and Hawaii beginning in 1960. However, it is believed that the inclusion of these two states does not materially affect life table values.

New Jersey data, 1962–1964

The life tables for 1962 and 1963 for the six population groups involving race do not include data from New Jersey, which omitted the item on race from its certificates of live birth, death, and fetal death in use at the beginning of 1962. The item was restored during the latter part of 1962. However, the certificate revision without this item was used for most of 1962, as well as for 1963. For computing vital rates, populations by age, race, and sex (excluding New Jersey) were estimated to obtain comparable denominators. Approximately 7% of the New Jersey death records for 1964 did not contain the race designation. When the records were being electronically processed for this state, the "race not stated" deaths were allocated proportionally to white or to black.

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Nonresidents

Beginning in 1970, the deaths of nonresidents of the United States were excluded from the life table statistics.

Estimation of life table functions

For some years, it was necessary to estimate life table functions for some race–sex groups. In Tables 20 and 21, values for the black population during the periods 1939–1941 and 1949–1951 were estimated using values for the nonwhite population. Life table functions were also missing in Tables 20 and 21 for some race–sex groups for the periods from 1900–1902 to 1939–1941. Values were missing for the following groups:

Years	*Race and sex*
1900–1902	Total white, total black
1909–1911	Total white, total black
1919–1921	Total, male, female, total white, total black
1929–1931	Total, male, female, total white, total black

These missing values were estimated by weighted averages using population distributions as the weights. For example, life expectancy at age 20 for the total black population was estimated by a weighted average of black male and black female life expectancies at age 20, using as weights the population distribution by sex of the black population aged 20.

Annual life tables were initiated in 1945 for white males, white females, all other males, and all other females. The values in Table 19 by race and sex for the following years were estimated using a procedure other than the abridged life table methodology (16):

Years	*Race and sex*
1900–1945	Total
1900–1947	Male
1900–1947	Female
1900–1950	White
1900–1944	White male
1900–1944	White female

Annual life table functions were not calculated for the black population before 1970. In Table 19, life expectancy for the black population for years before 1970 is estimated using values for the total nonwhite population.

Data for calculating life table functions

The data used to prepare the U.S. life tables include final death counts from the National Vital Statistics System (NVSS), population estimates from the U.S. Census Bureau, and death and population counts for Medicare beneficiaries aged 66–99 from the Centers for Medicare & Medicaid Services (CMS).

Vital statistics data

Death counts used for computing the life tables presented in this report are final numbers of deaths for 2017 collected from death certificates filed in state vital statistics offices and reported to NCHS as part of NVSS. Race and Hispanic origin are reported separately on the death certificate.

The U.S. Standard Certificate of Death was revised in 2003, and its race and Hispanic-origin items reflect the mandate of the 1997 Office of Management and Budget (OMB) standards (17). This revision allowed individuals to report more than one race and increased the race choices from four to five by separating the Asian and Pacific Islander groups. In 2017, 49 states and the District of Columbia had adopted the 1997 OMB standards, while 1 state continued to collect race and ethnicity data according to the 1977 OMB standards (6,18). To attain uniformity and comparability during the transition period until all states implement the 1997 standards, multiple-race responses are "bridged" back to the 1977 single-race standard, and Asian and Pacific Islander groups are combined according to the 1977 standards. The bridging procedure is the same as that used to bridge multiple-race population estimates, as discussed below (19).

Census population data

The population data used to estimate the life tables shown in this report were produced under a collaborative agreement with the U.S. Census Bureau and are consistent with the postcensal estimates of the 2010 census. Reflecting the 1997 OMB guidelines on race and ethnicity reporting (17), the 2010 census included an option for individuals to report more than one race and provided for the reporting of Asian persons separately from Native Hawaiian or other Pacific Islander persons. Death certificate data by race for states that have not yet implemented the 1997 OMB standards are thus currently incompatible with the population data collected in the 2010 census (the denominators for the rates). To produce death rates for 2017, it was necessary to bridge the reported population data for multiple-race persons back to single-race categories. In addition, the 2010 census counts were modified to be consistent with the 1977 OMB race categories (i.e., to report the data for Asian persons and Native Hawaiian or other Pacific Islander persons as a combined category [Asian or Pacific Islander] and to reflect age as of the census reference date) (20). The procedures used to produce the bridged populations are described elsewhere (19).

Medicare data

Medicare data have traditionally been employed in the estimation of U.S. decennial life tables and in the estimation of U.S. annual life tables since 1997 (9). Medicare data are considered to be more accurate than vital statistics and census data at the oldest ages because Medicare enrollees must have proof of age in order to enroll (21). However, the reliability of Medicare data beyond age 100 declines because of the small percentage of persons who enrolled at the start of the Medicare program in 1965 and for whom it was not possible to verify exact

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age (21). Further, the Medicare race and ethnicity classification system makes it impossible to correctly identify the Hispanic, American Indian or Alaska Native, or Asian or Pacific Islander populations (12,22). It is, however, possible to use Medicare data to estimate old-age mortality for both the white and black race groups, irrespective of Hispanic origin, as has been done traditionally, and to estimate old-age mortality for the non-Hispanic segments of these populations (12). As a result, data from the Medicare program are used to supplement vital statistics and census data for ages 66–99 for the total population and for the white, black, non-Hispanic white, and non-Hispanic black populations (12).

To estimate death rates for the Medicare white, black, non-Hispanic white, and non-Hispanic black populations in 2017, age-specific numbers of deaths and population counts by sex and race for the population aged 66–99 from the 2018 Medicare file were used. The data file is created by CMS for the Social Security Administration, which under a special agreement shares the data with NCHS. The 2018 file contains 2017 mid-year Medicare population counts (June 30, 2017) and calendar year Medicare death counts (January 1 through December 31, 2017). Age for both deaths and mid-year population counts is calculated as age at last birthday. The structure of this file differs from the previous Medicare files used to produce the life tables in several important ways. First, CMS now generates the summary data from the Integrated Data Repository (IDR) rather than the Health Insurance Skeleton Writeoff (HISKEW) file. IDR is considered superior to HISKEW with respect to data quality because it contains more ways to correctly determine beneficiary status. Second, deaths are tabulated by age at last birthday as has been done for population counts. Previously, deaths were tabulated by calendar age, which required additional steps to align age at death with age for the living population. Third, counts for the living population are generated as of June 30, rather than as of January 1, making the calculation of the age-specific death rates more direct. With the previous data structure, it was necessary to average January 1 population counts across 2 years and smooth half ages to achieve whole age counts. Last, final summary counts for a calendar year are available 6 months after the close of the data year. Previously, final counts became available 3 years after the close of the data year, which resulted in the estimation of provisional and final life tables for a data year. With the new Medicare data file structure, only one final version of the U.S. life tables will be produced for each data year. The life expectancy estimates are not substantively affected as a result of the change in the structure of the Medicare data files.

Preliminary adjustment of the data

Adjustment for unknown age

An adjustment is made to account for the small proportion of deaths each year for which age is not reported on the death certificate. The number of deaths in each age category is adjusted proportionally to account for those with not-stated ages. The following factor (F) is used to make the adjustment. F is calculated for the total and for each sex group within a racial and ethnic population for which life tables are constructed:

$$F = \frac{D}{D^a} \quad [1]$$

where D is the total number of deaths and D_a is the total number of deaths for which age is stated. F is then applied by multiplying it by the number of deaths in each age group. Table I shows values for F by sex used to adjust mortality data for the total, white, black, Hispanic, non-Hispanic white, and non-Hispanic black populations in 2017.

Table I. Values for *F* used to adjust for not-stated age based on 2017 mortality data

Race, Hispanic origin, and sex	Total deaths	Total deaths for which age was not stated	*F*
Total	2,813,503	129	1.00004585
Male	1,439,111	91	1.00006324
Female	1,374,392	38	1.00002765
White	2,378,385	108	1.00004541
Male	1,212,488	77	1.00006351
Female	1,165,897	31	1.00002659
Black	340,644	21	1.00006165
Male	177,332	14	1.00007895
Female	163,312	7	1.00004286
Hispanic	197,249	11	1.00005577
Male	108,579	8	1.00007368
Female	88,670	3	1.00003383
Non-Hispanic white	2,179,857	60	1.00002753
Male	1,102,838	47	1.00004262
Female	1,077,019	13	1.00001207
Non-Hispanic black	335,667	16	1.00004767
Male	174,403	10	1.00005734
Female	161,264	6	1.00003721

SOURCE: NCHS, National Vital Statistics System, Mortality.

Adjustment for misclassification of race and Hispanic origin on death certificates

The latest research to evaluate race and Hispanic-origin reporting on U.S. death certificates found that the misclassification of race and Hispanic origin on death certificates in the United States accounts for a net underestimate of 3% for total Hispanic deaths, a net underestimate of less than one-half percent for total non-Hispanic black deaths, and no under or overestimate for total non-Hispanic white deaths or for the population racially classified as white or black, irrespective of Hispanic origin (5). These results are based on a comparison of self-reported race and Hispanic origin on Current Population Surveys (CPS) with race and Hispanic origin reported on the death certificates of a sample of decedents in the National Longitudinal Mortality Study (NLMS) who died during the period 1999–2011 (5).

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NLMS-linked records are used to estimate sex-age-specific ratios of CPS race and Hispanic-origin counts to death certificate counts (5,13,14). The CPS/death certificate ratio, or "classification ratio," is specifically the ratio of the weighted count of self-reported race and ethnicity on the CPS to the weighted count of the same racial or ethnic category on the death certificates of the sample of NLMS decedents described above. It can be interpreted as the net difference in assignment of a specific race and Hispanic-origin category between the two classification systems and can be used as a correction factor for race and Hispanic-origin misclassification (5,13,14). The assumption is made that the race and ethnicity reported by a CPS respondent is more reliable than proxy reporting of race and ethnicity by a funeral director who has little personal knowledge of the decedent. Further, public policy embodied in the 1997 OMB standard mandates that self-identification should be the standard used for the collection and recording of race and ethnicity information (17).

The NLMS-based classification ratios discussed above are used to adjust the age-specific number of deaths for ages 1–95 and over for the total Hispanic, non-Hispanic white, and non-Hispanic black populations, and by sex for each group, as follows:

$$ {}_nD_x = {}_nD_x^F \bullet {}_nCR_x , \qquad [2] $$

where ${}_nD_x^F$ is the age-specific number of deaths adjusted for unknown age as described above, ${}_nCR_x$ are the sex- and age-specific classification ratios used to correct for the misclassification of race and Hispanic origin on death certificates, and ${}_nD_x$ are the final age-specific counts of death adjusted for age and race and Hispanic-origin misclassification. Table II shows values of the sex- and age-specific classification ratios, ${}_nCR_x$, by Hispanic origin and race for the non-Hispanic population (black and white).

Because NLMS classification ratios for infant deaths are unreliable due to small sample sizes, corrections for racial and ethnic misclassification of infant deaths are addressed by using infant death counts and live birth counts from the 2016 and 2017 linked birth/infant death data files rather than the traditional birth and death data files (23,24). In the linked file, each infant death record is linked to its corresponding birth record so that the race and ethnicity reported on the birth record can be ascribed to the infant death record. As a result, race- and ethnicity-specific infant mortality rates estimated with the linked file do not suffer from the problem of racial and ethnic discrepancies between the numerator and denominator of the rate. A ratio of infant mortality rates based on the traditional birth and death data files to infant mortality rates based on the linked birth/infant death data file shows that using the traditional files overestimates the infant mortality rate by 4.9% for Hispanic infants and 5.3% for non-Hispanic black infants, and underestimates the rate by 2% for non-Hispanic white infants (see ratios for age 0 in Table II). Because the probability of death at age 0 used to calculate the life table uses live births in the denominator (procedure described below), it is preferable to use the linked birth/infant death data file.

Note that although there is no conclusive evidence supporting return migration as a factor in the lower mortality of the Hispanic population, the possibility remains that Hispanic deaths are missed in NVSS due to return migration, and therefore, the resulting death rates may be biased irrespective of correction for ethnic misclassification (12,25).

Interpolation of P_x and D_x

Anomalies—both random and those associated with reporting age at death—can be problematic when using vital statistics and census data by single years of age to estimate the probability of death (1,9). Graduation techniques are often used to eliminate these anomalies and to derive a smooth curve by age. Beers' ordinary minimized fifth difference formula is used to obtain smoothed values of population counts (P_x) and death counts (D_x) from 5-year age groupings of ${}_nP_x$ from age 0 to 99 and ${}_nD_x$ from age 5 to 99, and where ${}_nD_x$ has first

Table II. Classification ratios by Hispanic origin, race for the non-Hispanic white and black populations, age, and sex

Age (years)	Hispanic			Non-Hispanic white			Non-Hispanic black		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
All ages	1.0329	1.0362	1.0294	0.9995	0.9993	0.9997	1.0047	1.0041	1.0053
0[1]	1.0489	1.0655	1.0299	0.9831	0.9774	0.9905	1.0532	1.0612	1.0432
1–14	0.9905	0.9659	*1.0299	0.9918	1.0755	0.8770	1.0266	0.9379	*1.1751
15–24	0.9668	0.9325	1.0604	0.9976	1.0019	0.9869	1.0248	1.0215	1.0343
25–34	1.0354	1.0401	1.0232	1.0021	1.0034	0.9994	0.9855	0.9770	1.0008
35–44	1.0434	1.0645	1.0066	0.9980	0.9997	0.9951	1.0062	1.0073	1.0048
45–54	1.0584	1.0372	1.0953	0.9969	0.9965	0.9976	1.0002	1.0019	0.9982
55–64	1.0571	1.0517	1.0659	0.9994	0.9992	0.9997	1.0003	0.9965	1.0046
65–74	1.0295	1.0485	1.0072	0.9967	0.9967	0.9966	1.0062	1.0055	1.0070
75–84	1.0192	1.0188	1.0196	1.0004	1.0003	1.0004	1.0057	1.0057	1.0058
85–94	1.0208	1.0313	1.0137	1.0008	1.0007	1.0009	1.0110	1.0155	1.0086
95 and over	1.0732	1.0509	1.0842	1.0005	0.9995	1.0008	0.9980	0.9872	0.9954

*Ratio does not meet NCHS standards of reliability because either the unweighted number of Current Population Survey deaths or the unweighted number of death certificate deaths, or both, are based on fewer than 20 deaths.
[1]Ratios for age 0 are estimated as the ratio of infant mortality rates based on the traditional death and birth files to the infant mortality rates based on the 2017 linked birth/infant death data file. Ratios are shown for illustrative purposes only; see text for details.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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been adjusted for not-reported age and race and Hispanic-origin misclassification on the death certificate (see reference 9 for details on the application of Beers' method).

Calculation of the probability of dying (q_x)

The first step in the calculation of a complete period life table is the estimation of the age-specific probability of dying, q_x, which is derived from the age-specific death rate, m_x (3,26). In the life table cohort,

$$m_x = \frac{d_x}{L_x}$$

where d_x is the number of deaths occurring between ages x and $x + 1$, and L_x is the number of person-years lived by the life table cohort between ages x and $x + 1$. The conversion of the age-specific death rate, m_x, to the age-specific probability of death, q_x, is as follows:

$$q_x = \frac{m_x}{1 + (1 - a_x)\, m_x} \qquad [3]$$

where a_x is the number of person-years lived in the age interval by members of the life table cohort who died in the interval. When the age interval is 1 year, except at infancy, $a_x = 1/2$; in other words, deaths occur on average midway through the age interval. As a result,

$$q_x = \frac{m_x}{1 + \frac{1}{2} m_x} \qquad [4]$$

because the complete period life table is based on the age-specific death rates of a current population observed for a specific calendar year, the life table death rate is equivalent to the observed death rates of the current population:

$$m_x = \frac{d_x}{L_x} = M_x = \frac{D_x}{P_x}$$

where D_x is the Beers' smoothed number of deaths adjusted for not-stated age and race and Hispanic-origin misclassification on the death certificate (for the Hispanic, non-Hispanic white, and non-Hispanic black populations) and P_x is the Beers' smoothed population at risk of dying between ages x and $x + 1$. Then,

$$q_x = \frac{M_x}{1 + \frac{1}{2} M_x} = \frac{D_x}{P_x + \frac{1}{2} D_x} \qquad [5]$$

this procedure is used to estimate vital statistics age-specific probabilities of death for ages 1–99.

Calculation of q_x at age 0

The higher mortality observed in infancy is associated with a high concentration of deaths occurring at the beginning of the age interval rather than in the middle. As a result, whenever possible, it is best to assign deaths to the appropriate birth cohorts. Therefore, the probability of death at birth, q_0, is calculated using a birth cohort method that employs a separation factor (f) defined as the proportion of infant deaths in year t occurring to infants born in the previous year ($t - 1$). The value f is estimated by categorizing infant deaths by date of birth. The probability of death is then calculated as

$$q_0 = \frac{D_0\,(1 - f)}{B^t} + \frac{D_0\,(f)}{B^{t-1}} \qquad [6]$$

where D_0 is the number of infant deaths adjusted for not-stated age in 2017, B^t is the number of live births in 2017, and B^{t-1} is the number of live births in 2016. Table III shows separation factors and numbers of births for 2016–2017.

Probabilities of dying at the oldest ages for the total, white, black, non-Hispanic white, and non-Hispanic black populations

Medicare data are used to supplement vital statistics data for the estimation of q_x at the oldest ages because these data are more accurate given that proof of age is required for enrollment in the Medicare program. Medicare data are used here to estimate the probability of dying for ages 66 and over for the total, white, black, non-Hispanic white, and non-Hispanic black populations.

The method described in this section consists of the following steps. First, vital statistics and Medicare death rates are blended in the age range 66–99. Second, a logistic model is used to smooth the blended death rates in the age range 85–99 and predict death rates for ages 100–120. Third, final resulting death rates, M_x, are converted to q_x.

For ages 66–94, vital statistics death rates, M_x^V, and Medicare death rates, M_x^M, are blended with a weighting process that gives gradually declining weight to vital statistics data and gradually increasing weight to Medicare data. For ages 95–99, M_x^M is used exclusively. Blended M_x is thus obtained as follows:

$$M_x = \frac{1}{30}[(95 - x)\, M_x^V + (x - 65)\, M_x^M] \qquad [7]$$

when $x = 66,\ldots,94$

and $M_x = M_x^M$

when $x = 95,\ldots,99$.

M_x^M is estimated as follows:

$$M_x^M = \frac{D_x^M}{P_x^M}$$

where D_x^M is the age-specific Medicare death count, and P_x^M is the age-specific Medicare mid-year population count.

A logistic model proposed by Kannisto is then used to smooth M_x in the age range 85–99 and predict M_x in the age range 100–120 (27). The start of the modeled age range varies by race- and ethnicity-specific population because it is a function of the age at which the rate of change in the age-specific death rates peaks. In current times, the rate of change in the age-specific

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death rate rises steadily up to approximately ages 80–85 or so and then begins to decline. As a result, it is difficult to model a large age span, such as 65–100, with one simple model without over smoothing and thus altering the underlying mortality pattern observed in the population of interest (28). Further, the observed data for the age range 65–85 or so is reliable and robust, as indicated by the very close similarity between vital statistics and Medicare death rates, so it is unnecessary to model (smooth) the entire age span (65–100).

The Kannisto model is a simple form of a logistic model in which the logit of u_x (or the natural log of the odds of u_x) is a linear function of age, x (27). It is expressed as:

$$\ln\left[\frac{u_x}{1-u_x}\right] = \ln(\alpha) + \beta x \qquad [8]$$

where u_x, the force of mortality (or the instantaneous death rate), is defined as:

$$u_x = \frac{\alpha e^{\beta x}}{1 + \alpha e^{\beta x}}$$

Because u_x is not directly observed but is closely approximated by m_x, and $m_x = M_x$, then the logit of M_x is modeled instead. A maximum-likelihood generalized linear model estimation procedure is used to fit the following model in the age range 85–99 years:

$$\ln\left[\frac{M_x}{1-M_x}\right] = \ln(\alpha) + \beta x \qquad [9]$$

Then, the estimated parameters are used to predict as $\bar{M}_x$ follows:

$$\bar{M}_x = \frac{e^a e^{bx}}{1 + e^a e^{bx}}, \text{ or equivalently, } \bar{M}_x = \frac{e^{a+bx}}{1 + e^{a+bx}} \qquad [10]$$

where a and b are the predicted values of parameters $\ln(\alpha)$ and β, respectively, given by fitting model [9]. Estimated parameters and the starting age for the modeled age span by population in 2017 are presented in Table IV.

Finally, the predicted probability of death, $\bar{q}_x$, for ages 85–120 is estimated by converting $\bar{M}_x$ as follows:

$$\bar{q}_x = \frac{\bar{M}_x}{1 + \frac{1}{2}\bar{M}_x} \qquad [11]$$

The probability of death is extrapolated to age 120 in order to estimate the life table population until no survivors remain. This information is then used to estimate L_x for ages 100–120, which is used to close the table with the age category 100 and over, combined (discussed below).

Probabilities of dying at the oldest ages for the Hispanic population

As noted above, Medicare data are unreliable for the Hispanic population due to inconsistencies in the Medicare race and ethnicity classification system. As a result, it was necessary to use other methods to estimate mortality at the oldest ages for this population. Beyond age 80, mortality estimates based strictly on vital statistics for the Hispanic population are too low, despite correction for ethnic misclassification on the death certificate.

A consistent finding across diverse studies has been that Hispanic mortality in the adult and advanced ages varies between approximately 80% and 89% of that of the non-Hispanic white population (13,14,25,29). The Brass relational logit model takes advantage of the relationship between Hispanic and non-Hispanic white mortality previously identified and has been widely and successfully used to predict the mortality of one population relative to another at the older ages (3,30–32). Using the age-specific mortality pattern of the non-Hispanic white population as the "standard," the Brass relational logit model is used to predict Hispanic mortality in the older ages. The standard is fit to Hispanic data in the age interval 45–80, and the predicted parameters are used to estimate the probabilities of death for ages 76–100. This method allows the relationship between the two populations in the younger ages to be carried over to the older ages (3,30–32).

The Brass relational logit model expresses the age-specific mortality pattern of a population of interest as a function of the age-specific mortality pattern of a standard population and is expressed as:

$$\bar{Y}_x = \alpha + \beta Y_x^s \qquad [12]$$

where $\bar{Y}_x$ is the predicted logit of the probability of death, q_x, in the population of interest, i.e.,

$$\text{logit}\,[q_x] = \ln\left[\frac{q_x}{1-q_x}\right]$$

Y_x^S is the logit of the probability of death in the standard population, q_x^S, i.e.,

$$\text{logit}\,[q_x^S] = \ln\left[\frac{q_x^S}{1-q_x^S}\right]$$

α is the predicted parameter that measures the level of mortality of the population of interest relative to the standard population, and β is the predicted parameter that measures the slope of the mortality function of the population of interest relative to the standard population (3,30–32). Table V shows values of predicted α and β and their standard errors.

A maximum-likelihood generalized linear model estimation procedure is used to fit equation [12] in the age range 45–80. The resulting predicted parameters α and β were then used to estimate the predicted probability of death for ages 76–120 in the Hispanic population. The value q_{x_1} was predicted to age 120 in order to estimate the life table population until no survivors remain, as was done for the other population groups. This information is then used to estimate L_x for ages 100–120, which is used to close the table with the age category 100 and over, combined (discussed below).

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Table III. Births in 2016 and 2017, deaths in 2017 of infants born in 2016 and 2017, and separation factors, by race, Hispanic origin, and sex: United States

Births, deaths, and separation factors	Total			White			Black			Hispanic			Non-Hispanic white			Non-Hispanic black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Births:																		
2016	3,945,875	2,018,183	1,927,692	2,945,970	1,508,585	1,437,385	654,067	331,470	322,597	918,447	468,504	449,943	2,094,054	1,073,824	1,020,230	583,786	295,719	288,067
2017	3,855,500	1,972,885	1,882,615	2,857,845	1,463,322	1,394,523	658,115	334,660	323,455	898,764	457,788	440,976	2,030,493	1,041,692	988,801	587,357	298,690	288,667
Deaths in 2017 of infants born in:																		
2016	2,747	1,559	1,194	1,636	929	704	944	540	404	523	292	232	1,171	670	502	850	482	367
2017	19,588	10,910	8,673	12,231	6,815	5,419	6,155	3,431	2,724	4,061	2,181	1,878	8,349	4,733	3,615	5,540	3,061	2,480
Separation factor, *f*	0.123	0.125	0.121	0.118	0.120	0.115	0.133	0.136	0.129	0.114	0.118	0.110	0.123	0.124	0.122	0.133	0.136	0.129

SOURCE: NCHS, National Vital Statistics System, Mortality.

Table IV. Estimated parameters α and β used for predicting m_x and starting age of modeled age span: United States Life Tables, 2017

Parameter	Total			White			Black			Non-Hispanic white			Non-Hispanic black		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Starting age	86	86	86	86	86	86	85	85	86	86	86	86	86	85	86
ln(α)	–13.79458	–13.82759	–14.40998	–14.03133	–14.17221	–14.63431	–11.23142	–11.05145	–12.41953	–13.98149	–14.11582	–14.58890	–11.51252	–10.93766	–12.33784
(SE)	(0.140)	(0.138)	(0.151)	(0.122)	(0.189)	(0.113)	(0.298)	(0.238)	(0.172)	(0.120)	(0.186)	(0.111)	(0.178)	(0.232)	(0.168)
β	0.1342198	0.1366751	0.1398584	0.1370951	0.1407714	0.1425772	0.1046864	0.1049647	0.1168216	0.136582	0.1401916	0.1421095	0.1078629	0.103776	0.1159727
(SE)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)

NOTE: SE is standard error.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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Predicted $\overline{q}_x$ is estimated by transforming its logit, $\overline{Y}_x$, back as follows:

$$\overline{q}_x = \frac{\exp[\overline{Y}_x]}{1+\exp[\overline{Y}_x]} = \frac{\exp[\alpha + \beta Y_x^s]}{1+\exp[\alpha + \beta Y_x^s]} \quad [13]$$

To ensure a smooth transition from vital q_x^V and predicted $\overline{q}_x$ the two were blended from ages 76 to 80 with a graduating process as follows:

$$q_x = \frac{1}{6}[(81-x)\,q_x^v + (x-75)\,\overline{q}_x] \quad [14]$$

when $x = 76,...,80$.

Table V. Estimated Brass relational logit model parameters α and β for the Hispanic-origin population, 2017

Parameter	Total (SE)	Male (SE)	Female (SE)
α	–0.2610415 (0.022)	–0.2163732 (0.030)	–0.2109235 (0.024)
β.....	1.00950 (0.006)	1.0093710 (0.008)	1.031907 (0.007)

NOTE: SE is standard error.
SOURCE: NCHS, National Vital Statistics System, Mortality.

Finally, to close the table at age 100 and over (combined), ${}_\infty q_{100}$ is set equal to 1.0 because all survivors to this age will die at some point in the open-ended age interval. Once q_x is obtained for each single year of age, the other life table functions are easily calculated.

Calculation of remaining life table functions for all groups

Survivor function (l_x)

The life table radix, l_0, is set at 100,000. For ages greater than 0, the number of survivors remaining at exact age x is calculated as

$$l_x = l_{x-1}\,(1 - q_{x-1}) \quad [15]$$

Decrement function (d_x)

The number of deaths occurring between ages x and $x+1$ is calculated from the survivor function:

$$d_x = l_x - l_{x+1} = l_x q_x \quad [16]$$

Note that ${}_\infty d_{100} = {}_\infty l_{100}$ *because* ${}_\infty q_{100} = 1.0$

Person-years lived (L_x)

Person-years lived for ages 1–99 are calculated assuming that the survivor function declines linearly between ages x and $x+1$. This gives the formula

$$L_x = \frac{1}{2}(l_x + l_{x+1}) = l_x - \frac{1}{2}\,d_x \quad [17]$$

For $x = 0$, the separation factor f is used to calculate L_0:

$$L_0 = f l_0 + (1-f)\,l_1 \quad [18]$$

Finally, ${}_\infty L_{100}$ is estimated as the sum of the extrapolated L_x values for ages 100–120.

Person-years lived at and above age x (T_x)

T_x is calculated by summing L_x values at and above age x:

$$T_x = \Sigma_{x=0}^{\infty} L_x \quad [19]$$

Life expectancy at age x (e_x)

Life expectancy at exact age x is calculated as

$$e_x = \frac{T_x}{l_x} \quad [20]$$

Abridging the complete life table

An abridged or collapsed version of the complete life table can be easily calculated in which life table functions are shown for 5-year rather than single-year age intervals. It is often desirable to summarize the life table and save space when publishing life table data. The abridgement of the complete life table is simplified by an important property of three of the six life table functions. The l_x, T_x, and e_x functions describe exact age x (i.e., the beginning of the age interval x to $x+n$ [where n denotes the length of the age interval; for 5-year age intervals, $n = 5$]). Life expectancy at age 20 (e_{20}), for example, has the same value regardless of whether the age interval is 20–21 or 20–25. Thus, the values l_x, T_x, and e_x can be extracted at 5-year intervals from the complete life table and placed into the abridged life table (compare l_x, T_x, and e_x in Table VI with the same functions in Table 1). It is also illustrative to compare values for e_x and l_x in Tables A and B with their corresponding values presented in Tables 1–18. The q_x, d_x, and L_x functions, in contrast, describe the age interval x to $x+n$. In fact, for abridged life tables, the notation for these functions is different (${}_nq_x$, ${}_nd_x$, and ${}_nL_x$, respectively). Thus, ${}_5q_{20}$ is the probability of dying between ages 20 and 25 and will obviously be somewhat larger than q_{20}, the probability of dying between ages 20 and 21. Taking this into account, ${}_nq_x$, ${}_nd_x$, and ${}_nL_x$ must be recalculated in the abridged life table. It is simplest to begin with ${}_nd_x$. The calculations are made for all but the final age interval as follows:

$${}_nd_x = l_x - l_{x+n}$$

$${}_nq_x = \frac{{}_nd_x}{l_x}$$

$${}_nL_x = T_x - T_{x+n}$$

Note that for the open-ended interval, ages 100 and over: ${}_\infty d_{100} = l_{100}$, ${}_\infty q_{100} = 1.0$, and ${}_\infty L_{100} = T_{100}$. Table VI shows each of the life table functions for the 2017 U.S. total population abridged from Table 1.

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Table VI. Life table for the total population: United States, 2017

Age (years)	Probability of dying between ages x and $x+n$	Number surviving to age x	Number dying between ages x and $x+n$	Person-years lived between ages x and $x+n$	Total number of person-years lived above age x	Expectation of life at age x
	${}_nq_x$	l_x	${}_nd_x$	${}_nL_x$	T_x	e_x
0–1	0.005777	100,000	578	99,493	7,860,752	78.6
1–5	0.000971	99,422	97	397,459	7,761,259	78.1
5–10	0.000580	99,326	58	496,474	7,363,800	74.1
10–15	0.000772	99,268	77	496,190	6,867,327	69.2
15–20	0.002567	99,191	255	495,410	6,371,137	64.2
20–25	0.004758	98,937	471	493,577	5,875,727	59.4
25–30	0.006032	98,466	594	490,888	5,382,151	54.7
30–35	0.007248	97,872	709	487,635	4,891,263	50.0
35–40	0.008660	97,163	841	483,766	4,403,628	45.3
40–45	0.010860	96,321	1,046	479,115	3,919,862	40.7
45–50	0.015514	95,275	1,478	472,916	3,440,747	36.1
50–55	0.024080	93,797	2,259	463,725	2,967,831	31.6
55–60	0.036188	91,538	3,313	449,853	2,504,106	27.4
60–65	0.051344	88,226	4,530	430,324	2,054,253	23.3
65–70	0.071680	83,696	5,999	404,199	1,623,929	19.4
70–75	0.106548	77,697	8,278	368,898	1,219,730	15.7
75–80	0.166810	69,418	11,580	319,671	850,832	12.3
80–85	0.267232	57,839	15,456	252,094	531,161	9.2
85–90	0.420519	42,382	17,823	167,663	279,068	6.6
90–95	0.618853	24,560	15,199	82,334	111,405	4.5
95–100	0.797697	9,361	7,467	24,922	29,071	3.1
100 and over	1.000000	1,894	1,894	4,148	4,148	2.2

SOURCE: NCHS, National Vital Statistics System, Mortality.

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National Vital Statistics Reports, Vol. 68, No. 7, June 24, 2019

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National Vital Statistics Reports

Volume 68, Number 7 June 24, 2019

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United States Life Tables, 2017

by Elizabeth Arias, Ph.D., and Jiaquan Xu, M.D., Division of Vital Statistics

Abstract

Objectives—This report presents complete period life tables for the United States by race, Hispanic origin, and sex, based on age-specific death rates in 2017.

Methods—Data used to prepare the 2017 life tables are 2017 final mortality statistics; July 1, 2017 population estimates based on the 2010 decennial census; and 2017 Medicare data for persons aged 66–99. The methodology used to estimate the life tables for the Hispanic population remains unchanged from that developed for the publication of life tables by Hispanic origin for data year 2006. The methodology used to estimate the 2017 life tables for all other groups was first implemented with data year 2008.

Results—In 2017, the overall expectation of life at birth was 78.6 years, decreasing from 78.7 in 2016. Between 2016 and 2017, life expectancy at birth decreased by 0.1 year for males (76.2 to 76.1) and did not change for females (81.1). Life expectancy at birth decreased by 0.1 year for the white population (78.9 to 78.8) and the non-Hispanic white population (78.6 to 78.5) between 2016 and 2017. Life expectancy at birth did not change from 2016 for the black population (75.3), the non-Hispanic black population (74.9), and the Hispanic population (81.8).

Keywords: life expectancy • survival • death rates • race • Hispanic origin

Introduction

There are two types of life tables: the cohort (or generation) life table and the period (or current) life table. The cohort life table presents the mortality experience of a particular birth cohort—all persons born in the year 1900, for example—from the moment of birth through consecutive ages in successive calendar years. Based on age-specific death rates observed through consecutive calendar years, the cohort life table reflects the mortality experience of an actual cohort from birth until no lives remain in the group. To prepare just a single complete cohort life table requires data over many years. It is usually not feasible to construct cohort life tables entirely on the basis of observed data for real cohorts due to data unavailability or incompleteness (1). For example, a life table representation of the mortality experience of a cohort of persons born in 1970 would require the use of data projection techniques to estimate deaths into the future (2,3).

Unlike the cohort life table, the period life table does not represent the mortality experience of an actual birth cohort. Rather, the period life table presents what would happen to a hypothetical cohort if it experienced throughout its entire life the mortality conditions of a particular period in time. For example, a period life table for 2017 assumes a hypothetical cohort that is subject throughout its lifetime to the age-specific death rates prevailing for the actual population in 2017. The period life table may thus be characterized as rendering a snapshot of current mortality experience and shows the long-range implications of a set of age-specific death rates that prevailed in a given year. In this report, the term life table refers only to the period life table and not to the cohort life table.

Life tables can be classified in two ways according to the length of the age interval in which data are presented. A complete life table contains data for every single year of age. An abridged life table typically contains data by 5- or 10-year age intervals. A complete life table can easily be aggregated into 5- or 10-year age groups (see Technical Notes for instructions). Other than the decennial life tables, U.S. life tables based on data before 1997 are abridged life tables constructed by reference to a standard table (4). This report presents complete period life tables by race, Hispanic origin, and sex.

Data and Methods

The data used to prepare the U.S. life tables for 2017 are final numbers of deaths for the year 2017; July 1, 2017 population estimates based on the 2010 decennial census; and age-specific death and population counts for Medicare beneficiaries aged 66–99 for the year 2017 from the Centers for Medicare & Medicaid Services. Data from the Medicare program

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are used to supplement vital statistics and census data for ages 66 and over. The U.S. life tables by Hispanic origin are based on death rates that have been adjusted for race and ethnicity misclassification on death certificates using classification ratios (or correction factors) generated from an updated evaluation of race and Hispanic-origin misclassification on death certificates in the United States (5). (See Technical Notes for a detailed description of the data sets and methodology used to estimate Hispanic-origin life tables.)

Expectation of life

The most frequently used life table statistic is life expectancy (e_x), which is the average number of years of life remaining for persons who have attained a given age (x). Life expectancy and other life table values for each age in 2017 are shown for the total population by race, Hispanic origin, and sex in Tables 1–18. Life expectancy is summarized by age, race, Hispanic origin, and sex in Table A.

Life expectancy at birth (e_0) for 2017 for the total population was 78.6 years. This represents the average number of years that the members of the hypothetical life table cohort can expect to live at the time of birth (Table A).

Survivors to specified ages

Another way of assessing the longevity of the period life table cohort is by determining the proportion that survives to specified ages. The l_x column of the life table provides the data for computing this proportion. Table B summarizes the number of survivors by age, race, Hispanic origin, and sex. To illustrate, 57,839 persons out of the original 2017 hypothetical life table cohort of 100,000 (or 57.8%) were alive at exact age 80. In other words, the probability that a person will survive from birth to age 80, given 2017 age-specific mortality rates, is 57.8%. Probabilities of survival can be calculated at any age by simply dividing the number of survivors at the terminal age by the number at the beginning age. For example, to calculate the probability of surviving from age 20 to age 85, one would divide the number of survivors at age 85 (42,382) by the number of survivors at age 20 (98,937), which results in a 42.8% probability of survival.

Explanation of life table columns

Column 1. Age (between x and $x + 1$)—Shows the age interval between the two exact ages indicated. For instance, "20–21" means the 1-year interval between the 20th and 21st birthdays.

Column 2. Probability of dying (q_x)—Shows the probability of dying between ages x and $x + 1$. For example, for males in the age interval 20–21 years, the probability of dying is 0.001147 (Table 2). This column forms the basis of the life table; all subsequent columns are derived from it.

Column 3. Number surviving (l_x)—Shows the number of persons from the original hypothetical cohort of 100,000 live births who survive to the beginning of each age interval. The l_x values are computed from the q_x values, which are successively applied to the remainder of the original 100,000 persons still alive at the beginning of each age interval. Thus, out of 100,000 female babies born alive, 99,477 will complete the first year of life and enter the second; 99,341 will reach age 10; 99,134 will reach age 20; and 49,264 will live to age 85 (Table 3).

Column 4. Number dying (d_x)—Shows the number dying in each successive age interval out of the original 100,000 live births. For example, out of 100,000 males born alive, 630 will die in the first year of life; 113 between ages 20 and 21; and 971 after reaching age 100 (Table 2). Each figure in column 4 is the difference between the two successive figures in column 3.

Column 5. Person-years lived (L_x)—Shows the number of person-years lived by the hypothetical life table cohort within an age interval x to $x + 1$. Each figure in column 5 represents the total time (in years) lived between two indicated birthdays by all those reaching the earlier birthday. Thus, the figure 98,692 for males in the age interval 20–21 is the total number of years lived between the 20th and 21st birthdays by the 98,749 males (column 3) who reached their 20th birthday out of 100,000 males born alive (Table 2).

Column 6. Total number of person-years lived (T_x)—Shows the total number of person-years that would be lived after the beginning of the age interval x to $x + 1$ by the hypothetical life table cohort. For example, 5,626,672 is the total number of years lived after reaching age 20 by the 98,749 males reaching that age (Table 2).

Column 7. Expectation of life (e_x)—The expectation of life at any given age is the average number of years remaining to be lived by those surviving to that age, based on a given set of age-specific rates of dying. It is derived by dividing the total person-years that would be lived beyond age x by the number of persons who survived to that age interval (T_x/l_x). Thus, the average remaining lifetime for males who reach age 20 is 57.0 years (5,626,672 divided by 98,749) (Table 2).

Results

Life expectancy in the United States

Tables 1–18 show complete life tables for 2017 by race (white and black), Hispanic origin, and sex. Table A summarizes life expectancy by age, race, Hispanic origin, and sex. Life expectancy at birth for 2017 represents the average number of years that a group of infants would live if they were to experience throughout life the age-specific death rates prevailing in 2017. In 2017, life expectancy at birth was 78.6 years, decreasing by 0.1 year from 78.7 in 2016.

Changes in mortality by age and cause of death can have a major effect on life expectancy. Life expectancy between 2016 and 2017 decreased due to increases in mortality from unintentional injuries, suicide, diabetes, Alzheimer disease, Influenza and pneumonia, and decreases in mortality from cancer, heart disease, Viral hepatitis, HIV disease, and septicemia. For males, life expectancy decreased due to increases in mortality from unintentional injuries, suicide, diabetes, hypertension,

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Table 14. Life table for non-Hispanic white males: United States, 2017

Spreadsheet version available from: https://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/68_07/Table14.xlsx.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.005168	100,000	517	99,547	7,608,533	76.1
1–2	0.000436	99,483	43	99,462	7,508,986	75.5
2–3	0.000319	99,440	32	99,424	7,409,524	74.5
3–4	0.000204	99,408	20	99,398	7,310,100	73.5
4–5	0.000165	99,388	16	99,380	7,210,702	72.6
5–6	0.000157	99,371	16	99,364	7,111,322	71.6
6–7	0.000135	99,356	13	99,349	7,011,959	70.6
7–8	0.000120	99,342	12	99,336	6,912,610	69.6
8–9	0.000108	99,331	11	99,325	6,813,273	68.6
9–10	0.000102	99,320	10	99,315	6,713,948	67.6
10–11	0.000105	99,310	10	99,304	6,614,633	66.6
11–12	0.000124	99,299	12	99,293	6,515,329	65.6
12–13	0.000165	99,287	16	99,279	6,416,036	64.6
13–14	0.000231	99,271	23	99,259	6,316,757	63.6
14–15	0.000319	99,248	32	99,232	6,217,498	62.6
15–16	0.000415	99,216	41	99,195	6,118,266	61.7
16–17	0.000517	99,175	51	99,149	6,019,071	60.7
17–18	0.000637	99,123	63	99,092	5,919,922	59.7
18–19	0.000774	99,060	77	99,022	5,820,830	58.8
19–20	0.000922	98,984	91	98,938	5,721,808	57.8
20–21	0.001076	98,892	106	98,839	5,622,870	56.9
21–22	0.001224	98,786	121	98,726	5,524,031	55.9
22–23	0.001356	98,665	134	98,598	5,425,305	55.0
23–24	0.001464	98,531	144	98,459	5,326,707	54.1
24–25	0.001554	98,387	153	98,311	5,228,248	53.1
25–26	0.001636	98,234	161	98,154	5,129,937	52.2
26–27	0.001715	98,073	168	97,989	5,031,784	51.3
27–28	0.001790	97,905	175	97,818	4,933,794	50.4
28–29	0.001861	97,730	182	97,639	4,835,977	49.5
29–30	0.001932	97,548	188	97,454	4,738,337	48.6
30–31	0.002004	97,360	195	97,262	4,640,884	47.7
31–32	0.002075	97,164	202	97,064	4,543,622	46.8
32–33	0.002139	96,963	207	96,859	4,446,558	45.9
33–34	0.002192	96,755	212	96,649	4,349,699	45.0
34–35	0.002239	96,543	216	96,435	4,253,049	44.1
35–36	0.002292	96,327	221	96,217	4,156,614	43.2
36–37	0.002353	96,106	226	95,993	4,060,397	42.2
37–38	0.002410	95,880	231	95,765	3,964,404	41.3
38–39	0.002464	95,649	236	95,531	3,868,639	40.4
39–40	0.002525	95,414	241	95,293	3,773,108	39.5
40–41	0.002607	95,173	248	95,049	3,677,815	38.6
41–42	0.002721	94,924	258	94,795	3,582,766	37.7
42–43	0.002862	94,666	271	94,531	3,487,971	36.8
43–44	0.003024	94,395	285	94,252	3,393,440	35.9
44–45	0.003204	94,110	302	93,959	3,299,188	35.1
45–46	0.003400	93,808	319	93,649	3,205,229	34.2
46–47	0.003625	93,489	339	93,320	3,111,580	33.3
47–48	0.003896	93,150	363	92,969	3,018,260	32.4
48–49	0.004229	92,788	392	92,591	2,925,291	31.5
49–50	0.004624	92,395	427	92,182	2,832,700	30.7
50–51	0.005046	91,968	464	91,736	2,740,518	29.8
51–52	0.005497	91,504	503	91,252	2,648,782	28.9
52–53	0.006017	91,001	548	90,727	2,557,530	28.1
53–54	0.006601	90,453	597	90,155	2,466,803	27.3
54–55	0.007220	89,856	649	89,532	2,376,648	26.4
55–56	0.007844	89,207	700	88,857	2,287,117	25.6
56–57	0.008465	88,508	749	88,133	2,198,259	24.8
57–58	0.009105	87,758	799	87,359	2,110,126	24.0
58–59	0.009785	86,959	851	86,534	2,022,767	23.3
59–60	0.010517	86,108	906	85,656	1,936,233	22.5
60–61	0.011317	85,203	964	84,721	1,850,578	21.7

See footnotes at end of table.

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Table 14. Life table for non-Hispanic white males: United States, 2017—Con.

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Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
61–62	0.012157	84,239	1,024	83,727	1,765,857	21.0
62–63	0.013005	83,215	1,082	82,673	1,682,130	20.2
63–64	0.013837	82,132	1,136	81,564	1,599,457	19.5
64–65	0.014674	80,996	1,189	80,402	1,517,893	18.7
65–66	0.015549	79,807	1,241	79,187	1,437,491	18.0
66–67	0.016597	78,566	1,304	77,914	1,358,304	17.3
67–68	0.017770	77,262	1,373	76,576	1,280,390	16.6
68–69	0.019113	75,890	1,450	75,164	1,203,814	15.9
69–70	0.020735	74,439	1,544	73,667	1,128,650	15.2
70–71	0.022262	72,896	1,623	72,084	1,054,982	14.5
71–72	0.024516	71,273	1,747	70,399	982,898	13.8
72–73	0.026511	69,525	1,843	68,604	912,499	13.1
73–74	0.028989	67,682	1,962	66,701	843,895	12.5
74–75	0.031512	65,720	2,071	64,685	777,194	11.8
75–76	0.034727	63,649	2,210	62,544	712,510	11.2
76–77	0.038315	61,439	2,354	60,262	649,966	10.6
77–78	0.042619	59,085	2,518	57,826	589,704	10.0
78–79	0.046908	56,567	2,653	55,240	531,878	9.4
79–80	0.051904	53,913	2,798	52,514	476,638	8.8
80–81	0.057383	51,115	2,933	49,648	424,124	8.3
81–82	0.063313	48,182	3,051	46,657	374,476	7.8
82–83	0.070328	45,131	3,174	43,544	327,819	7.3
83–84	0.078560	41,957	3,296	40,309	284,275	6.8
84–85	0.087267	38,661	3,374	36,974	243,966	6.3
85–86	0.097106	35,287	3,427	33,574	206,992	5.9
86–87	0.107057	31,861	3,411	30,155	173,418	5.4
87–88	0.120262	28,450	3,421	26,739	143,263	5.0
88–89	0.134704	25,028	3,371	23,343	116,524	4.7
89–90	0.150403	21,657	3,257	20,028	93,181	4.3
90–91	0.167356	18,400	3,079	16,860	73,153	4.0
91–92	0.185533	15,320	2,842	13,899	56,293	3.7
92–93	0.204874	12,478	2,556	11,200	42,394	3.4
93–94	0.225287	9,922	2,235	8,804	31,194	3.1
94–95	0.246647	7,686	1,896	6,738	22,390	2.9
95–96	0.268800	5,791	1,556	5,012	15,652	2.7
96–97	0.291561	4,234	1,234	3,617	10,640	2.5
97–98	0.314725	3,000	944	2,528	7,023	2.3
98–99	0.338071	2,056	695	1,708	4,495	2.2
99–100	0.361370	1,361	492	1,115	2,787	2.0
100 and over	1.000000	869	869	1,672	1,672	1.9

NOTES: This life table is based on death rates that have been adjusted for race and ethnicity misclassification on death certificates. Updated classification ratios were applied; see Technical Notes.

SOURCE: NCHS, National Vital Statistics System, Mortality.

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EXHIBIT 4

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Employer Costs for Employee Compensation						
Original Data Value						
Series Id:	CMU1010000000000D					
Series Title:	All Civilian Total compensation for All					
Ownership:	Civilian workers					
Component:	Total compensation					
Occupation:	All workers					
Industry:	All workers					
Subcategory:	All workers					
Area:	United States (National)					
Data Type:	Cost of compensation (Cost per hour worked)					
Years:	2004 to 2018					
Year	**Period**	**Wages and Salaries**	**Health Insurance**	**Retirement**	**Health Insurance and Retirement**	**Percent of Wages and Salaries**
2004	**Qtr1**	$17.71	$1.81	$0.99	$2.80	15.81%
2004	**Qtr2**	$17.70	$1.81	$1.01	$2.82	15.93%
2004	**Qtr3**	$17.96	$1.84	$1.05	$2.89	16.09%
2004	**Qtr4**	$18.07	$1.87	$1.08	$2.95	16.33%
2005	**Qtr1**	$18.22	$1.93	$1.11	$3.04	16.68%
2005	**Qtr2**	$18.21	$1.93	$1.09	$3.02	16.58%
2005	**Qtr3**	$18.28	$1.97	$1.13	$3.10	16.96%
2005	**Qtr4**	$18.59	$2.01	$1.13	$3.14	16.89%
2006	**Qtr1**	$18.82	$2.05	$1.15	$3.20	17.00%
2006	**Qtr2**	$18.80	$2.06	$1.15	$3.21	17.07%
2006	**Qtr3**	$19.12	$2.09	$1.18	$3.27	17.10%
2006	**Qtr4**	$19.24	$2.13	$1.21	$3.34	17.36%
2007	**Qtr1**	$19.47	$2.19	$1.16	$3.35	17.21%
2007	**Qtr2**	$19.38	$2.18	$1.17	$3.35	17.29%
2007	**Qtr3**	$19.56	$2.21	$1.22	$3.43	17.54%
2007	**Qtr4**	$19.62	$2.21	$1.24	$3.45	17.58%
2008	**Qtr1**	$19.83	$2.26	$1.26	$3.52	17.75%
2008	**Qtr2**	$19.85	$2.25	$1.25	$3.50	17.63%
2008	**Qtr3**	$20.13	$2.27	$1.28	$3.55	17.64%

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Year	Period	Wages and Salaries	Health Insurance	Retirement	Health Insurance and Retirement	Percent of Wages and Salaries
2008	Qtr4	$20.37	$2.31	$1.29	$3.60	17.67%
2009	Qtr1	$20.49	$2.37	$1.31	$3.68	17.96%
2009	Qtr2	$20.42	$2.36	$1.29	$3.65	17.87%
2009	Qtr3	$20.50	$2.39	$1.29	$3.68	17.95%
2009	Qtr4	$20.49	$2.40	$1.29	$3.69	18.01%
2010	Qtr1	$20.67	$2.48	$1.32	$3.80	18.38%
2010	Qtr2	$20.55	$2.46	$1.31	$3.77	18.35%
2010	Qtr3	$20.69	$2.49	$1.34	$3.83	18.51%
2010	Qtr4	$20.71	$2.49	$1.33	$3.82	18.45%
2011	Qtr1	$20.91	$2.53	$1.36	$3.89	18.60%
2011	Qtr2	$20.80	$2.52	$1.37	$3.89	18.70%
2011	Qtr3	$20.91	$2.54	$1.38	$3.92	18.75%
2011	Qtr4	$21.14	$2.56	$1.39	$3.95	18.68%
2012	Qtr1	$21.27	$2.60	$1.40	$4.00	18.81%
2012	Qtr2	$21.22	$2.59	$1.39	$3.98	18.76%
2012	Qtr3	$21.32	$2.61	$1.42	$4.03	18.90%
2012	Qtr4	$21.35	$2.60	$1.44	$4.04	18.92%
2013	Qtr1	$21.50	$2.67	$1.47	$4.14	19.26%
2013	Qtr2	$21.44	$2.65	$1.47	$4.12	19.22%
2013	Qtr3	$21.54	$2.65	$1.49	$4.14	19.22%
2013	Qtr4	$21.77	$2.70	$1.53	$4.23	19.43%
2014	Qtr1	$21.96	$2.75	$1.60	$4.35	19.81%
2014	Qtr2	$21.95	$2.74	$1.66	$4.40	20.05%
2014	Qtr3	$22.13	$2.75	$1.67	$4.42	19.97%
2014	Qtr4	$22.65	$2.78	$1.75	$4.53	20.00%
2015	Qtr1	$22.88	$2.82	$1.78	$4.60	20.10%
2015	Qtr2	$22.72	$2.80	$1.70	$4.50	19.81%
2015	Qtr3	$22.88	$2.83	$1.72	$4.55	19.89%
2015	Qtr4	$23.06	$2.79	$1.75	$4.54	19.69%
2016	Qtr1	$23.25	$2.85	$1.74	$4.59	19.74%
2016	Qtr2	$23.35	$2.84	$1.75	$4.59	19.66%
2016	Qtr3	$23.42	$2.85	$1.76	$4.61	19.68%
2016	Qtr4	$23.87	$2.91	$1.88	$4.79	20.07%

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Year	Period	Wages and Salaries	Health Insurance	Retirement	Health Insurance and Retirement	Percent of Wages and Salaries
2017	**Qtr1**	$24.10	$2.94	$1.92	$4.86	20.17%
2017	**Qtr2**	$24.10	$2.92	$1.92	$4.84	20.08%
2017	**Qtr3**	$24.33	$2.96	$1.96	$4.92	20.22%
2017	**Qtr4**	$24.49	$2.99	$1.90	$4.89	19.97%
2018	**Qtr1**	$24.77	$3.03	$1.92	$4.95	19.98%
2018	**Qtr2**	$24.72	$2.99	$1.93	$4.92	19.90%

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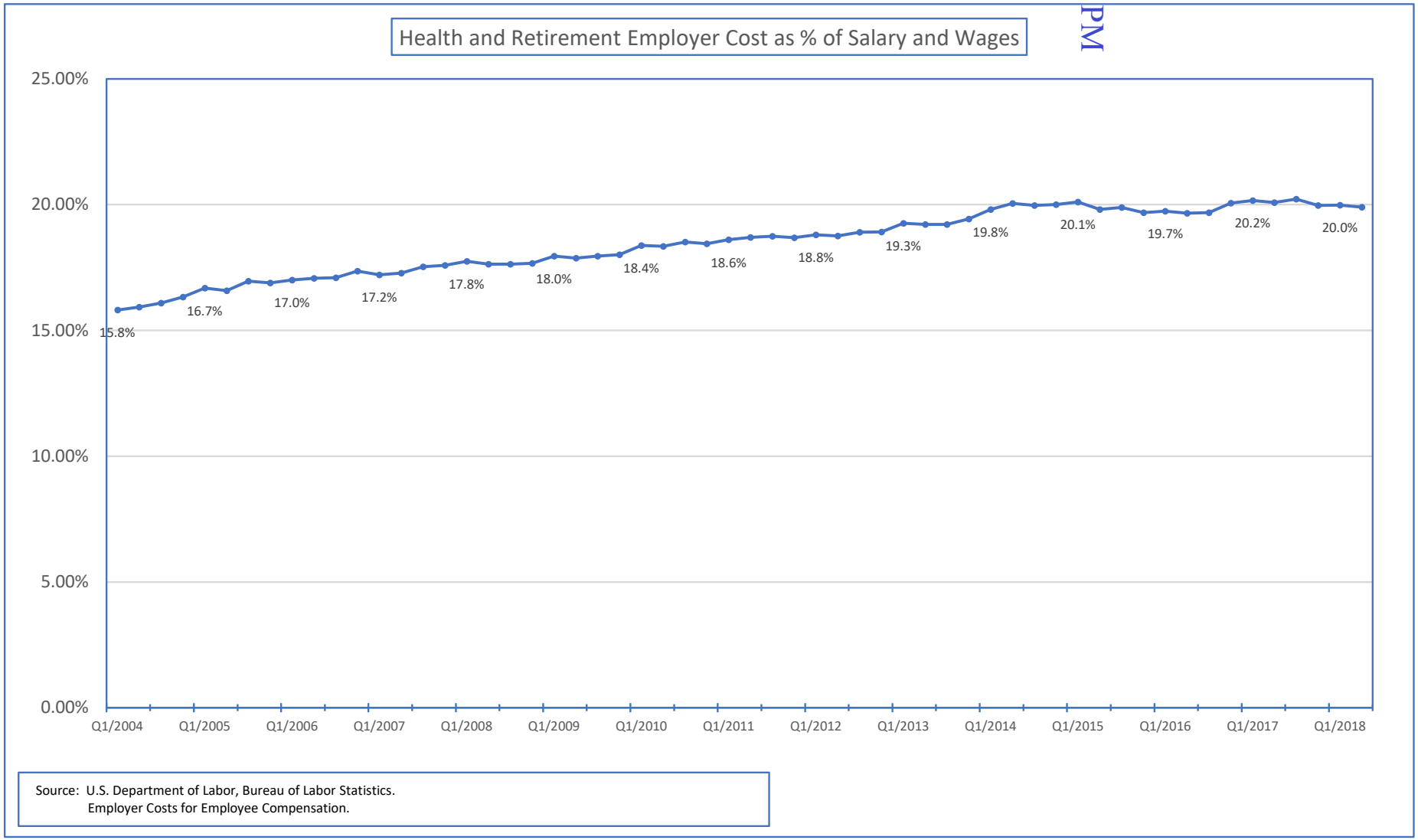

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Table A-3. Mean Earnings of Workers 18 Years and Over, by Educational Attainment, Race, Hispanic Origin, and Sex: 1975 to 2017

(Mean annual earnings [dollars]. Total number with earnings in thousands. Standard error of the mean. Noninstitutionalized population.)

Race, sex, and earnings year	Total			Not a high school graduate			High school graduate			Some college/associate's degree			Bachelor's degree			Advanced degree		
	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error
White																		
Male																		
2017	64,266	69,222	354	32,096	6,277	587	46,284	19,933	478	51,974	18,724	486	83,478	15,913	758	122,160	8,373	1,711
2016	62,680	68,496	356	33,153	6,255	799	45,390	19,941	494	50,063	18,951	461	84,069	15,136	869	116,854	8,211	1,569
2015	60,652	68,610	343	31,336	6,755	676	43,711	19,807	427	47,900	18,905	410	82,495	14,884	909	115,094	8,257	1,545
2014	58,387	67,466	328	30,342	6,858	705	41,492	19,815	345	48,405	18,518	508	78,348	14,409	802	112,351	7,864	1,544
2013	56,215	67,148	321	28,253	6,773	612	39,191	19,796	267	45,403	18,729	410	74,018	14,113	779	117,959	7,735	1,739
2012	55,802	66,906	337	25,725	6,809	473	40,070	19,390	423	45,049	18,825	460	74,594	14,268	799	114,150	7,612	1,718
2011	55,013	66,151	323	25,819	6,917	424	40,247	19,524	472	44,155	18,279	386	73,630	13,978	689	112,515	7,451	1,741
2010	52,646	65,828	295	25,311	6,896	624	37,684	19,685	372	42,479	18,019	344	72,241	13,845	741	106,142	7,383	1,453
2009	51,287	67,464	292	23,353	7,426	408	36,418	20,855	306	42,884	18,273	402	71,286	13,740	770	106,571	7,168	1,558
2008	52,672	68,816	295	25,386	8,113	477	37,852	20,899	333	43,463	18,849	374	75,053	13,596	835	107,099	7,356	1,491
2007	51,781	69,099	285	25,886	8,170	453	38,214	21,129	350	42,903	18,995	332	73,477	13,577	790	103,293	7,227	1,514
2006	51,013	68,752	305	24,579	8,932	324	38,833	21,090	449	42,684	18,340	403	71,735	13,326	831	103,340	7,063	1,555
2005	49,611	67,874	309	23,556	8,582	285	36,753	20,914	355	42,206	18,583	444	69,852	12,900	857	103,144	6,893	1,747
2004	47,389	66,714	282	22,596	8,592	374	35,362	20,761	344	40,617	18,005	351	65,583	12,582	709	99,899	6,774	1,719
2003	46,114	66,199	266	21,791	8,500	251	34,224	20,238	276	39,594	18,060	375	65,264	12,665	800	94,017	6,734	1,418
2002	45,793	66,202	273	22,539	8,841	416	33,920	20,156	321	39,605	18,068	414	65,439	12,512	787	92,733	6,623	1,390
2001	45,071	66,216	279	22,006	8,833	400	33,545	20,465	319	38,501	17,957	344	65,046	12,396	838	92,304	6,562	1,577
2000	44,181	66,222	282	21,561	8,859	431	32,528	20,553	253	38,476	18,179	398	64,831	12,271	880	89,812	6,359	1,617
1999	41,622	65,134	341	19,279	8,549	300	31,289	20,579	320	36,757	17,831	538	59,672	11,869	983	85,405	6,307	2,016
1998	39,638	64,181	341	19,632	8,430	490	29,782	20,388	359	35,277	17,407	588	56,620	11,874	1,001	79,734	6,083	1,716
1997	37,933	63,738	347	20,071	8,670	563	29,298	20,426	402	33,691	17,423	571	51,678	11,340	920	80,322	5,879	2,023
1996	35,821	63,532	320	18,246	8,899	514	28,591	20,329	405	32,238	17,418	534	48,014	11,065	800	75,481	5,821	1,871
1995	34,276	62,520	298	17,032	8,660	338	27,467	19,982	403	30,529	17,136	451	47,016	10,851	852	70,155	5,891	1,634
1994	33,292	62,029	283	16,835	8,133	547	26,125	19,833	330	28,240	17,091	361	47,575	10,992	880	67,629	5,979	1,504
1993	31,719	61,356	270	15,295	8,430	265	24,781	19,835	264	27,297	16,959	334	44,505	10,452	722	70,000	5,680	1,914
1992	29,201	61,270	180	15,180	8,776	245	23,677	20,333	199	26,095	16,468	274	40,802	10,040	511	59,297	5,651	1,000
1991	28,516	60,770	171	15,499	8,720	271	23,475	20,765	187	26,090	15,873	279	39,547	9,893	490	55,256	5,519	924
1990	28,105	60,676	167	15,319	9,476	168	23,135	23,088	174	26,841	13,003	317	39,780	8,770	546	50,385	6,731	798
1989	28,013	60,877	171	15,217	9,805	165	23,291	23,029	191	26,260	12,582	303	39,654	8,750	553	51,031	6,710	831
1988	26,184	60,221	160	14,943	10,008	175	22,216	22,707	181	24,462	12,277	310	36,637	8,467	521	46,181	6,762	728
1987	24,898	59,468	152	15,303	10,132	202	21,012	22,682	162	23,310	11,771	295	34,865	8,384	510	43,440	6,499	702
1986	23,892	58,932	131	14,168	10,239	183	20,128	22,392	143	22,303	11,846	248	34,273	8,041	437	42,480	6,413	618
1985	22,604	58,385	122	13,579	10,163	158	19,203	22,357	136	21,240	11,831	224	32,165	7,970	416	40,358	6,064	580
1984	21,174	57,362	100	13,248	10,280	148	18,681	21,989	125	19,344	11,387	193	29,781	7,624	321	36,219	6,081	423
1983	19,812	56,641	96	12,573	10,387	140	17,281	21,733	117	18,388	10,974	202	27,726	7,379	309	33,981	6,168	409
1982	18,859	56,364	92	11,952	10,816	129	16,662	21,436	116	17,571	10,822	186	26,404	7,242	302	32,266	6,047	406

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Table A-3. Mean Earnings of Workers 18 Years and Over, by Educational Attainment, Race, Hispanic Origin, and Sex: 1975 to 2017

(Mean annual earnings [dollars]. Total number with earnings in thousands. Standard error of the mean. Noninstitutionalized population.)

Race, sex, and earnings year	Total			Not a high school graduate			High school graduate			Some college/associate's degree			Bachelor's degree			Advanced degree		
	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error
1981	18,141	56,397	86	12,094	11,523	142	16,352	21,809	109	17,303	10,448	184	24,943	6,824	289	30,396	5,794	393
1980	16,945	55,772	79	11,539	11,937	114	15,382	21,453	99	16,313	10,400	171	23,803	6,618	286	27,991	5,363	373
1979	15,971	55,556	76	11,127	12,291	109	13,916	20,834	94	15,043	10,572	157	21,785	6,464	271	26,645	5,395	374
1978	14,627	54,113	72	10,358	12,141	103	13,534	20,328	91	13,589	10,350	146	20,085	6,205	263	24,635	5,088	369
1977	13,329	53,174	60	9,366	12,903	86	12,377	19,773	74	12,657	9,853	131	18,521	5,941	219	23,093	4,704	325
1976	12,342	52,312	56	8,867	13,117	85	11,497	19,446	69	11,616	9,394	130	16,995	5,765	194	21,490	4,589	314
1975	11,448	51,510	53	8,110	13,191	77	10,726	19,361	69	11,028	9,096	119	16,079	5,587	197	19,858	4,275	295

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Table A-3. Mean Earnings of Workers 18 Years and Over, by Educational Attainment, Race, Hispanic Origin, and Sex: 1975 to 2017

(Mean annual earnings [dollars]. Total number with earnings in thousands. Standard error of the mean. Noninstitutionalized population.)

Race, sex, and earnings year	Total			Not a high school graduate			High school graduate			Some college/associate's degree			Bachelor's degree			Advanced degree		
	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error	Mean	Number with earnings	Standard error

Notes:

- Starting in 2011, earnings data were created using population controls based on Census 2010 data.
- Prior to 1991, Some college/Associate degree equals 1 to 3 years of college completed; Bachelor's degree equals 4 years of college; Advanced degree equals 5 or more years of college completed.
- Starting with 2000, earnings data were calculated using population controls based on Census 2000.
- Starting with 2000, earnings data are from the expanded Current Population Survey sample.
- Starting in 2003, respondents could choose more than one race. The race data in this table for White, Black, non-Hispanic White, and non-Hispanic Black and Asian from 2003 onward represent those respondents who indicated only one racial identity.
- NA - Not Available
- People of Hispanic origin may be of any race.

Source: U.S. Census Bureau, 1975-2002 March Current Population Survey, 2003 to 2018 Annual Social and Economic Supplement to the Current Population Survey (noninstitutionalized population, excluding members of the Armed Forces living in barracks).

Contact: U.S. Census Bureau, Education and Social Stratification Branch, (301) 763-2464.

The 2014 Current Population Survey Annual Social and Economic Supplement included redesigned questions for income and health insurance coverage. All of the approximately 98,000 addresses were selected to receive the improved set of health insurance coverage items. The improved income questions were implemented using a split panel design. Approximately 68,000 addresses were selected to receive a set of income questions similar to those used in the 2013 Current Population Survey Annual Social and Economic Supplement. The remaining 30,000 addresses were selected to receive the redesigned income questions. The source of data for this table is from the 2014 Current Population Survey Annual Social and Economic Supplement sample of 98,000 addresses.

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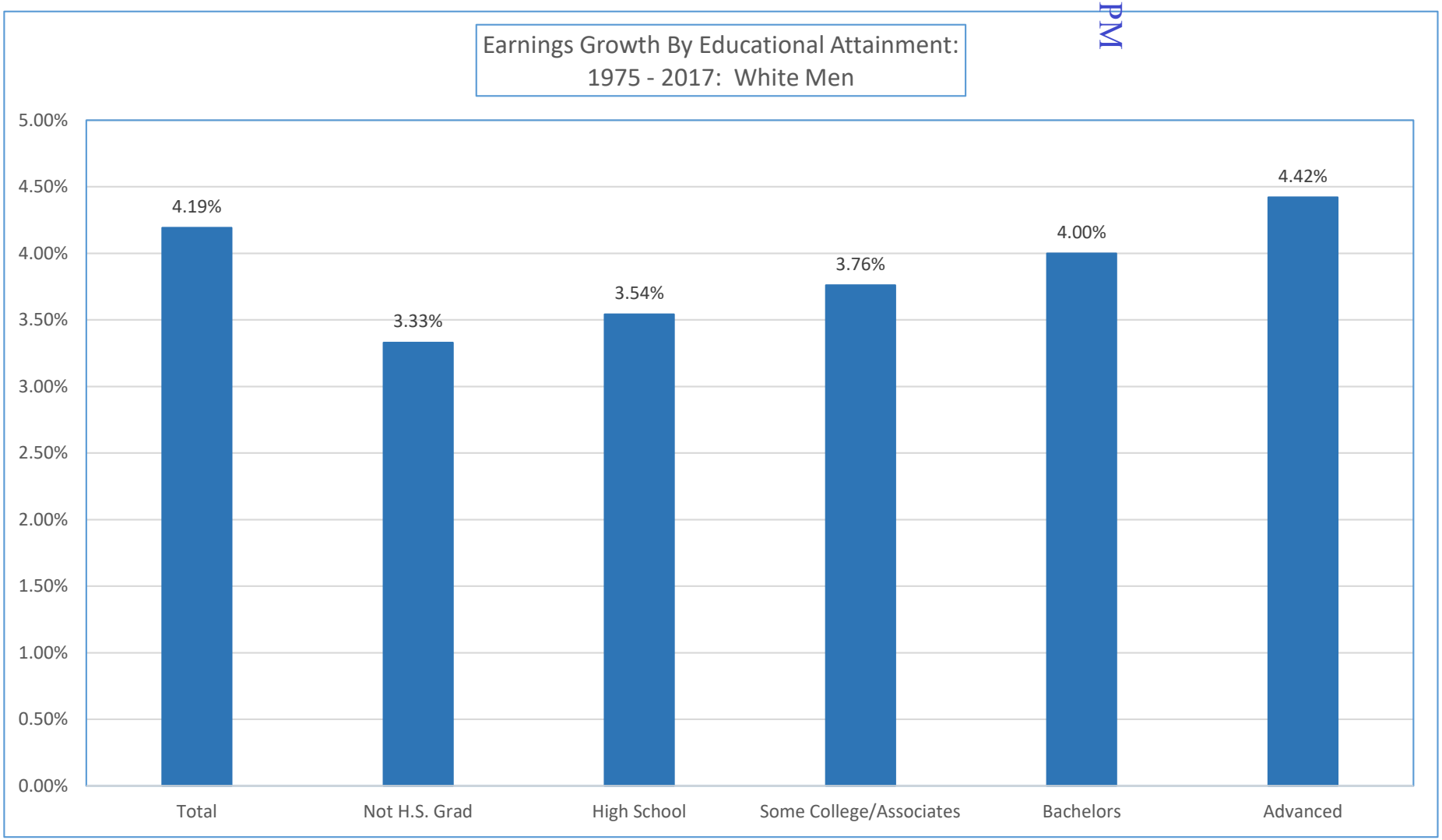

Table A-3. Mean Earnings of Workers 18 Years and Over, by Educational Attainment, Race, Hispanic Origin, and Sex: 1975 to 2017. U. S.. Census Bureau.

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EXHIBIT 6

AgeGrp	Sex	Race	Status	Total	<9th	<HS	HS	HS+	Assoc	BA	MA	Prof	PHD
Total	M	Wh	FT	75,041	35,679	41,662	53,128	61,836	65,029	92,812	122,392	177,112	156,770
18 to 24 years	M	Wh	FT	37,975	(B)	39,388	35,233	35,462	35,511	52,940	(B)	(B)	(B)
25 to 29 years	M	Wh	FT	54,035	30,022	36,842	41,022	45,324	50,164	68,353	100,149	(B)	(B)
30 to 34 years	M	Wh	FT	64,453	31,639	33,252	47,200	56,406	57,585	80,827	101,159	102,457	106,135
35 to 39 years	M	Wh	FT	74,586	36,249	42,085	56,216	65,182	70,602	87,956	106,090	150,537	149,992
40 to 44 years	M	Wh	FT	80,911	35,077	40,330	57,989	65,510	69,092	103,044	126,738	163,622	156,600
45 to 49 years	M	Wh	FT	83,896	41,323	46,660	57,355	71,535	74,275	104,270	118,655	184,628	190,887
50 to 54 years	M	Wh	FT	83,967	37,949	41,515	56,988	73,368	74,208	108,629	121,348	231,876	166,957
55 to 59 years	M	Wh	FT	89,055	36,279	50,600	67,263	69,351	68,520	108,152	152,595	215,191	188,245
60 to 64 years	M	Wh	FT	86,275	35,435	42,655	60,966	71,633	65,317	106,334	145,414	159,093	149,900
65 to 69 years	M	Wh	FT	95,476	(B)	(B)	57,759	70,935	70,879	106,853	122,735	232,566	157,192
70 to 74 years	M	Wh	FT	95,220	(B)	(B)	55,244	70,546	79,857	91,018	140,877	(B)	(B)

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EXHIBIT 7

AgeGrp	Sex	Race	Status	Total	<9th	<HS	HS	HS+	Assoc	BA	MA	Prof	PHD
Total	M	Wh	FT	81,370	37,590	44,421	54,567	67,470	67,759	100,807	127,831	202,179	178,751
18 to 24 years	M	Wh	FT	39,151	(B)	34,334	36,060	34,788	38,505	55,598	(B)	(B)	(B)
25 to 29 years	M	Wh	FT	55,281	(B)	41,056	42,050	50,030	49,181	71,898	70,334	(B)	(B)
30 to 34 years	M	Wh	FT	69,162	32,728	36,815	50,341	55,376	59,714	83,089	110,349	127,608	125,293
35 to 39 years	M	Wh	FT	81,624	36,504	47,080	55,805	64,781	68,542	99,212	115,579	208,692	173,773
40 to 44 years	M	Wh	FT	87,071	40,020	44,322	57,691	74,162	74,743	107,932	147,261	187,675	149,401
45 to 49 years	M	Wh	FT	92,079	39,200	51,130	58,924	79,635	72,642	109,341	134,042	203,982	250,999
50 to 54 years	M	Wh	FT	94,734	39,438	45,325	59,167	86,072	75,293	120,523	148,941	237,256	178,994
55 to 59 years	M	Wh	FT	96,868	37,003	44,926	64,372	82,414	84,301	131,928	138,534	217,205	191,768
60 to 64 years	M	Wh	FT	92,718	37,165	50,284	62,379	77,273	72,576	112,631	138,214	261,386	186,980
65 to 69 years	M	Wh	FT	94,094	(B)	(B)	65,522	78,078	74,284	106,064	125,681	189,879	157,303
70 to 74 years	M	Wh	FT	105,455	(B)	(B)	69,685	85,671	(B)	112,068	110,784	(B)	(B)

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Source: PINC-04. Educational Attainment-People 18 Years Old and Over, by Total Money Earnings in 2019, Race, Hispanic Origin, and Sex.
U.S. Census Bureau, CPS, 2020 Annual Social and Economic Supplement.

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EXHIBIT 8

116th Congress, 1st Session – – – – – – – – – – – – – – – House Document 116-28

THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

COMMUNICATION

FROM

THE BOARD OF TRUSTEES, FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

TRANSMITTING

THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS



April 25, 2019—Referred to the Committee on Ways and Means and ordered to be printed

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U.S. GOVERNMENT PUBLISHING OFFICE

36-128 WASHINGTON: 2019

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LETTER OF TRANSMITTAL

BOARD OF TRUSTEES OF THE
FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND
FEDERAL DISABILITY INSURANCE TRUST FUNDS,
Washington, D.C., April 22, 2019

HON. NANCY PELOSI,
Speaker of the House of Representatives.

HON. MICHAEL R. PENCE,
President of the Senate.

DEAR MADAM SPEAKER AND MR. PRESIDENT:

We have the honor of transmitting to you the 2019 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, the 79th such report.

Respectfully,

STEVEN T. MNUCHIN,
Secretary of the Treasury,
and Managing Trustee of the Trust Funds.

R. ALEXANDER ACOSTA,
Secretary of Labor,
and Trustee.

ALEX M. AZAR II,
Secretary of Health and Human Services,
and Trustee.

NANCY A. BERRYHILL,
Acting Commissioner
of Social Security, and Trustee.

VACANT,
Public Trustee.

VACANT,
Public Trustee.

MARK J. WARSHAWSKY,
Deputy Commissioner
for Retirement and Disability Policy,
Social Security Administration,
and Acting Secretary, Board of Trustees.

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THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

I. INTRODUCTION

The Old-Age, Survivors, and Disability Insurance (OASDI) program makes monthly income available to insured workers and their families at retirement, death, or disability. The OASDI program consists of two parts. Retired workers, their families, and survivors of deceased workers receive monthly benefits under the Old-Age and Survivors Insurance (OASI) program. Disabled workers and their families receive monthly benefits under the Disability Insurance (DI) program.

The Social Security Act established the Board of Trustees to oversee the financial operations of the OASI and DI Trust Funds. The Board is composed of six members. Four members serve by virtue of their positions in the Federal Government: the Secretary of the Treasury, who is the Managing Trustee; the Secretary of Labor; the Secretary of Health and Human Services; and the Commissioner of Social Security. The President appoints and the Senate confirms the other two members to serve as public representatives. These two positions are currently vacant. The Deputy Commissioner of the Social Security Administration serves as Secretary of the Board.

The Social Security Act requires that the Board, among other duties, report annually to the Congress on the actuarial status and financial operations of the OASI and DI Trust Funds. The 2019 report is the 79th such report.

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II. OVERVIEW

A. HIGHLIGHTS

This section summarizes the report's major findings.

In 2018

At the end of 2018, the OASDI program was providing benefit payments[1] to about 63 million people: 47 million retired workers and dependents of retired workers, 6 million survivors of deceased workers, and 10 million disabled workers and dependents of disabled workers. During the year, an estimated 176 million people had earnings covered by Social Security and paid payroll taxes on those earnings. The total cost of the program in 2018 was $1,000 billion. Total income was $1,003 billion, which consisted of $920 billion in non-interest income and $83 billion in interest earnings. Asset reserves held in special issue U.S. Treasury securities grew from $2,892 billion at the beginning of the year to $2,895 billion at the end of the year.

Short-Range Results

Under the Trustees' intermediate assumptions, Social Security's total cost is projected to be less than its total income in 2019 and higher than its total income in 2020 and all later years. Social Security's cost has exceeded its non-interest income since 2010. For 2019, program cost is projected to be less than total income by about $1 billion and exceed non-interest income by about $81 billion.

To illustrate the actuarial status of the Social Security program as a whole, the operations of the OASI and DI funds are often shown on a combined basis as OASDI. However, by law, the two funds are separate entities and therefore the combined fund operations and reserves are hypothetical. The combined reserves are projected to decrease from $2,895 billion at the beginning of 2019 to $2,148 billion at the end of 2028.

The reserves of the combined OASI and DI Trust Funds along with projected program income are adequate to cover projected program cost over the next 10 years under the intermediate assumptions. The ratio of reserves to annual cost is projected to decline from 273 percent at the beginning of 2019 to 130 percent at the beginning of 2028. By remaining at or above 100 percent,

[1] The definitions of "benefit payments" and other terms appear in the Glossary.

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the combined OASI and DI Trust Funds satisfy the Trustees' test of short-range financial adequacy.[1] Considered separately, the OASI Trust Fund also satisfies the test, but the DI Trust Fund does not. For last year's report, the Trustees projected that combined reserves would be 272 percent of annual cost at the beginning of 2019 and 120 percent at the beginning of 2028.

Long-Range Results

Under the Trustees' intermediate assumptions, OASDI cost is projected to exceed total income starting in 2020, and the dollar level of the hypothetical combined trust fund reserves declines until reserves become depleted in 2035. Figure II.D2 shows the implications of reserve depletion for the combined OASI and DI Trust Funds. Considered separately, the OASI Trust Fund reserves become depleted in 2034 and the DI Trust Fund reserves become depleted in 2052.[2] In last year's report, the projected reserve depletion years were 2034 for OASDI, 2034 for OASI, and 2032 for DI.

The large change in the reserve depletion date for DI is mainly due to continuing favorable experience for DI applications and benefit awards, both of which fell well below levels projected in last year's report for 2018. Disability applications have been declining steadily since 2010, and the total number of disabled-worker beneficiaries in current payment status has been falling since 2014. For this report, disability applications and incidence rates are assumed to rise more gradually from the current low levels to an ultimate age-sex-adjusted disability incidence rate assumption of 5.2 per thousand exposed by the end of the short-range projection period, compared to 5.4 per thousand assumed in last year's report. See page 37 for more details on these changes in the DI projections.

Projected OASDI cost increases more rapidly than projected non-interest income through 2040 primarily because the retirement of the baby-boom generation will increase the number of beneficiaries much faster than the number of covered workers increases, as subsequent lower-birth-rate generations replace the baby-boom generation at working ages. From 2040 through 2051, the cost rate (the ratio of program cost to taxable payroll) generally declines because the aging baby-boom generation is gradually replaced at

[1] The test of short-range financial adequacy for a trust fund is met if (1) the estimated trust fund ratio is at least 100 percent at the beginning of the period and remains at or above 100 percent throughout the 10-year short-range period or (2) the ratio is initially less than 100 percent, reaches at least 100 percent within 5 years (without reserve depletion at any time during this period) and remains at or above 100 percent throughout the remainder of the 10-year short-range period.

[2] If the OASI Trust Fund reserves were to become depleted in 2034 as is currently projected, the operations of the hypothetical combined OASI and DI Trust Funds would not reflect the aggregated operation of the OASI Trust Fund and the DI Trust Fund because part of the OASI benefits could not be paid without a change in the law. Implicitly, the values shown for the hypothetical combined trust funds assume the law will have been changed to permit the transfer of resources between funds as needed.

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retirement ages by subsequent lower-birth-rate generations. Thereafter, increases in life expectancy cause OASDI cost to increase generally relative to non-interest income, but more slowly than between 2010 and 2040.

The projected OASDI annual cost rate increases from 13.91 percent of taxable payroll for 2019 to 16.62 percent for 2040 and to 17.47 percent for 2093, a level that is 4.11 percent of taxable payroll more than the projected income rate (the ratio of non-interest income to taxable payroll) for 2093. For last year's report, the Trustees estimated the OASDI cost for 2093 at 17.72 percent, or 4.36 percent of payroll more than the annual income rate for that year. Expressed in relation to the projected gross domestic product (GDP), OASDI cost generally rises from 4.9 percent of GDP for 2019 to about 5.9 percent by 2039, then declines to 5.8 percent by 2052, and then generally increases to 6.0 percent by 2093.

For the 75-year projection period, the actuarial deficit is 2.78 percent of taxable payroll, decreased from 2.84 percent of taxable payroll in last year's report. The closely-related open-group unfunded obligation for OASDI over the 75-year period is 2.61 percent of taxable payroll, decreased from 2.68 percent of payroll in last year's report. The open-group unfunded obligation for OASDI over the 75-year period is $13.9 trillion in present value and is $0.7 trillion more than the measured level of $13.2 trillion a year ago. If the assumptions, methods, starting values, and the law had all remained unchanged, the actuarial deficit would have increased to 2.90 percent of taxable payroll, and the unfunded obligation would have risen to about 2.74 percent of taxable payroll and $13.7 trillion in present value due to the change in the valuation date.

To illustrate the magnitude of the 75-year actuarial deficit, consider that for the combined OASI and DI Trust Funds to remain fully solvent throughout the 75-year projection period: (1) revenue would have to increase by an amount equivalent to an immediate and permanent payroll tax rate increase of 2.70 percentage points[1] to 15.10 percent, (2) scheduled benefits would have to be reduced by an amount equivalent to an immediate and permanent reduction of about 17 percent applied to all current and future beneficiaries, or about 20 percent if the reductions were applied only to those who become

[1] The necessary tax rate increase of 2.70 percent differs from the 2.78 percent actuarial deficit for two reasons. First, the necessary tax rate increase is the increase required to maintain solvency throughout the period with a zero trust fund reserve at the end of the period, whereas the actuarial deficit also incorporates an ending trust fund reserve equal to one year's cost at the end of the projection period. Second, the necessary tax rate increase reflects a behavioral response to tax rate changes, whereas the actuarial deficit does not. In particular, the calculation of the necessary tax rate increase assumes that an increase in payroll taxes results in a small shift of wages and salaries to forms of employee compensation that are not subject to the payroll tax.

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initially eligible for benefits in 2019 or later; or (3) some combination of these approaches would have to be adopted.

If substantial actions are deferred for several years, the changes necessary to maintain Social Security solvency would be concentrated on fewer years and fewer generations. Much larger changes would be necessary if action is deferred until the combined trust fund reserves become depleted in 2035. For example, maintaining 75-year solvency with changes that begin in 2035 would require: (1) an increase in revenue by an amount equivalent to a permanent 3.65 percentage point payroll tax rate increase to 16.05 percent starting in 2035, (2) a reduction in scheduled benefits by an amount equivalent to a permanent 23 percent reduction in all benefits starting in 2035, or (3) some combination of these approaches.

Conclusion

Under the intermediate assumptions, the projected hypothetical combined OASI and DI Trust Fund asset reserves become depleted and unable to pay scheduled benefits in full on a timely basis in 2035. At the time of depletion of these combined reserves, continuing income to the combined trust funds would be sufficient to pay 80 percent of scheduled benefits. The OASI Trust Fund reserves are projected to become depleted in 2034, at which time OASI income would be sufficient to pay 77 percent of OASI scheduled benefits. DI Trust Fund asset reserves are projected to become depleted in 2052, at which time continuing income to the DI Trust Fund would be sufficient to pay 91 percent of DI scheduled benefits.

Lawmakers have a broad continuum of policy options that would close or reduce Social Security's long-term financing shortfall. Cost estimates for many such policy options are available at www.ssa.gov/OACT/solvency/provisions/.

The Trustees recommend that lawmakers address the projected trust fund shortfalls in a timely way in order to phase in necessary changes gradually and give workers and beneficiaries time to adjust to them. Implementing changes sooner rather than later would allow more generations to share in the needed revenue increases or reductions in scheduled benefits. Social Security will play a critical role in the lives of 64 million beneficiaries and 178 million covered workers and their families during 2019. With informed discussion, creative thinking, and timely legislative action, Social Security can continue to protect future generations.

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B. TRUST FUND FINANCIAL OPERATIONS IN 2018

Table II.B1 shows the income, cost, and asset reserves for the OASI, the DI, and the combined OASI and DI Trust Funds in calendar year 2018.

Table II.B1.—Summary of 2018 Trust Fund Financial Operations
[In billions]

	OASI	DI	OASDI
Asset reserves at the end of 2017	$2,820.3	$71.5	$2,891.8
Total income in 2018	831.0	172.3	1,003.4
Net payroll tax contributions	715.9	169.2	885.1
Interest	80.7	2.6	83.3
Taxation of benefits	34.5	.5	35.0
Reimbursement from General Fund of the Treasury	[a]	[a]	[a]
Total cost in 2018	853.5	146.8	1,000.2
Benefit payments	844.9	143.7	988.6
Administrative expenses	3.8	2.9	6.7
Railroad Retirement financial interchange	4.8	.2	4.9
Net increase in asset reserves in 2018	-22.4	25.6	3.1
Asset reserves at the end of 2018	2,797.9	97.1	2,894.9

[a] Less than $50 million.

Note: Totals do not necessarily equal the sums of rounded components.

In 2018, net payroll tax contributions accounted for 88.2 percent of total trust fund income. Net payroll tax contributions consist of taxes paid by employees, employers, and the self-employed on earnings covered by Social Security. These taxes are paid on covered earnings up to a specified maximum annual amount, which was $128,400 in 2018. Table II.B2 shows the payroll tax rates for 2018.

Interest earned on invested trust fund asset reserves accounted for 8.3 percent of OASI and DI combined trust fund income in 2018. Revenue from subjecting up to 50 percent of Social Security benefits to Federal personal income taxation for beneficiaries with income (including half of benefits and all non-taxable interest received) exceeding specified levels accounted for 3.5 percent of OASDI income. The remaining income to the combined OASI and DI Trust Funds, less than 0.01 percent, came from reimbursements from the General Fund of the Treasury.[1]

[1] Public Laws 111-312, 112-78, and 112-96 account for most of the reimbursement for the year. These acts specified General Fund reimbursement for temporary reductions in revenue due to reduced payroll tax rates for employees and for self-employed workers for 2011 and 2012.

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The Department of the Treasury invests trust fund reserves in interest-bearing securities issued by the U.S. Government. In 2018, the combined trust fund reserves earned interest at an effective annual rate of 2.9 percent.

Retirement, survivor, and disability benefits accounted for 98.8 percent of OASI and DI combined trust fund cost in 2018. The expenses for administering the Social Security program were 0.7 percent of total cost. The net payment to the Railroad Retirement Social Security Equivalent Benefit Account from the combined OASI and DI Trust Funds accounted for 0.5 percent of total OASDI cost.

The trust fund investments provide the basis for paying benefits. Combined trust fund reserves increased by $3.1 billion during 2018 because income to the combined funds, including interest earned on trust fund reserves, exceeded total cost. In last year's report, combined reserves were projected to start declining in 2018. At the end of 2018, the combined reserves of the OASI and the DI Trust Funds were $2,895 billion, or 273 percent of estimated cost[1] for 2019. In comparison, the combined reserves at the end of 2017 were 289 percent of actual cost for 2018.

Table II.B2.—Payroll Tax Contribution Rates for 2018
[In percent]

	OASI	DI	OASDI
Payroll tax contribution rate for employees	5.015	1.185	6.20
Payroll tax contribution rate for employers	5.015	1.185	6.20
Payroll tax contribution rate for self-employed persons	10.030	2.370	12.40

Note: Section 833 of Public Law 114-74, the Bipartisan Budget Act of 2015, requires a temporary reallocation of the payroll tax rates between the OASI and DI Trust Funds. For earnings in calendar years 2016 through 2018, this section increases from 1.80 percent to 2.37 percent the portion of the total 12.40 percent OASDI payroll tax that is directed to the DI Trust Fund. There is a corresponding decrease in the portion of the tax rates directed to the OASI Trust Fund for these years.

[1] Estimated cost is based on the intermediate set of assumptions.

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C. ASSUMPTIONS ABOUT THE FUTURE

The future income and cost of the OASI and DI Trust Funds will depend on many factors, including the size and characteristics of the population receiving benefits, the level of monthly benefit amounts, the size of the workforce, and the level of covered workers' earnings. These factors will depend in turn on future birth rates, death rates, immigration, marriage and divorce rates, retirement-age patterns, disability incidence and termination rates, employment rates, productivity gains, wage increases, inflation, interest rates, and many other demographic, economic, and program-specific factors.

Table II.C1 presents key demographic, economic, and programmatic assumptions for three alternative scenarios. The intermediate assumptions reflect the Trustees' best estimates of future experience. Therefore, most of the figures in this overview present outcomes under the intermediate assumptions only. Any projection of the future is, of course, uncertain. For this reason, the Trustees also present results under low-cost and high-cost alternatives to provide a range of possible future experience. The actual future costs are unlikely to be as extreme as those portrayed by the low-cost or high-cost projections. A separate section on the uncertainty of the projections, beginning on page 17, highlights the implications of these alternative scenarios.

The Trustees reexamine the assumptions each year in light of recent experience and new information. This annual review helps to ensure that the Trustees' assumptions provide the best estimate of future possibilities.

Table II.C1.—Key Assumptions[a] and Summary Measures for the Long-Range (75-year) Projection Period

Long-range assumptions	Intermediate	Low-cost	High-cost
Demographic:			
Total fertility rate (children per woman), for 2027 and later	2.0	2.2	1.8
Average annual percentage reduction in total age-sex-adjusted death rates from 2018 to 2093	.77	.41	1.16
Average annual net immigration (in thousands) for 2019 to 2093	1,265	1,601	949
Economic:			
Average annual percentage change in:			
Productivity (total U.S. economy), for 2029 and later	1.63	1.93	1.33
Average wage in covered employment from 2028 to 2093	3.81	5.04	2.60
Consumer Price Index (CPI-W), for 2021 and later	2.60	3.20	2.00
Average annual real-wage differential (percent) for 2029 to 2093	1.21	1.84	.60
Unemployment rate (percent, age-sex-adjusted), for 2025 and later	5.5	4.5	6.5
Annual trust fund real interest rate (percent), for 2029 and later	2.5	3.0	2.0
Programmatic:			
Disability incidence rate (per 1,000 exposed, age-sex-adjusted) in 2093	5.2	4.2	6.2
Disability recovery rate (per 1,000 beneficiaries, age-sex-adjusted) in 2093	10.3	12.5	8.2

[a] See chapter V for details, including historical and projected values.

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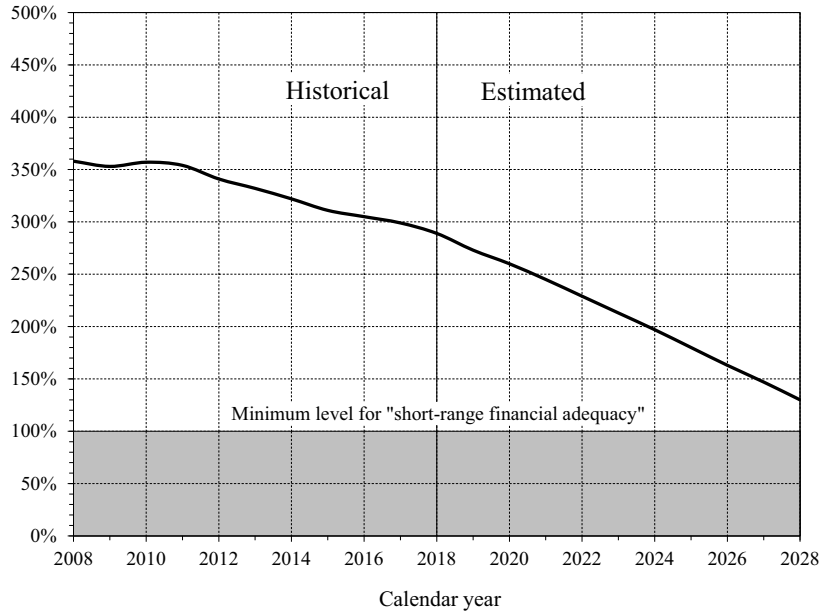
D. PROJECTIONS OF FUTURE FINANCIAL STATUS

Short-Range Actuarial Estimates

For the short-range period (2019 through 2028), the Trustees measure financial adequacy by comparing projected asset reserves at the beginning of each year to projected program cost for that year under the intermediate set of assumptions. Maintaining a trust fund ratio of 100 percent or more—that is, reserves at the beginning of each year at least equal to projected cost for the year—is a good indication that the trust fund can cover most short-term contingencies. The projected trust fund ratios under the intermediate assumptions for the OASI Trust Fund exceed 100 percent throughout the short-range period. Therefore, OASI satisfies the Trustees' test of short-range financial adequacy. The DI Trust Fund fails the Trustees' test of short-range financial adequacy. The Trustees estimate that the DI trust fund ratio was at 65 percent at the beginning of 2019. The projected DI trust fund ratio declines to 56 percent at the beginning of 2022, and then increases to 68 percent by the beginning of 2028. On a combined basis, OASDI also satisfies the Trustees' test of short-range financial adequacy. Figure II.D1 shows that the trust fund ratio for the combined OASI and DI Trust Funds declines consistently after 2010, but remains above 100 percent throughout the short-range period.

Projected OASDI cost is less than total income in 2019, so that combined trust fund reserves increase during the year. In last year's report, combined trust fund reserves were projected to decline starting in 2018. For this report, combined reserves are projected to start declining in 2020 and to continue to decline throughout the remainder of the short-range period. The trust fund ratio declines throughout the short-range period, as shown in figure II.D1.

Figure II.D1.—Short-Range OASI and DI Combined Trust Fund Ratio
[Asset reserves as a percentage of annual cost, under Intermediate Assumptions]



Long-Range Actuarial Estimates

The Trustees use three types of measures to assess the actuarial status of the program over the next 75 years: (1) annual cash-flow measures, including income rates, cost rates, and balances; (2) trust fund ratios; and (3) summary measures such as actuarial balances and open-group unfunded obligations. The Trustees express these measures as percentages of taxable payroll, as percentages of gross domestic product (GDP), or in dollars. The Trustees also present summary measures over the infinite horizon in appendix F. The infinite horizon values provide an additional indication of Social Security's very-long-run financial condition.

The Trustees also apply a test of long-range close actuarial balance each year. To satisfy the test, a trust fund must meet two conditions: (1) the trust fund satisfies the test of short-range financial adequacy, and (2) the trust fund ratio stays above zero throughout the 75-year projection period, such that benefits would be payable in a timely manner throughout the period. The OASI, DI, and combined OASI and DI Trust Funds all fail the test of long-range close actuarial balance under the intermediate assumptions.

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Annual Income Rates, Cost Rates, and Balances

Figure II.D2 illustrates the year-by-year relationship among OASDI income (excluding interest), cost (including scheduled benefits), and expenditures (including payable benefits) for the full 75-year period (2019 through 2093). The figure shows all values as percentages of taxable payroll. Under the intermediate assumptions, demographic factors would by themselves cause the projected cost rate to rise rapidly for the next two decades before leveling off in about 2040. However, the most recent recession temporarily depressed taxable earnings and increased the number of beneficiaries, which in turn sharply, but temporarily, increased the cost rate starting in 2009. From a peak in 2013, the cost rate declined through 2017 under the economic recovery and thereafter returns to a gradually rising trend. The projected income rate is stable at about 13 percent throughout the 75-year period.

Annual OASDI cost has exceeded non-interest income every year beginning with 2010. The Trustees project that cost will continue to exceed non-interest income throughout the 75-year valuation period. Beginning in 2020, cost is projected to exceed total income, and combined OASI and DI Trust Fund reserves diminish until they become depleted in 2035. After trust fund reserve depletion, continuing income is sufficient to support expenditures at a level of 80 percent of program cost for the rest of 2035, declining to 75 percent for 2093. Figure II.D2 depicts OASDI operations as a combined whole. However, under current law, the differences between scheduled and payable benefits would begin at different times for the program's two trust funds: in 2034 for OASI and in 2052 for DI.

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Figure II.D2.—OASDI Income, Cost, and Expenditures as Percentages of Taxable Payroll
[Under Intermediate Assumptions]

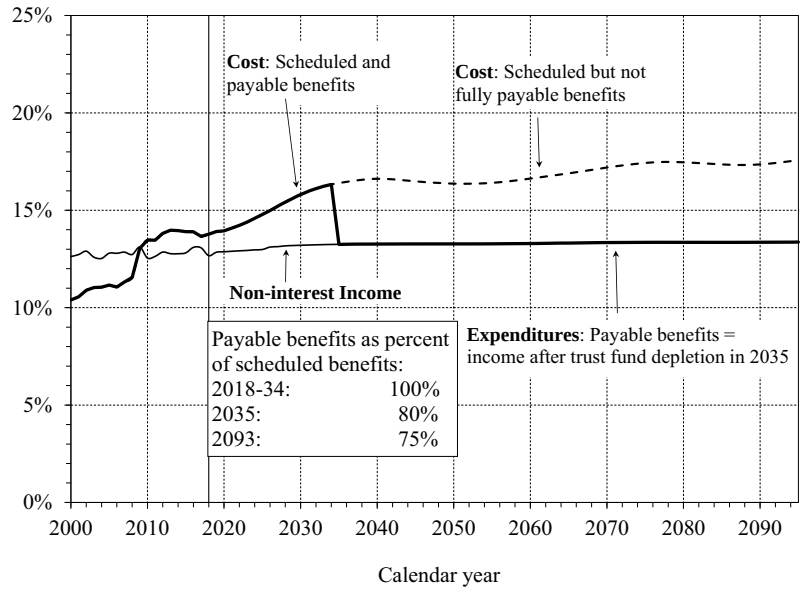

Figure II.D3 shows the estimated number of covered workers per OASDI beneficiary. Figures II.D2 and II.D3 illustrate the inverse relationship between cost rates and the number of workers per beneficiary. In particular, the projected future increase in the cost rate reflects a projected decline in the number of covered workers per beneficiary. There were about 2.8 workers for every OASDI beneficiary in 2018. This ratio had been stable, remaining between 3.2 and 3.4 from 1974 through 2008, and has declined since then due to the most recent economic recession and the beginning of the demographic shift that will continue to drive this ratio down over the next 20 years. The ratio of workers to beneficiaries will continue to decline due to this demographic shift, as workers of lower-birth-rate generations replace workers of the baby-boom generation. The ratio of workers to beneficiaries reaches 2.2 by 2035 when the baby-boom generation will have largely retired, and will generally decline very gradually thereafter due to increasing longevity.

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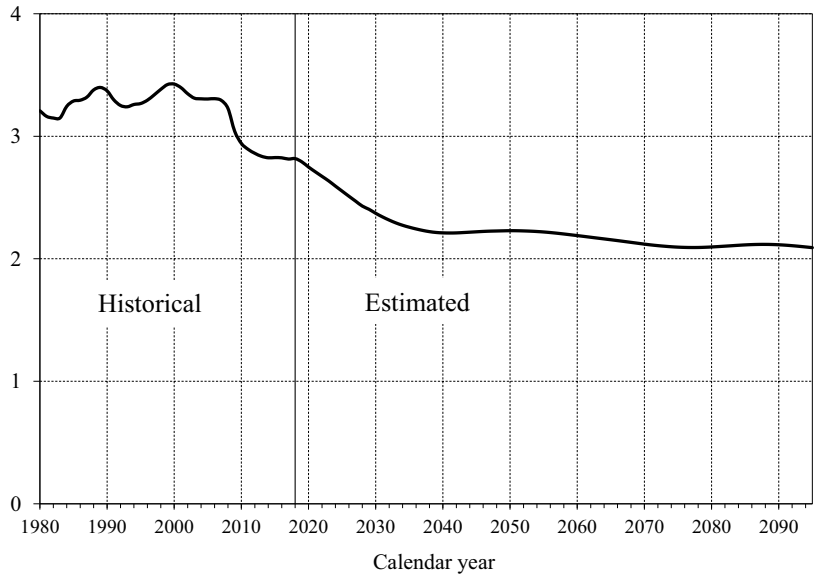
Figure II.D3.—Number of Covered Workers Per OASDI Beneficiary
[Under Intermediate Assumptions]



Another important way to look at Social Security's future is to view its annual cost and non-interest income as a share of U.S. economic output (GDP). As shown in figure II.D4, Social Security's cost as a percent of GDP is projected to grow from 4.9 percent in 2019 to about 5.9 percent by 2039, then decline to 5.8 percent by 2052, and generally increase thereafter to 6.0 percent by 2093. Social Security's non-interest income is projected to rise from 4.6 percent of GDP in 2019 to 4.8 percent by 2029. Thereafter, non-interest income as a percent of GDP declines gradually, to about 4.6 percent by 2093, because the Trustees expect the share of employee compensation provided as noncovered fringe benefits to increase gradually.

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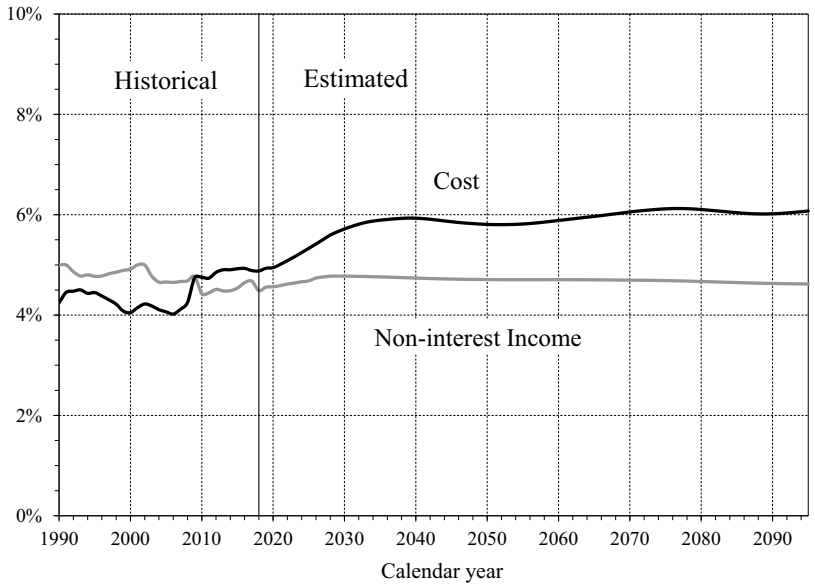
Figure II.D4.—OASDI Cost and Non-interest Income as a Percentage of GDP
[Under Intermediate Assumptions]



Trust Fund Ratios

The trust fund ratio is defined as the asset reserves at the beginning of a year expressed as a percentage of the cost during the year. The trust fund ratio thus represents the proportion of a year's cost which could be paid solely with the reserves at the beginning of the year. Table II.D1 displays the projected maximum trust fund ratios during the long-range period for the OASI, DI, and combined OASI and DI funds. The table also shows the year of maximum projected trust fund ratio during the long-range projection period (2019 through 2093) and the year of trust fund asset reserve depletion. Trust fund ratios for OASI and OASDI are projected to decline from their current levels until reserve depletion. For DI, the trust fund ratio is projected to rise to 91 in 2037, then decline until reserve depletion.

Table II.D1.—Projected Maximum Trust Fund Ratios During the Long-Range Period and Trust Fund Reserve Depletion Dates
[Under Intermediate Assumptions]

	OASI	DI	OASDI
Maximum projected trust fund ratio (percent)	307	91	273
Year attained	2019	2037	2019
Projected year of trust fund reserve depletion	2034	2052	2035

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Summary Measures

The actuarial balance is a summary measure of the program's financial status through the end of the 75-year valuation period. The actuarial balance measure includes the trust fund asset reserves at the beginning of the period, all cost and income during the valuation period, and the cost of reaching a target trust fund reserve of one year's cost by the end of the period. Therefore, the actuarial balance is essentially the difference between the present values of income and cost from 1937 through the end of the valuation period. Actuarial balance is expressed as a percentage of the taxable payroll for the 75-year valuation period. A negative actuarial balance is called an actuarial deficit. The actuarial deficit represents the average amount of change in income or cost that is needed throughout the valuation period in order to achieve actuarial balance.

In this report, the actuarial deficit for the combined OASI and DI Trust Funds under the intermediate assumptions is 2.78 percent of taxable payroll. The actuarial deficit was 2.84 percent in the 2018 report. If the assumptions, methods, starting values, and the law had all remained unchanged from last year, the actuarial deficit would have increased to 2.90 percent of payroll solely due to advancing the valuation period by 1 year.

Another way to illustrate the projected financial shortfall of the OASDI program is to examine the cumulative present value of scheduled income less cost. Figure II.D5 shows the present value of cumulative OASDI income less cost from the inception of the program through each of the years from 2018 to 2093. A positive value represents the present value of trust fund reserves at the end of the selected year. A negative value is the unfunded obligation through the selected year. The asset reserves of the combined trust funds were $2.9 trillion at the end of 2018. The combined trust fund reserves decline on a present value basis after 2018, but remain positive through 2034. However, after 2034 this cumulative amount becomes negative, which means that the combined OASI and DI Trust Funds have a net unfunded obligation through each year after 2034. Through the end of 2093, the combined funds have a present-value unfunded obligation of $13.9 trillion. If the assumptions, methods, starting values, and the law had all remained unchanged from last year, the unfunded obligation would have risen to about $13.7 trillion due to the change in the valuation date.

This unfunded obligation represents 2.61 percent of taxable payroll (decreased from 2.68 percent in last year's report) and 0.9 percent of GDP (decreased from 1.0 percent in last year's report) for the 75-year valuation period. The unfunded obligation as a share of taxable payroll (2.61 percent)

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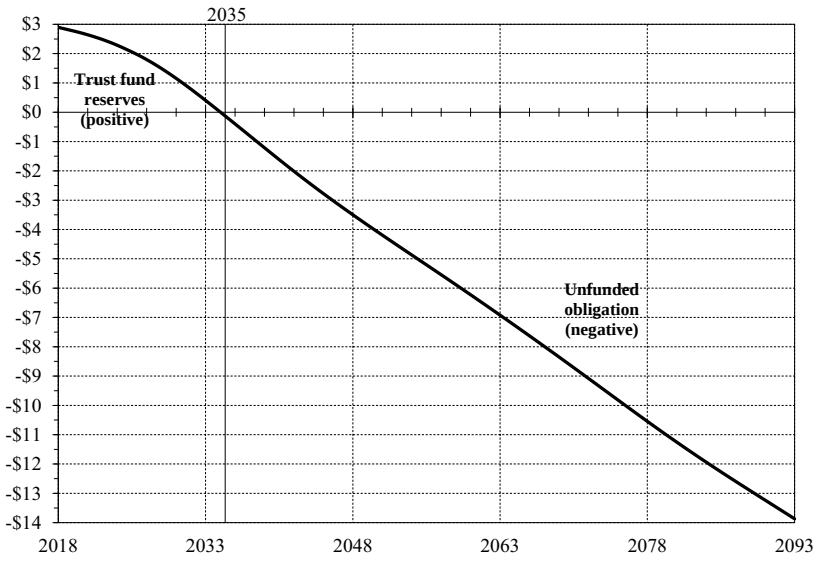
and the actuarial deficit (2.78 percent) are similar measures, but differ because the actuarial deficit includes the cost of having an ending trust fund reserve equal to one year's cost.

Figures II.D2, II.D4, and II.D5 show that the program's financial condition is worsening at the end of the projection period. Trends in annual balances and cumulative values toward the end of the 75-year period provide an indication of the program's ability to maintain solvency beyond 75 years. Consideration of summary measures alone for a 75-year period can lead to incorrect perceptions and to policy prescriptions that do not achieve sustainable solvency.[1]

Figure II.D5.—Cumulative Scheduled OASDI Income Less Cost, From Program Inception Through Years 2018-2093
[Present value as of January 1, 2019, in trillions, under Intermediate Assumptions]



Appendix F presents summary measures over the infinite horizon. The infinite horizon values provide an additional indication of Social Security's financial condition for the period beginning with the inception of the program and extending indefinitely into the future, but results are subject to

[1] Sustainable solvency for the financing of the program under a specified set of assumptions has been achieved when the projected trust fund ratio is positive throughout the 75-year projection period and is either stable or rising at the end of the period.

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much greater uncertainty. Extending the horizon beyond 75 years increases the measured unfunded obligation. Through the infinite horizon, the unfunded obligation, or shortfall, is equivalent to 4.1 percent of future taxable payroll or 1.4 percent of future GDP.

Uncertainty of the Projections

Significant uncertainty surrounds the intermediate assumptions. The Trustees use several methods to help illustrate that uncertainty.

A first approach uses alternative scenarios reflecting low-cost (alternative I) and high-cost (alternative III) sets of assumptions. Figure II.D6 shows the projected trust fund ratios for the combined OASI and DI Trust Funds under the intermediate, low-cost, and high-cost assumptions. The figure indicates that the combined trust funds are projected to become depleted in 2035 under the intermediate alternative, remain above 100 percent of annual cost throughout the projection period under the low-cost alternative, and become depleted in 2030 under the high-cost alternative. The low-cost alternative includes a higher ultimate total fertility rate, slower improvement in mortality, a higher real-wage differential, a higher ultimate real interest rate, a higher ultimate annual change in the CPI, and a lower unemployment rate. The high-cost alternative, in contrast, includes a lower ultimate total fertility rate, more rapid improvement in mortality, a lower real-wage differential, a lower ultimate real interest rate, a lower ultimate annual change in the CPI, and a higher unemployment rate. These alternatives are not intended to suggest that all parameters would be likely to differ from the intermediate values in the specified directions, but are intended to illustrate the effect of clearly defined scenarios that are, on balance, very favorable or unfavorable for the program's financial status. Actual future costs are unlikely to be as extreme as those portrayed by the low-cost or high-cost projections. The method for constructing the low-cost and high-cost projections does not lend itself to estimating the probability that actual experience will lie within or outside the range they define.

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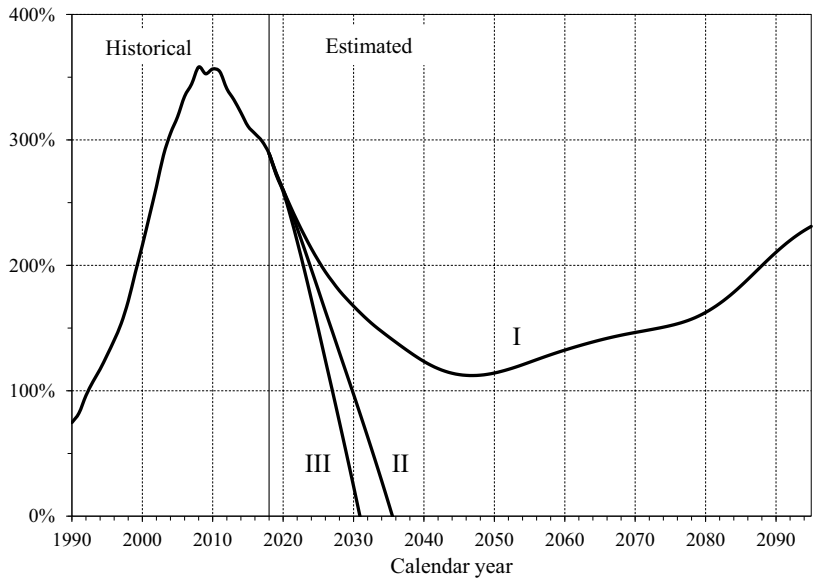
Figure II.D6.—Long-Range OASI and DI Combined Trust Fund Ratios Under Alternative Scenarios
[Asset reserves as a percentage of annual cost]



Appendix D of this report presents long-range sensitivity analysis for the OASDI program. By varying one parameter at a time, sensitivity analysis provides a second approach for illustrating the uncertainty surrounding projections into the future.

A third approach uses 5,000 independently generated stochastic simulations that reflect randomly assigned annual values for most of the key parameters. These simulations produce a distribution of projected outcomes and corresponding probabilities that future outcomes will fall within or outside a given range. The results of the stochastic simulations, discussed in more detail in appendix E, suggest that trust fund reserve depletion (i.e., the point at which the trust fund ratio reaches zero) is very likely by mid-century. In particular, figure II.D7 suggests that based on these stochastic simulations, trust fund asset reserves will become depleted between 2031 and 2044 with a 95-percent confidence.

The stochastic results suggest that trust fund ratios as high as the low-cost alternative are very unlikely. However, the relationship between the stochastic results and the low-cost and high-cost alternatives may change as the methodology for the stochastic simulations is further developed. As noted in

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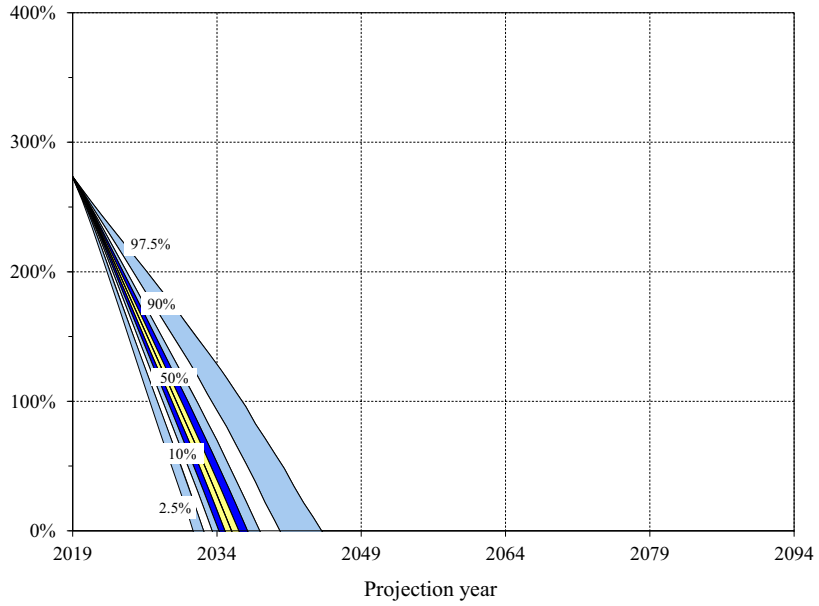
appendix E, future improvements and refinements are expected to be more likely to expand than to reduce the indicated range of uncertainty.

Figure II.D7.—Long-Range OASI and DI Combined Trust Fund Ratios From Stochastic Modeling



Changes From Last Year's Report

The projected long-range OASDI actuarial deficit decreased from 2.84 percent of taxable payroll for last year's report to 2.78 percent of taxable payroll for this year's report. The change in the 75-year projection period alone would have increased the actuarial deficit to 2.90 percent. Changes in law, methods, starting values, and assumptions combined to decrease the actuarial deficit by 0.11 percent of taxable payroll. For a detailed description of the specific changes identified in table II.D2, see section IV.B.6.

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Table II.D2.—Reasons for Change in the 75-Year Actuarial Balance, Based on Intermediate Assumptions
[As a percentage of taxable payroll]

Item	OASI	DI	OASDI
Shown in last year's report:			
Income rate	11.99	1.86	13.84
Cost rate	14.62	2.07	16.69
Actuarial balance	**-2.63**	**-.21**	**-2.84**
Changes in actuarial balance due to changes in:			
Legislation / Regulation	.00	.00	.00
Valuation period[a]	-.05	-.01	-.05
Demographic data and assumptions	.06	.00	.06
Economic data and assumptions	-.03	.00	-.04
Disability data and assumptions	-.02	.09	.07
Methods and programmatic data	.00	.02	.01
Total change in actuarial balance	-.04	.09	.06
Shown in this report:			
Actuarial balance	**-2.67**	**-.12**	**-2.78**
Income rate	11.96	1.85	13.81
Cost rate	14.63	1.97	16.60

[a] The change in the 75-year valuation period from last year's report to this report means that the 75-year actuarial balance now includes the relatively large negative annual balance for 2093. This change in the valuation period results in a larger long-range actuarial deficit. The actuarial deficit includes the trust fund reserve at the beginning of the projection period.

Note: Totals do not necessarily equal the sums of rounded components.

Figure II.D8 compares this year's projections of annual balances (non-interest income minus cost) to those in last year's report. The annual balances in this year's report are higher (less negative) throughout the 75-year projection period. For the full 75-year projection period, the annual balances average 0.18 percentage point higher. See page 78 for details.

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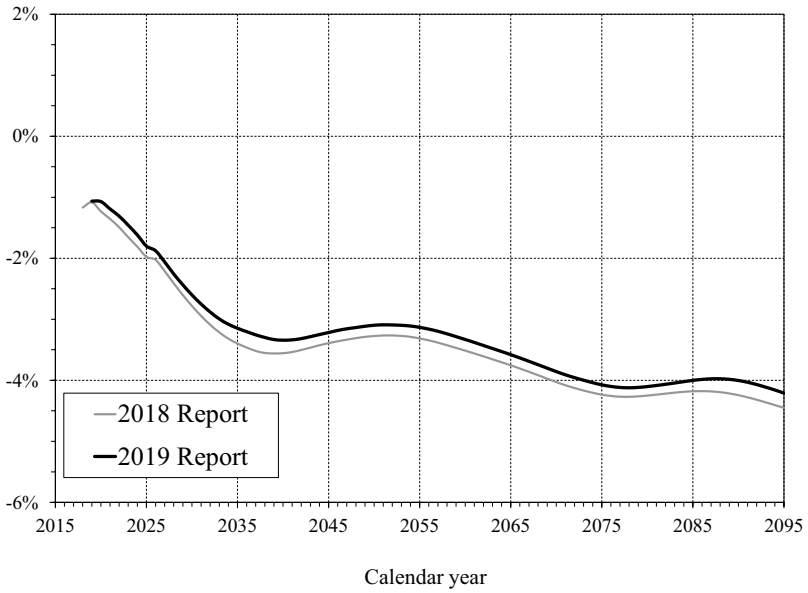
Figure II.D8.—OASDI Annual Balances: 2018 and 2019 Trustees Reports
[As a percentage of taxable payroll, under the intermediate assumptions]



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E. CONCLUSION

Under current law, the projected cost of Social Security increases faster than projected income through 2040 primarily because the ratio of workers paying taxes to beneficiaries receiving benefits will decline as the baby-boom generation ages and is replaced at working ages with subsequent lower birth-rate generations. While the effects of the aging baby boom and subsequent lower birth rates will have stabilized after 2040, annual cost will continue to grow faster than income, but to a lesser degree, reflecting continuing increases in life expectancy. Based on the Trustees' intermediate assumptions, Social Security's cost exceeds total income beginning in 2020, and throughout the remainder of the 75-year projection period.

The OASI Trust Fund and the DI Trust Fund are projected to have sufficient reserves to pay full benefits on time until 2034 and 2052, respectively. Legislative action will be needed to prevent reserve depletion in those years. In the absence of such legislation, continuing income to the trust funds at the time of reserve depletion would be sufficient to pay 77 percent of OASI benefits and 91 percent of DI benefits.

Social Security's combined trust funds are projected to cover full payment of scheduled benefits on a timely basis until the trust fund reserves become depleted in 2035. (Full payment of benefits until combined reserve depletion in 2035 implicitly assumes that the law will have been changed to permit the transfer of funds between OASI and DI as needed.) At that time, projected continuing income to the combined trust funds equals about 80 percent of the program cost. By 2093, continuing income equals about 75 percent of the program cost.

The 75-year actuarial deficit for the combined trust funds under the intermediate assumptions is 2.78 percent of taxable payroll, decreased from the 2.84 percent deficit in last year's report. To illustrate the magnitude of the deficit, consider that for the combined OASI and DI Trust Funds to remain fully solvent throughout the 75-year projection period: (1) revenue would have to be increased by an amount equivalent to an immediate and permanent payroll tax rate increase of 2.70 percentage points to 15.10 percent; (2) scheduled benefits would have to be reduced by an amount equivalent to an immediate and permanent reduction of about 17 percent applied to all current and future beneficiaries, or about 20 percent if the reductions were applied only to those who become initially eligible for benefits in 2019 or later; or (3) some combination of these approaches would have to be adopted. If actions are deferred for several years, the changes necessary to

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maintain Social Security solvency become concentrated on fewer years and fewer generations.

If lawmakers design legislative solutions only to eliminate the overall actuarial deficit without consideration of year-by-year financing, then a substantial financial imbalance could remain at the end of the period, and the long-range sustainability of program financing could still be in doubt. Sustainable solvency for the financing of the program under a specified set of assumptions is achieved when the projected trust fund ratio is positive throughout the long-range period and is either stable or rising at the end of the period. Making changes now that achieve sustainable solvency could avoid the need for later legislative changes.

Lawmakers have a broad continuum of policy options that would close or reduce Social Security's long-term financing shortfall. Cost estimates for many such policy options are available at www.ssa.gov/OACT/solvency/provisions/. Broadly speaking, the approaches that lawmakers can take include increasing revenue from workers and employers by raising the tax rate or the maximum level of taxable earnings, or by dedicating revenue from other sources; lowering benefits for some or all beneficiaries by changing certain program parameters; or a combination of these approaches. There are countless variations on these options, including those that vary the timing, magnitude, and other specifics of the changes under consideration.

The Trustees recommend that lawmakers address the projected trust fund shortfalls in a timely way in order to phase in necessary changes gradually and give workers and beneficiaries time to adjust to them. Implementing changes sooner rather than later would allow more generations to share in the needed revenue increases or reductions in scheduled benefits. Social Security will play a critical role in the lives of 64 million beneficiaries and 178 million covered workers and their families during 2019. With informed discussion, creative thinking, and timely legislative action, Social Security can continue to protect future generations.

For further information related to the contents of this report, see the following websites:

- www.ssa.gov/OACT/tr/2019/
- www.ssa.gov/OACT/solvency/provisions/
- www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/ReportsTrustFunds/
- www.treasury.gov/resource-center/economic-policy/ss-medicare/Pages/Soc-Sec-and-Medicare.aspx

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III. FINANCIAL OPERATIONS OF THE TRUST FUNDS AND LEGISLATIVE CHANGES IN THE LAST YEAR

A. OPERATIONS OF THE OLD-AGE AND SURVIVORS INSURANCE (OASI) AND DISABILITY INSURANCE (DI) TRUST FUNDS, IN CALENDAR YEAR 2018

This section presents detailed information on the operations of the OASI and DI Trust Funds[1] during calendar year 2018. Chapter IV provides projections for calendar years 2019 through 2095.

1. OASI Trust Fund

Table III.A1 presents a statement of the income and cost of the Federal Old-Age and Survivors Insurance Trust Fund in calendar year 2018, and of the asset reserves in the fund at the beginning and end of the calendar year. As shown in this table, total trust fund income in 2018 amounted to $831.0 billion, while cost totaled $853.5 billion, a decrease in trust fund reserves during 2018 of $22.4 billion.

Total income during calendar year 2018 included $718.3 billion in payroll tax contributions. These contributions include initial appropriations of payroll taxes, made on an estimated basis, and adjustments to appropriations for prior years to reflect actual tax income. The OASI fund paid the General Fund $2.4 billion for the estimated amount of employee payroll-tax refunds, partially offsetting these gross contributions. Employees who work for more than one employer during a year and pay contributions on total earnings in excess of the contribution and benefit base are eligible for such refunds. Net payroll tax contributions were therefore $715.9 billion in 2018.

Net reimbursements from the General Fund of the Treasury amounted to $18 million in 2018. As shown in the table, almost all of that amount came from adjustments to prior year reimbursements based on Public Law 111-312, the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Public Law 112-78, the Temporary Payroll Tax Cut Continuation Act of 2011, and Public Law 112-96, the Middle Class Tax Relief and Job Creation Act of 2012. These acts specified General Fund reimbursement for temporary reductions in employee and self-employment payroll taxes for earnings in 2011 and 2012.

Income to the OASI Trust Fund based on the taxation of OASI benefits amounted to $34.5 billion in 2018. As first required by the 1983 Social Secu-

[1] See www.ssa.gov/oact/ProgData/fundsQuery.html.

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rity Amendments, this income comes from two separate sources: (1) Federal income taxation on up to 50 percent of an individual's or couple's OASI benefits under certain circumstances, and (2) a tax withheld from the benefits paid to certain nonresident alien beneficiaries. For the direct Federal income tax portion, Treasury transfers estimated amounts to the OASI Trust Fund in advance at the beginning of each calendar quarter. Treasury makes subsequent adjustments based on the actual amounts shown on annual income tax records. There were two such adjustments made in 2018 totaling $2.2 billion. The amount of income from direct Federal income taxation on OASI benefits constituted approximately 99 percent of income from benefit taxation. The remaining one percent of the income from benefit taxation is the amounts withheld from the benefits paid to nonresident aliens.

In 2018, the OASI Trust Fund earned $80.7 billion in net interest, which consisted of: (1) interest earned on the investments held by the trust fund, (2) interest on adjustments in the allocation of administrative expenses between the trust fund and the General Fund account for the Supplemental Security Income program, (3) interest arising from the revised allocation of administrative expenses among the trust funds, and (4) interest on certain reimbursements to the trust fund.

The remaining income, about $188 thousand, consisted of gifts received under the provisions authorizing the deposit of monetary gifts or bequests in the trust funds.

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Table III.A1.—Operations of the OASI Trust Fund, Calendar Year 2018
[In millions]

Total asset reserves, December 31, 2017		$2,820,309
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$718,285	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-2,420	
Net payroll tax contributions[a]		715,865
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L. 111-312, P.L. 112-78, and P.L. 112-96[a]	18	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		18
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	217	
All other, not subject to withholding[a]	34,271	
Total income from taxation of benefits[a]		34,488
Investment income and interest adjustments:		
Interest on investments	80,655	
Interest adjustments[c]	[b]	
Total investment income and interest adjustments		80,655
Gifts		[b]
Total income		831,026
Cost:		
Benefit payments:		
Monthly benefits and lump-sum death payments[d]	844,924	
Reimbursement from the General Fund for unnegotiated checks	-36	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	7	
Net benefit payments[d]		844,895
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		4,769
Administrative expenses:		
Costs incurred by:		
Social Security Administration	3,277	
Department of the Treasury	530	
Offsetting miscellaneous receipts	-1	
Miscellaneous reimbursements from the General Fund [e]	-6	
Net administrative expenses		3,800
Total cost		853,464
Net increase in asset reserves		-22,437
Total invested assets	2,797,974	
Undisbursed balances [f]	-102	
Total asset reserves, December 31, 2018		2,797,872

[a] Includes adjustments for prior calendar years.
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust fund and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust fund.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI program.
[f] A negative balance represents a situation where the actual cash payments exceeded the amount of invested securities of the OASI Trust Fund that were redeemed to make such payments. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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Of the $853.5 billion in total OASI cost in 2018, $844.9 billion were for net benefit payments, including recovered overpayments, reimbursements from the General Fund for unnegotiated checks, and the reimbursable costs of vocational rehabilitation services.[1] Net benefit payments increased by 5.8 percent from calendar year 2017 to calendar year 2018. This increase is due primarily to: (1) an increase in the average number of beneficiaries during the year and (2) an increase in the average monthly benefit amount. The increase in the average benefit amount in 2018 was due in part to the automatic cost-of-living benefit increase of 2.0 percent which became effective for December 2017 under the automatic-adjustment provisions in section 215(i) of the Social Security Act. In addition, new beneficiaries tend to have higher monthly benefit amounts than previous beneficiary cohorts, because their initial benefits are based on average wages, which tend to rise faster than the cost of living.

The Railroad Retirement Act requires an annual financial interchange between the Railroad Retirement program and the OASDI program. The purpose of the interchange is to put the OASI and DI Trust Funds in the same financial position in which they would have been had railroad employment always been covered directly by Social Security. The Railroad Retirement Board and the Social Security Administration calculated an interchange of $4.8 billion from the OASI Trust Fund to the Social Security Equivalent Benefit Account for June 2018.

The remaining $3.8 billion of cost for the OASI Trust Fund were for net administrative expenses. The Social Security Administration charges administrative expenses incurred to administer the OASI program directly to the trust fund on an estimated basis. Periodically, as actual expenses are recorded, adjustments are made to the allocations of administrative expenses for prior periods. These adjustments affect the OASI Trust Fund, the DI Trust Fund, the Hospital Insurance (HI) Trust Fund, the Supplementary Medical Insurance (SMI) Trust Fund, and the General Fund account for the Supplemental Security Income program, and include appropriate interest adjustments. As described earlier, the trust fund accounting records such interest adjustments under investment income.

For 2018, the cost incurred by the Social Security Administration to administer the OASI program was 86 percent of OASI net administrative expenses. The Social Security Administration charged such costs to the trust fund in

[1] Vocational rehabilitation services under the OASI program are furnished to disabled widow(er) beneficiaries and to those children of retired or deceased workers who receive benefits based on disabilities that began before age 22. The trust funds reimburse the providers of such services only in those cases where the services contributed to the successful rehabilitation of the beneficiary.

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the amount of $3.3 billion in 2018. In addition, the Department of the Treasury charged the trust fund $0.5 billion in 2018 for services provided in administering the OASI program. A relatively small offset to administrative expenses of $1 million in 2018 represents income from miscellaneous receipts due to the trust fund, which may include refunds, penalties, fees, and other receipts.

Finally, the General Fund of the Treasury makes net reimbursements for administrative costs incurred by the Social Security Administration in performing certain legislatively mandated activities that are not directly related to paying OASI benefits. These reimbursements include $5 million in costs associated with union activities related to administering the OASI program and $1 million in costs of providing information to participants in certain pension plans in 2018. These miscellaneous reimbursements totaled $6 million in 2018.

The asset reserves shown for the OASI Trust Fund at the end of calendar year 2018 totaled $2,797.9 billion, consisting of $2,798.0 billion in U.S. Government obligations and, as an offset, an extension of credit of $102 million against securities to be redeemed within the first few days of the following year. The effective annual rate of interest earned by the reserves in the OASI Trust Fund during calendar year 2018 was 2.9 percent, slightly lower than the 3.0 percent earned during calendar year 2017. Table VI.A4, presented in appendix A, shows a detailed listing of OASI Trust Fund holdings by type of security, interest rate, and year of maturity at the end of calendar years 2017 and 2018.

By law, the Department of the Treasury must invest trust fund reserves in interest-bearing securities backed by the full faith and credit of the United States Government. The securities currently held by the OASI Trust Fund are entirely special issue securities sold by the Treasury only to the trust funds. These special issues are of two types: short-term certificates of indebtedness and longer-term bonds. Daily trust fund tax income is invested in the short-term certificates of indebtedness which mature on the next June 30 following the date of issue. The trust fund normally acquires long-term special-issue bonds when special issue securities of either type mature on June 30 and must be reinvested. The amount of long-term bonds acquired on June 30 is equal to the amount of special issue securities maturing (including accrued interest earnings), plus tax income for that day, less amounts required to meet cost on that day.

Section 201(d) of the Social Security Act provides that the obligations issued for purchase by the OASI and DI Trust Funds shall have maturities fixed

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with due regard for the needs of the funds. The usual practice has been to reinvest the maturing special issue securities, as of each June 30, so that the value of the total portfolio of special issue securities maturing in each of the next 15 years are approximately equal. Accordingly, the Department of the Treasury, in consultation with the Chief Actuary of the Social Security Administration, selected the amounts and maturity dates of the special-issue bonds purchased on June 30, 2018, so that the maturity dates of the total portfolio of special issue securities were spread evenly to the extent possible over the 15-year period 2019 through 2033. The bonds purchased on that date have an interest rate of 2.875 percent, reflecting the average market yield, as of the last business day of the prior month, on all of the outstanding marketable U.S. obligations that are due or callable more than 4 years in the future. Table III.A7 shows additional details on the investment transactions during 2018, including the amounts of bonds purchased on June 30, 2018.

2. DI Trust Fund

Table III.A2 presents a statement of the income and cost of the Federal Disability Insurance Trust Fund in calendar year 2018, and of the asset reserves in the fund at the beginning and end of the calendar year.

Line entries in the DI statement are similar to those in the OASI statement. The explanations of the OASI entries generally apply to DI as well.

Of the $172.3 billion in total income, $169.2 billion was net payroll tax contributions.

Of the $146.8 billion of total cost, $143.7 billion was net benefit payments. The total level of net benefit payments in 2018 increased by 0.7 percent from total net benefit payments paid in 2017, largely due to an increase in average benefit amounts and an offsetting decrease in the average number of beneficiaries. Non-interest income, and total income, exceeded total cost in 2018 due primarily to the temporary reallocation of the payroll tax rate from OASI to DI for years 2016 through 2018. DI total cost exceeded non-interest income from 2005 to 2015, and exceeded total income to the trust fund from 2009 to 2015.

Table III.A2.—Operations of the DI Trust Fund, Calendar Year 2018
[In millions]

Total asset reserves, December 31, 2017		$71,480
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$169,769	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-583	
Net payroll tax contributions[a]		169,186
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L. 111-312, P.L. 112-78, and P.L. 112-96[a]	3	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		3
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	4	
All other, not subject to withholding[a]	526	
Total income from taxation of benefits[a]		530
Investment income and interest adjustments:		
Interest on investments	2,626	
Interest adjustments[c]	3	
Total investment income and interest adjustments		2,628
Gifts		—
Total income		172,347
Cost:		
Benefit payments:		
Monthly benefits[d]	143,656	
Reimbursement from the General Fund for unnegotiated checks	-19	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	103	
Net benefit payments[d]		143,741
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		174
Administrative expenses:		
Costs incurred by:		
Social Security Administration	2,745	
Department of the Treasury	96	
Demonstration projects	19	
Miscellaneous reimbursements from the General Fund[e]	-4	
Net administrative expenses		2,856
Total cost		146,770
Net increase in asset reserves		25,577
Total invested assets	97,201	
Undisbursed balances[f]	-144	
Total asset reserves, December 31, 2018		97,057

[a] Includes adjustments for prior calendar years.
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust fund and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust fund.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing legislatively mandated activities not directly related to administering the DI program.
[f] A negative balance represents a situation where the actual cash payments exceeded the amount of invested securities of the DI Trust Fund that were redeemed to make such payments. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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During 2018, the reserves in the DI Trust Fund increased by $25.6 billion, from $71.5 billion at the end of 2017 to $97.1 billion at the end of 2018. This $97.1 billion consisted of $97.2 billion in U.S. Government obligations and, as an offset, an extension of credit of $144 million against securities to be redeemed within the first few days of the following year. The effective annual rate of interest earned by the asset reserves in the DI Trust Fund during calendar year 2018 was 3.1 percent, slightly lower than the 3.2 percent earned during calendar year 2017. Table VI.A5 shows a detailed listing of DI Trust Fund holdings by type of security, interest rate, and year of maturity at the end of calendar years 2017 and 2018.

Section 201(d) of the Social Security Act provides that the Treasury securities issued for purchase by the OASI and DI Trust Funds shall have maturities fixed with due regard for the needs of the funds. Each year, bond purchases for each trust fund are made on June 30, taking into account the projected reserve depletion date in the most recently issued Trustees Report. The usual practice has been to reinvest the maturing special issue securities, as of each June 30, so that the values of the securities maturing in each of the next 15 years are approximately equal. However, as of June 2018, the Trustees projected that the reserves in the DI Trust Fund would be depleted within 15 years. Therefore, the Department of the Treasury, in consultation with the Chief Actuary of the Social Security Administration, selected the amounts and maturity dates of the DI special-issue bonds purchased on June 30, 2018, so that the bonds would mature over the 14-year period 2019-32. The bonds purchased have an interest rate of 2.875 percent, reflecting the average market yield, as of the last business day of the prior month, on the outstanding marketable U.S. obligations that are due or callable more than 4 years in the future. As of June 30, 2018, most of the invested asset reserves of the DI Trust Fund had maturity dates of June 30 in 2019 through 2023, so this investment approach required that all bond purchases on June 30, 2018 be split over the maturity dates of June 30, 2024 through June 30, 2032. Table III.A7 shows details on investment transactions during 2018.

3. OASI and DI Trust Funds, Combined

Table III.A3 presents a statement of the operations of the OASI and DI Trust Funds on a hypothetical combined basis.[1] The entries in this table represent the sums of the corresponding values from tables III.A1 and III.A2. The two preceding subsections that cover OASI and DI provide a description of the nature of these income and cost transactions.

[1] The OASI and DI Trust Funds are distinct legal entities which operate independently. To illustrate the actuarial status of the program as a whole, the fund operations are often combined on a hypothetical basis.

Table III.A3.—Operations of the Combined OASI and DI Trust Funds, Calendar Year 2018
[In millions]

Total asset reserves, December 31, 2017		$2,891,789
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$888,054	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-3,003	
Net payroll tax contributions[a]		885,051
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L. 111-312, P.L. 112-78, and P.L. 112-96[a]	21	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		21
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	220	
All other, not subject to withholding[a]	34,797	
Total income from taxation of benefits[a]		35,017
Investment income and interest adjustments:		
Interest on investments	83,280	
Interest adjustments[c]	3	
Total investment income and interest adjustments		83,283
Gifts		[b]
Total income		1,003,373
Cost:		
Benefit payments:		
Monthly benefits and lump-sum death payments[d]	988,580	
Reimbursement from the General Fund for unnegotiated checks	-55	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	111	
Net benefit payments[d]		988,635
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		4,942
Administrative expenses:		
Costs incurred by:		
Social Security Administration	6,022	
Department of the Treasury	625	
Offsetting miscellaneous receipts	-1	
Demonstration projects	19	
Miscellaneous reimbursements from the General Fund[e]	-10	
Net administrative expenses		6,656
Total cost		1,000,233
Net increase in asset reserves		3,140
Total invested assets	2,895,175	
Undisbursed balances[f]	-246	
Total asset reserves, December 31, 2018		2,894,929

[a] Includes adjustments for prior calendar years.
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust funds and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust funds.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI and DI programs.
[f] A negative balance represents a situation where the actual cash payments exceeded the amount of invested securities of the OASI and DI Trust Funds that were redeemed to make such payments. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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Table III.A4 compares estimates of total income and total cost for calendar year 2018 from the intermediate projections in the 2014 through 2018 Trustees Reports to the corresponding actual amounts for 2018.

Table III.A4.—Comparison of Actual Calendar Year 2018 Trust Fund Operations With Estimates Made in Prior Reports, Based on Intermediate Assumptions[a]
[Amounts in billions]

	Total income[b]		Total cost	
	Amount	Difference from actual (percent)	Amount	Difference from actual (percent)
OASI Trust Fund:				
Estimate in 2014 report	$965.3	16.2	$920.5	7.9
Estimate in 2015 report	949.7	14.3	909.8	6.6
Estimate in 2016 report	873.2	5.1	873.2	2.3
Estimate in 2017 report	873.6	5.1	859.0	.6
Estimate in 2018 report	828.2	-.3	853.6	[c]
Actual amount	831.0	—	853.5	—
DI Trust Fund:				
Estimate in 2014 report	[d]	[d]	167.1	13.9
Estimate in 2015 report	[d]	[d]	165.7	12.9
Estimate in 2016 report	181.4	5.3	159.4	8.6
Estimate in 2017 report	182.6	6.0	152.5	3.9
Estimate in 2018 report	172.9	.3	149.3	1.7
Actual amount	172.3	—	146.8	—
OASI and DI Trust Funds, combined:				
Estimate in 2014 report	1,105.0	10.1	1,087.6	8.7
Estimate in 2015 report	1,088.4	8.5	1,075.5	7.5
Estimate in 2016 report	1,054.7	5.1	1,032.5	3.2
Estimate in 2017 report	1,056.2	5.3	1,011.5	1.1
Estimate in 2018 report	1,001.1	-.2	1,002.8	.3
Actual amount	1,003.4	—	1,000.2	—

[a] Percentage differences are calculated prior to rounding.
[b] "Actual" income for 2018 reflects adjustments to payroll tax contributions for prior calendar years (see appendix A for description of these adjustments). "Estimated" income also includes such adjustments, but on an estimated basis.
[c] Between -0.05 and 0.05 percent.
[d] In the annual reports for 2014 and 2015, the DI Trust Fund was projected to become depleted in calendar year 2016 under the intermediate assumptions. Under those circumstances, scheduled benefits could not be paid in full on a timely basis, so that certain projected items of income such as income from taxing benefits and interest on trust fund reserves could not be meaningfully projected. Accordingly, total DI Trust Fund income was not reported for 2018 in those earlier reports. Following the tax rate reallocation enacted in the Bipartisan Budget Act of 2015, the DI Trust Fund was not projected to become depleted until after 2018 in the 2016 through 2018 reports, and thus an estimate for total income was reported. Appendix A presents a detailed description of the components of income and cost, along with complete historical values.

Note: Totals do not necessarily equal the sums of rounded components.

A number of factors contribute to differences between estimates and subsequent actual amounts, including: (1) actual values for key demographic, economic, and other variables that differ from earlier assumed levels; and (2) legislation that was enacted or other administrative initiatives that were finalized after the Trustees completed their estimates.

At the end of calendar year 2018, the OASDI program was providing monthly benefits to about 62.9 million people. The OASI Trust Fund was

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providing benefits to about 52.7 million people and the DI Trust Fund was providing benefits to about 10.2 million people. The number of people receiving benefits from the OASI Trust Fund grew by 2.4 percent while the number of people receiving DI benefits fell by 2.4 percent during calendar year 2018. These changes are in large part due to the gradual aging of the population, with the earliest cohorts of the baby-boom generation now moving above normal retirement age, where DI benefits are no longer applicable. Table III.A5 shows the estimated distributions of benefit payments in calendar years 2017 and 2018, by type of beneficiary, for each trust fund separately.

Table III.A5.—Distribution of Benefit Payments by Type of Beneficiary or Payment, Calendar Years 2017 and 2018
[Amounts in millions]

	Calendar year 2017		Calendar year 2018	
	Amount	Percentage of total	Amount	Percentage of total
Total OASDI benefit payments	$941,461	100.0	$988,580	100.0
OASI benefit payments	798,722	84.8	844,924	85.5
DI benefit payments	142,740	15.2	143,656	14.5
OASI benefit payments, total	798,722	100.0	844,924	100.0
Monthly benefits:				
Retired workers and auxiliaries	680,233	85.2	723,542	85.6
Retired workers	644,181	80.7	686,099	81.2
Spouses	30,493	3.8	31,615	3.7
Children	5,559	.7	5,828	.7
Survivors of deceased workers	118,279	14.8	121,175	14.3
Aged widows and widowers	94,307	11.8	96,623	11.4
Disabled widows and widowers	2,375	.3	2,372	.3
Parents	20	[a]	20	[a]
Children	20,048	2.5	20,660	2.4
Widowed mothers and fathers caring for child beneficiaries	1,529	.2	1,500	.2
Lump-sum death payments	210	[a]	207	[a]
DI benefit payments, total	142,740	100.0	143,656	100.0
Disabled workers	133,871	93.8	134,962	93.9
Spouses	551	.4	536	.4
Children	8,318	5.8	8,158	5.7

[a] Less than 0.05 percent.

Note: Benefits are monthly benefits and lump-sum death payments. Totals do not necessarily equal the sums of rounded components.

Net administrative expenses of the OASI and DI Trust Funds in calendar year 2018 totaled $6.7 billion, equal to 0.7 percent each of total cost and total income. Table III.A6 shows corresponding percentages for each trust fund separately and for OASDI as a whole for the last 5 years.

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Table III.A6.—Administrative Expenses as a Percentage of Total Income and of Total Cost, Calendar Years 2014-2018

	OASI Trust Fund		DI Trust Fund		OASI and DI Trust Funds, combined	
Calendar year	Total income	Total cost	Total income	Total cost	Total income	Total cost
2014	0.4	0.4	2.6	2.0	0.7	0.7
2015	.4	.4	2.4	1.9	.7	.7
2016	.4	.4	1.7	1.9	.7	.7
2017	.4	.5	1.6	1.9	.6	.7
2018	.5	.4	1.7	1.9	.7	.7

The acquisition and redemption of securities during calendar year 2018 changed the invested reserves of the OASI and DI Trust Funds. Table III.A7 presents investment transactions for each fund separately and combined.

Table III.A7.—Trust Fund Investment Transactions, Calendar Year 2018
[In millions]

	OASI Trust Fund	DI Trust Fund	OASI and DI Trust Funds, combined
Invested asset reserves, December 31, 2017[a]	$2,820,368	$71,624	$2,891,992
Acquisitions:			
Special issue securities:			
Certificates of indebtedness	801,981	174,308	976,289
Bonds[b]	176,890	32,617	209,507
Total acquisitions	978,870	206,925	1,185,795
Redemptions:			
Special issue securities:			
Certificates of indebtedness	797,475	172,027	969,502
Bonds	203,789	9,321	213,110
Total redemptions	1,001,265	181,348	1,182,613
Net increase in invested asset reserves	-22,394	25,577	3,183
Invested asset reserves, December 31, 2018[a]	2,797,974	97,201	2,895,175

[a] Invested asset reserves differ from total asset reserves by the amount of undisbursed balances. See tables VI.A4 and VI.A5 for details.

[b] Purchased on June 30, 2018. The interest rate on these purchases was 2.875 percent.

Note: Investments are shown at par value. Totals do not necessarily equal the sums of rounded components.

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B. SOCIAL SECURITY AMENDMENTS SINCE THE 2018 REPORT

Since the Trustees submitted the 2018 report to Congress, one policy change has been implemented that is expected to have notable effects on the OASDI program.

The Social Security Administration (SSA) implemented the Disability Redesign Prototype model in ten states in 1999. Among other features, the prototype model eliminated the reconsideration step in the disability appeals process. Beginning in 2019, SSA is reinstating the reconsideration step in these states, which will make the process uniform nationwide. This reinstatement is expected to decrease disability incidence rates very slightly beginning in 2020, and thus has a small but significant positive effect on the financial status of the DI program over the short-range period and a negligible positive effect over the long-range projection period.

This report also incorporates the effects of one change in law and one change in policy with negligible effects over the short-range and long-range projection periods:

- The Tribal Social Security Fairness Act of 2018, Public Law 115-243, was enacted on September 20, 2018. At the request of any Indian tribe, the Social Security Administration is directed to enter into an agreement to extend Social Security coverage to tribal council members. Such agreements, which are irrevocable, apply to all members of the council and to all services performed in their capacity as council members.
- The Deferred Action for Childhood Arrivals, or DACA, policy was implemented on June 15, 2012, enabling certain other-than-lawful-permanent-resident immigrants who entered the United States as children to receive employment authorization. DACA was rescinded by the Administration on September 5, 2017, directing a phase out of the program to be carried out over the following two years. As of the time this report was drafted, the phase out has been held up in the court system. This year's report accordingly assumes the phase out will be completed one year later than assumed in last year's report.

Sections IV.A.4 and IV.B.6 of this report provide further description of the magnitude of effects on the financial status of the OASDI program.

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IV. ACTUARIAL ESTIMATES

This chapter presents actuarial estimates of the future financial condition of the Social Security program. These estimates show the income, cost, and asset reserves or unfunded obligation of the OASI and DI Trust Funds: (1) in dollars over the 10-year short-range period; and (2) as a percentage of taxable payroll, as a percentage of gross domestic product, and in present-value dollars over the 75-year long-range period. In addition, the chapter discusses a variety of measures of the adequacy of current program financing. This report distinguishes between: (1) the cost (obligations) of the program, which includes all past and future benefits scheduled under current law; and (2) expenditures, which include actual payments for the past plus only the portion of projected program cost that would be payable with the financing provisions in current law.

This chapter presents the estimates and measures of trust fund financial adequacy for the short-range period (2019 through 2028) first, followed by estimates and measures of actuarial status for the long-range period (2019 through 2093). Summary measures are also provided for trust fund status over the infinite horizon. As described in chapter II of this report, these estimates depend upon a broad set of demographic, economic, and programmatic factors. This chapter presents estimates under three sets of assumptions to show a wide range of possible outcomes, because assumptions related to these factors are subject to uncertainty. The intermediate set of assumptions, designated as alternative II, reflects the Trustees' best estimate of future experience; the low-cost alternative I is significantly more optimistic and the high-cost alternative III is significantly more pessimistic for the trust funds' future financial outlook. The tables of this report show the intermediate estimates first, followed by the low-cost and high-cost estimates. Chapter V describes these three sets of assumptions, along with the actuarial methods used to produce the estimates. Appendix D and appendix E present two additional methods to illustrate the uncertainty of the projections. Appendix D presents sensitivity analyses of the effects of variation in individual factors and appendix E presents probability distributions generated by a stochastic model.

In this report, the DI Trust Fund reserve depletion date is again extended, as it was for the last three reports. The experience for disability beneficiaries and benefit levels following the last economic recession has not followed expectations, so substantial revisions have been required in the reports of 2016, 2017, 2018, and 2019.

In 2014, initial disability applications to the states' Disability Determination Services (DDS) dropped by 4.3 percent compared to 2013. For the 2015 report, the Trustees assumed that applications would drop by another

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1.0 percent in 2015, but the decline was actually 4.8 percent. This larger-than-anticipated decline in applications extended reserve depletion by about one year, in addition to the six-year extension due to the reallocation of tax rates included in the Bipartisan Budget Act of 2015. Together, these changes extended the DI Trust Fund reserve depletion year from 2016 for the 2015 report to 2023 for the 2016 report. The change in the reserve depletion date due to DI application experience in the 2016 report was relatively modest, because the Trustees had assumed a 9.1 percent rebound in applications for 2016. However, applications instead dropped again in 2016, by 7.1 percent. Largely on this basis, the 2017 report assumed a more gradual rise in applications after the very low level in 2016, with an increase of only 2.6 percent for 2017. This more gradual path resulted in an additional five-year extension of the projected DI reserve depletion date, to 2028 for the 2017 report.

Applications once again dropped in 2017, by 4.1 percent, a yet lower starting point. For the 2018 report, the Trustees assumed a steeper rise in applications and incidence rates in order to reach the unchanged ultimate levels of incidence rates by 2027. Even with this steep rise, applications and incidence rates were lower for much of the first ten years of the projection period. The extension of the reserve depletion date from 2028 to 2032 for the 2018 report owes largely to this further drop in applications in 2017, partially mitigated by the more rapid rebound to the ultimate assumed level.

This year's projections reflect an additional 4.8 percent drop in disability applications for 2018 compared to 2017. Steady declines in applications since 2010, and the resulting lower levels of disability beneficiaries, have caused the annual cost of the DI program to become much closer to annual income, making the DI Trust Fund reserve depletion date very sensitive to small changes in income and cost. As a result, lower applications in 2018 and a slightly more gradual rise to the ultimate incidence rate have, by themselves, extended the reserve depletion date by 14 years.

In addition, the Trustees have changed the assumed ultimate age-sex-adjusted incidence rate, taking into account long-term averages of incidence rates over multiple economic cycles. The drop in incidence rates since 2010, which is due to many factors including the recent economic recovery and the declining unemployment rate, has lowered long-term average incidence rates. Therefore, the Trustees have reduced the assumed ultimate age-sex-adjusted incidence rate from 5.4 per thousand to 5.2 per thousand exposed, the same incidence rate that had been assumed for the 2008 through 2011 Trustees Reports. This change in the ultimate disability incidence rate added another five years to the reserve depletion date. Finally, restoring the reconsideration step for disability determinations added one more year to the reserve depletion date. The 20-year increase in the projected reserve deple-

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tion date for the DI Trust Fund, from 2032 in last year's report to 2052 for this report, extends the projected DI depletion date beyond the projected OASI depletion date for the first time since the 1983 Trustees Report.

A. SHORT-RANGE ESTIMATES

The Trustees consider the trust funds to be solvent at any point in time if the funds can pay scheduled benefits in full on a timely basis. A standard measure for assessing solvency is the "trust fund ratio," which is the reserves in a fund at the beginning of a year (not including advance tax transfers) expressed as a percentage of the cost during the year. A positive trust fund ratio indicates that the trust fund was solvent at the end of the prior year. The trust fund ratio represents the proportion of a year's cost which the reserves available at the beginning of that year can cover. The Trustees assume that a trust fund ratio of 100 percent of annual program cost provides a reasonable "contingency reserve." Maintaining a reasonable contingency reserve is important because the trust funds do not have borrowing authority. After reserves are depleted, the trust funds would be unable to pay scheduled benefits in full on a timely basis if annual revenue were less than annual cost. Unexpected events, such as severe economic recessions, can quickly diminish reserves. In such cases, a reasonable contingency reserve can maintain the ability to pay scheduled benefits while giving lawmakers time to address possible changes to the program.

The test of short-range financial adequacy applies to the OASI and DI Trust Funds individually and combined on a hypothetical basis.[1] If the estimated trust fund ratio is at least 100 percent at the beginning of the projection period, the test requires that it remain at or above 100 percent throughout the 10-year period. If the ratio is initially less than 100 percent, then it must reach at least 100 percent within 5 years (without reserve depletion at any time during this period) and then remain at or above 100 percent throughout the remainder of the 10-year period. This test is applied using the estimates based on the intermediate assumptions. If either trust fund fails this test, then program solvency in the next 10 years is in question, and lawmakers should take prompt action to improve short-range financial adequacy.

1. Operations of the OASI Trust Fund

This subsection presents estimates, based on the assumptions described in chapter V, of the operations and financial status of the OASI Trust Fund for the period 2019 through 2028. These estimates assume that there are no further changes in the statutory provisions and regulations under which the

[1] The OASI and DI Trust Funds are distinct legal entities which operate independently. To illustrate the actuarial status of the program as a whole, the fund operations are often combined on a hypothetical basis.

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OASDI program currently operates beyond the changes since last year's report indicated in section III.B.[1]

Estimates of the OASI Trust Fund operations presented in table IV.A1 indicate that the asset reserves of the OASI Trust Fund are projected to decrease in all years after 2019 under the intermediate assumptions, increase in all years after 2018 under the low-cost assumptions, and decrease in all years through 2028 under the high-cost assumptions. Trust fund ratios decline throughout the 10-year projection period under all three sets of assumptions. Based on the intermediate assumptions, the reserves of the OASI Trust Fund continue to exceed 100 percent of annual cost through 2028. Consequently, the OASI Trust Fund satisfies the test of short-range financial adequacy. See figure IV.A1 for an illustration of these results.

Table IV.A1.—Operations of the OASI Trust Fund, Calendar Years 2014-2028[a]

[Dollar amounts in billions]

	Income					Cost[b]				Asset Reserves[b]		
Calendar year	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
Historical data:												
2014 . .	$769.4	$646.2	$0.4	$28.0	$94.8	$714.2	$706.8	$3.1	$4.3	$55.2	$2,729.2	374
2015 . .	801.6	679.5	.3	30.6	91.2	750.5	742.9	3.4	4.3	51.0	2,780.3	364
2016 . .	797.5	678.8	.1	31.6	87.0	776.4	768.6	3.5	4.3	21.1	2,801.3	358
2017 . .	825.6	706.5	[f]	35.9	83.2	806.7	798.7	3.7	4.3	19.0	2,820.3	347
2018 . .	831.0	715.9	[f]	34.5	80.7	853.5	844.9	3.8	4.8	-22.4	2,797.9	330
Intermediate:												
2019 . .	917.6	803.4	[f]	35.3	79.0	910.3	901.6	3.7	4.9	7.3	2,805.2	307
2020 . .	961.3	844.6	[f]	38.5	78.2	962.9	954.0	3.9	4.9	-1.6	2,803.6	291
2021 . .	1,005.2	886.0	[f]	42.3	76.9	1,025.7	1,016.8	4.1	4.9	-20.5	2,783.1	273
2022 . .	1,052.1	930.7	[f]	46.2	75.2	1,092.8	1,083.4	4.2	5.2	-40.7	2,742.4	255
2023 . .	1,100.9	976.1	[f]	50.2	74.6	1,164.2	1,154.6	4.3	5.3	-63.3	2,679.1	236
2024 . .	1,153.8	1,024.1	[f]	54.7	74.9	1,240.2	1,230.4	4.4	5.4	-86.4	2,592.7	216
2025 . .	1,206.4	1,071.9	[f]	59.7	74.8	1,319.2	1,309.2	4.6	5.5	-112.8	2,479.9	197
2026 . .	1,272.5	1,122.1	[f]	75.2	75.2	1,402.1	1,391.8	4.7	5.6	-129.7	2,350.2	177
2027 . .	1,330.3	1,173.6	[f]	81.7	75.0	1,489.8	1,479.3	4.9	5.6	-159.5	2,190.7	158
2028 . .	1,388.0	1,226.3	[f]	88.8	72.9	1,584.6	1,573.9	5.0	5.7	-196.6	1,994.1	138
Low-cost:												
2019 . .	926.6	810.8	[f]	35.3	80.4	909.9	901.3	3.7	4.9	16.7	2,814.5	307
2020 . .	994.3	872.6	[f]	38.8	82.8	969.5	960.7	3.9	4.9	24.8	2,839.3	290
2021 . .	1,061.1	933.4	[f]	42.8	84.9	1,037.1	1,028.2	4.1	4.9	24.0	2,863.3	274
2022 . .	1,131.9	997.1	[f]	46.9	87.9	1,110.5	1,101.1	4.3	5.2	21.4	2,884.7	258
2023 . .	1,207.1	1,062.8	[f]	51.3	92.9	1,189.0	1,179.2	4.4	5.3	18.1	2,902.8	243

[1] The estimates shown in this subsection reflect 12 months of scheduled benefits in each year of the short-range projection period. In practice, the actual payment dates have at times shifted over calendar year boundaries as a result of the statutory requirement for early delivery of benefit payments when the normal check delivery date is a Saturday, Sunday, or legal public holiday.

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Table IV.A1.—Operations of the OASI Trust Fund, Calendar Years 2014-2028[a] (Cont.)
[Dollar amounts in billions]

Calendar year	Income					Cost[b]				Asset Reserves[b]		
	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
2024 . .	$1,288.5	$1,133.0	[f]	$56.2	$99.3	$1,273.0	$1,262.9	$4.6	$5.4	$15.5	$2,918.3	228
2025 . .	1,373.2	1,205.2	[f]	61.6	106.4	1,361.0	1,350.6	4.9	5.5	12.2	2,930.5	214
2026 . .	1,474.4	1,281.1	[f]	78.0	115.4	1,454.3	1,443.6	5.1	5.6	20.1	2,950.6	202
2027 . .	1,569.7	1,359.5	[f]	85.2	125.0	1,554.2	1,543.2	5.3	5.7	15.6	2,966.2	190
2028 . .	1,669.5	1,442.1	[f]	93.2	134.2	1,662.9	1,651.6	5.5	5.7	6.6	2,972.8	178
High-cost:												
2019 . .	909.2	796.0	[f]	35.3	77.9	910.9	902.3	3.7	4.9	-1.7	2,796.1	307
2020 . .	918.3	806.5	[f]	38.4	73.4	959.4	950.5	3.9	5.0	-41.1	2,755.0	291
2021 . .	933.7	823.6	[f]	42.0	68.1	1,018.2	1,009.1	4.0	5.0	-84.5	2,670.5	271
2022 . .	959.7	850.9	[f]	45.6	63.1	1,080.6	1,071.2	4.1	5.3	-120.9	2,549.6	247
2023 . .	987.8	879.9	[f]	49.5	58.4	1,146.6	1,137.1	4.2	5.4	-158.8	2,390.8	222
2024 . .	1,019.3	911.4	[f]	53.7	54.2	1,216.4	1,206.7	4.3	5.5	-197.1	2,193.7	197
2025 . .	1,051.6	943.9	[f]	58.3	49.5	1,288.2	1,278.4	4.4	5.5	-236.6	1,957.1	170
2026 . .	1,095.9	978.2	[f]	73.1	44.6	1,363.1	1,353.1	4.4	5.6	-267.2	1,690.0	144
2027 . .	1,130.0	1,011.8	[f]	79.1	39.1	1,441.5	1,431.4	4.5	5.6	-311.5	1,378.5	117
2028 . .	1,160.9	1,044.4	[f]	85.5	31.0	1,525.6	1,515.3	4.6	5.6	-364.7	1,013.8	90

[a] Appendix A presents a detailed description of the components of income and cost, along with complete historical values.

[b] Amounts for 2015 and 2016 are adjusted to include in 2016 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2016, which were actually paid on December 31, 2015 as required by the statutory provision for early benefit payments when the normal delivery date is on a weekend or holiday. Such shifts in payments across calendar years have occurred in the past and will occur periodically in the future whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on trust fund operations over time, all trust fund operations in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[c] Includes reimbursements from the General Fund of the Treasury to the OASI Trust Fund for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[d] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.

[e] The "Trust fund ratio" column represents reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.

[f] Between -$50 million and $50 million.

Note: Totals do not necessarily equal the sums of rounded components.

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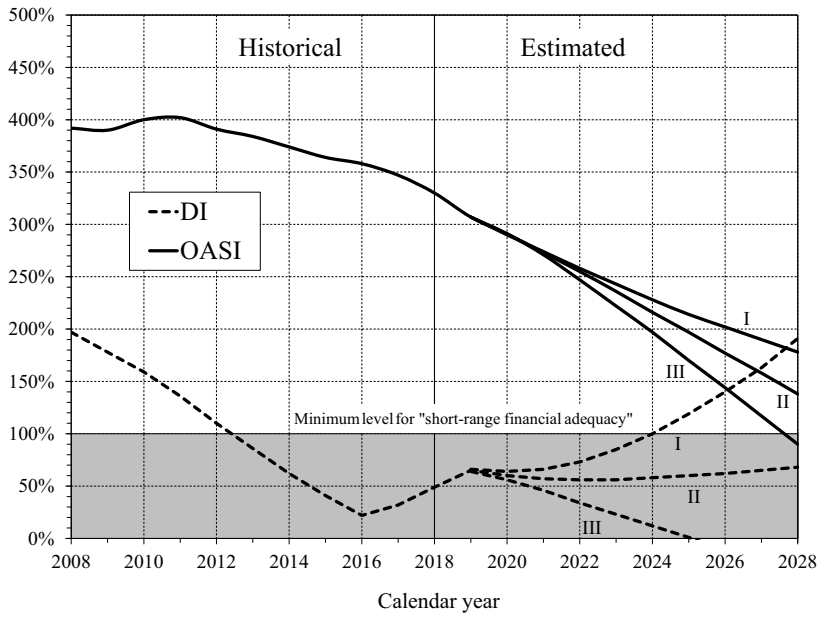
Figure IV.A1.—Short-Range OASI and DI Trust Fund Ratios
[Asset reserves as a percentage of annual cost]



The estimated income shown in table IV.A1 increases annually under each set of assumptions throughout the short-range projection period. The estimated increases in income result primarily from the projected increases in OASDI taxable payroll. Employment increases in every year through 2028 for all three alternatives, with the exception of small decreases in covered employment in 2021 for the high-cost alternative: the number of covered workers increases under alternatives I, II, and III from 176 million during calendar year 2018 to about 190 million, 186 million, and 182 million, respectively, in 2028[1]. The total annual amount of taxable payroll increases in every year through 2028 for each alternative. Total taxable payroll increases from $7,262 billion in 2018 to $13,639 billion, $11,591 billion, and $9,865 billion in 2028, on the basis of alternatives I, II, and III, respectively.[2] These increases in taxable payroll are due primarily to: (1) projected increases in employment levels as the working age population increases; (2) trend increases in average earnings in covered employment (reflecting both real growth and price inflation); (3) increases in the contribution and benefit base under the automatic-adjustment provisions; and (4) growth in employment and average earnings, temporarily higher than trend, as the

[1] See table IV.B3.
[2] See table VI.G6.

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economy continues to recover from the severe economic downturn that began in late 2007.

Interest earnings contribute to the overall projected level of trust fund income during this period. Interest income declines generally at a slow rate under the intermediate assumptions and much faster under the high-cost assumptions, and increases generally under the low-cost assumptions, due to the net effects of changes in reserve levels and the patterns of projected interest rates. Under the intermediate assumptions, interest also declines as a share of total OASI Trust Fund income reaching 5 percent of total trust fund income for 2028, as compared to 10 percent for 2018.

Rising OASI cost from 2018 through 2028 reflects automatic benefit increases as well as the upward trend in the number of beneficiaries and in the average monthly earnings underlying benefits. The steady growth in the number of OASI beneficiaries in the past and the expected future growth result both from the increase in the aged population and from the increase in the proportion of the population that is eligible for benefits.

The Treasury invests OASI income in financial securities, generally special public-debt obligations of the U.S. Government. The revenue used to make these purchases flows to the General Fund of the Treasury. The trust fund earns interest on these securities, and the Treasury invests the proceeds from maturing securities in new securities if not immediately needed to pay program costs. Program expenditures require the redemption of trust fund securities, generally prior to maturity, to cover the payments made by the General Fund of the Treasury on behalf of the trust fund.[1]

2. Operations of the DI Trust Fund

Table IV.A2 shows the estimated operations and financial status of the DI Trust Fund during calendar years 2019 through 2028 under the three sets of assumptions, together with values for actual experience during 2014 through 2018. Non-interest income for DI was much higher in 2016 through 2018 than in 2015, due to the temporary payroll tax rate reallocation from OASI to DI in these years. For 2019, non-interest income is less than DI cost. Non-interest income increases steadily thereafter under each alternative, with the exception of a small decrease in 2020 under the high-cost assumptions, due to most of the same factors described previously for the OASI Trust Fund beginning on page 42. DI cost grows steadily throughout the period under each alternative. Under the intermediate assumptions, reserves decline through 2020, then increase through 2028. Under the high-cost assumptions, DI reserves decline after 2018 until depletion in the first quarter of 2025.

[1] For an explanation of the interrelationship between the Medicare and Social Security trust funds and the overall Federal budget, see appendix F of the 2019 Medicare Trustees Report.

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Under the low-cost assumptions, reserves increase throughout the short-range projection period except for a small decrease in 2019.

Table IV.A2.—Operations of the DI Trust Fund, Calendar Years 2014-2028[a]
[Dollar amounts in billions]

	Income					Cost[b]				Asset Reserves[b]		
Calendar year	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
Historical data:												
2014 . . .	$114.9	$109.7	$0.1	$1.7	$3.4	$145.1	$141.7	$2.9	$0.4	-$30.2	$60.2	62
2015 . . .	118.6	115.4	[f]	1.1	2.1	146.6	143.4	2.8	.4	-28.0	32.3	41
2016 . . .	160.0	157.4	[f]	1.2	1.4	145.9	142.8	2.8	.4	14.1	46.3	22
2017 . . .	171.0	167.1	[f]	2.0	1.9	145.8	142.8	2.8	.2	25.1	71.5	32
2018 . . .	172.3	169.2	[f]	.5	2.6	146.8	143.7	2.9	.2	25.6	97.1	49
Intermediate:												
2019 . . .	143.4	138.8	[f]	1.6	3.0	149.8	146.9	2.8	.1	-6.4	90.7	65
2020 . . .	148.1	143.4	[f]	1.7	3.0	150.9	147.8	3.0	.1	-2.7	87.9	60
2021 . . .	155.2	150.4	[f]	1.8	3.0	154.6	151.5	3.1	.1	.6	88.5	57
2022 . . .	163.0	158.0	[f]	1.9	3.0	159.2	155.8	3.3	.1	3.8	92.3	56
2023 . . .	171.1	165.7	[f]	2.0	3.3	164.5	160.8	3.6	.1	6.6	99.0	56
2024 . . .	179.9	173.9	[f]	2.2	3.8	171.3	167.4	3.9	[f]	8.6	107.5	58
2025 . . .	188.7	182.0	[f]	2.4	4.3	179.2	175.1	4.1	[f]	9.5	117.0	60
2026 . . .	198.5	190.5	[f]	3.0	4.9	187.7	183.3	4.4	[f]	10.7	127.8	62
2027 . . .	208.1	199.3	[f]	3.3	5.5	196.6	191.9	4.7	[f]	11.5	139.3	65
2028 . . .	218.1	208.2	[f]	3.5	6.3	204.0	199.0	4.9	[f]	14.1	153.4	68
Low-cost:												
2019 . . .	144.9	140.1	[f]	1.6	3.2	147.7	144.9	2.8	.1	-2.8	94.2	66
2020 . . .	153.4	148.2	[f]	1.7	3.6	148.3	145.2	3.0	.1	5.2	99.4	64
2021 . . .	164.4	158.5	[f]	1.8	4.2	150.9	147.7	3.1	.1	13.5	112.9	66
2022 . . .	176.3	169.3	[f]	1.9	5.1	154.5	151.1	3.4	.1	21.8	134.7	73
2023 . . .	189.1	180.5	[f]	2.0	6.7	158.8	155.1	3.7	[f]	30.3	165.0	85
2024 . . .	203.3	192.4	[f]	2.1	8.8	164.6	160.6	4.0	[f]	38.7	203.7	100
2025 . . .	218.3	204.6	[f]	2.3	11.4	171.5	167.2	4.3	[f]	46.8	250.5	119
2026 . . .	235.1	217.5	[f]	2.9	14.7	179.3	174.6	4.6	[f]	55.8	306.3	140
2027 . . .	252.4	230.9	[f]	3.1	18.5	187.5	182.5	5.0	[f]	65.0	371.3	163
2028 . . .	271.4	244.9	[f]	3.4	23.1	194.5	189.1	5.3	[f]	76.9	448.2	191

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Table IV.A2.—Operations of the DI Trust Fund, Calendar Years 2014-2028[a] (Cont.)
[Dollar amounts in billions]

Calendar year	Income					Cost[b]				Asset Reserves[b]		
	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
High-cost:												
2019	$142.0	$137.5	[f]	$1.6	$2.9	$152.1	$149.3	$2.8	$0.1	-$10.1	$86.9	64
2020	141.2	136.9	[f]	1.7	2.5	155.2	152.1	3.0	.1	-14.0	73.0	56
2021	143.6	139.9	[f]	1.9	1.9	160.2	157.0	3.1	.1	-16.5	56.4	46
2022	147.8	144.5	[f]	2.0	1.3	165.0	161.6	3.3	.1	-17.2	39.2	34
2023	152.4	149.4	[f]	2.1	.9	170.3	166.7	3.5	.1	-17.9	21.3	23
2024	157.4	154.8	[f]	2.3	.4	177.4	173.6	3.8	.1	-20.0	1.4	12
2025	[g]	160.3	[f]	2.5	[g]	185.6	181.5	4.0	.1	[g]	[g]	1
2026	[g]	166.1	[f]	3.1	[g]	194.3	190.1	4.2	.1	[g]	[g]	[g]
2027	[g]	171.8	[f]	3.4	[g]	203.3	198.9	4.4	[f]	[g]	[g]	[g]
2028	[g]	177.3	[f]	3.7	[g]	210.7	206.0	4.6	.1	[g]	[g]	[g]

[a] The DI Trust Fund reserves become depleted in the first quarter of 2025 under the high-cost assumptions. For any period during which reserves would be depleted, scheduled benefits could not be paid in full on a timely basis, income from taxing benefits would be less than would apply to scheduled benefits, and interest on trust fund reserves would be negligible. Appendix A presents a detailed description of the components of income and cost, along with complete historical values.

[b] Amounts for 2015 and 2016 are adjusted to include in 2016 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2016, which were actually paid on December 31, 2015 as required by the statutory provision for early benefit payments when the normal delivery date is on a weekend or holiday. Such shifts in payments across calendar years have occurred in the past and will occur periodically in the future whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on trust fund operations over time, all trust fund operations in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[c] Includes reimbursements from the General Fund of the Treasury to the DI Trust Fund for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[d] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.

[e] The "Trust fund ratio" column represents reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.

[f] Between -$50 million and $50 million.

[g] While the fund is depleted, values under current law would reflect permissible expenditures only, which would be less than the cost of scheduled benefits shown in this table.

Note: Totals do not necessarily equal the sums of rounded components.

For the future, DI cost is projected to increase in part due to increases in average benefit levels resulting from: (1) automatic benefit increases and (2) projected increases in the amounts of average monthly earnings on which benefits are based. Future changes in DI cost also reflect changes in the number of DI beneficiaries in current-payment status. In 2018, the number of DI beneficiaries in current-payment status continued the declining trend of the prior four years. Under the intermediate assumptions, that number of DI beneficiaries is projected to drop further through the end of 2021, then increase through the remainder of the short-range projection period. The rate of increase after 2021 is much slower than was experienced on average from 1990 to 2010, when the population with the highest disability prevalence rates was growing rapidly due to the aging of the baby-boom generation. See section V.C.5 for further details.

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At the beginning of calendar year 2018, the reserves of the DI Trust Fund represented 49 percent of annual cost. During 2018, DI income substantially exceeded cost due to the 2016-18 reallocation of the payroll tax rate from OASI to DI, and the estimated trust fund ratio for the beginning of 2019 increased to about 65 percent. Under the intermediate assumptions, DI total cost is projected to exceed income in 2019 and 2020, causing reserves to decrease. Thereafter, income exceeds total cost and trust fund reserves steadily increase through the remainder of the short-range projection period.

Because the reserves of the DI Trust Fund at the beginning of 2019 were less than the estimated annual cost for 2019, and are projected to remain below annual cost throughout the short-range period under the intermediate assumptions, the DI Trust Fund fails the Trustees' test of short-range financial adequacy.

3. Operations of the Combined OASI and DI Trust Funds

Table IV.A3 shows the estimated operations and status of the combined OASI and DI Trust Funds for calendar years 2019 through 2028 under the three alternatives, together with actual experience in 2014 through 2018. Income and cost for the OASI Trust Fund represent over 80 percent of the corresponding amounts for the combined OASI and DI Trust Funds. Therefore, based on the relative strength of the OASI Trust Fund over the next 10 years, the combined OASI and DI Trust Funds would have sufficient financial resources to pay all scheduled benefits through the end of the short-range period, although it is important to note that under current law, one trust fund cannot share financial resources with another trust fund. In addition, the combined OASI and DI Trust Funds would satisfy the test of short-range financial adequacy.

Table IV.A3.—Operations of the Combined OASI and DI Trust Funds, Calendar Years 2014-2028[a]
[Dollar amounts in billions]

	Income					Cost[b]				Asset Reserves[b]		
Calendar year	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
Historical data:												
2014 . .	$884.3	$756.0	$0.5	$29.6	$98.2	$859.2	$848.5	$6.1	$4.7	$25.0	$2,789.5	322
2015 . .	920.2	794.9	.3	31.6	93.3	897.1	886.3	6.2	4.7	23.0	2,812.5	311
2016 . .	957.5	836.2	.1	32.8	88.4	922.3	911.4	6.2	4.7	35.2	2,847.7	305
2017 . .	996.6	873.6	[f]	37.9	85.1	952.5	941.5	6.5	4.5	44.1	2,891.8	299
2018 . .	1,003.4	885.1	[f]	35.0	83.3	1,000.2	988.6	6.7	4.9	3.1	2,894.9	289

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Table IV.A3.—Operations of the Combined OASI and DI Trust Funds, Calendar Years 2014-2028[a] (Cont.)

[Dollar amounts in billions]

Calendar year	Income					Cost[b]				Asset Reserves[b]		
	Total	Net payroll tax contributions	GF reimbursements[c]	Taxation of benefits[d]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
Intermediate:												
2019 . .	$1,061.0	$942.1	[f]	$36.9	$82.0	$1,060.0	$1,048.6	$6.5	$5.0	$1.0	$2,895.9	273
2020 . .	1,109.4	988.0	[f]	40.2	81.2	1,113.7	1,101.8	6.9	5.0	-4.3	2,891.6	260
2021 . .	1,160.4	1,036.4	[f]	44.1	79.8	1,180.3	1,168.2	7.1	5.0	-19.9	2,871.6	245
2022 . .	1,215.1	1,088.8	[f]	48.1	78.2	1,252.0	1,239.2	7.5	5.3	-36.9	2,834.7	229
2023 . .	1,272.0	1,141.8	[f]	52.3	77.9	1,328.7	1,315.4	7.9	5.4	-56.6	2,778.0	213
2024 . .	1,333.7	1,198.0	[f]	56.9	78.7	1,411.5	1,397.8	8.3	5.5	-77.9	2,700.2	197
2025 . .	1,395.1	1,253.9	[f]	62.1	79.1	1,498.4	1,484.2	8.7	5.5	-103.3	2,596.9	180
2026 . .	1,470.9	1,312.7	[f]	78.2	80.1	1,589.9	1,575.1	9.1	5.6	-118.9	2,478.0	163
2027 . .	1,538.4	1,372.8	[f]	85.0	80.6	1,686.4	1,671.3	9.5	5.6	-148.0	2,330.0	147
2028 . .	1,606.2	1,434.6	[f]	92.3	79.2	1,788.6	1,773.0	9.9	5.7	-182.5	2,147.5	130
Low-cost:												
2019 . .	1,071.4	950.9	[f]	36.9	83.7	1,057.6	1,046.1	6.5	5.0	13.8	2,908.8	274
2020 . .	1,147.7	1,020.8	[f]	40.5	86.4	1,117.8	1,105.9	6.9	5.0	29.9	2,938.7	260
2021 . .	1,225.6	1,092.0	[f]	44.6	89.0	1,188.1	1,176.0	7.2	4.9	37.5	2,976.2	247
2022 . .	1,308.2	1,166.4	[f]	48.8	93.1	1,265.0	1,252.1	7.6	5.2	43.2	3,019.4	235
2023 . .	1,396.2	1,243.3	[f]	53.3	99.6	1,347.8	1,334.3	8.1	5.3	48.4	3,067.8	224
2024 . .	1,491.7	1,325.4	[f]	58.3	108.1	1,437.6	1,423.5	8.6	5.4	54.2	3,122.0	213
2025 . .	1,591.5	1,409.8	[f]	63.9	117.8	1,532.5	1,517.9	9.2	5.5	59.0	3,181.0	204
2026 . .	1,709.5	1,498.6	[f]	80.8	130.0	1,633.5	1,618.2	9.7	5.6	76.0	3,256.9	195
2027 . .	1,822.2	1,590.4	[f]	88.3	143.4	1,741.6	1,725.7	10.3	5.7	80.5	3,337.5	187
2028 . .	1,940.9	1,687.0	[f]	96.6	157.3	1,857.4	1,840.8	10.9	5.7	83.5	3,421.0	180
High-cost:												
2019 . .	1,051.2	933.5	[f]	37.0	80.7	1,063.0	1,051.6	6.5	5.0	-11.9	2,883.1	272
2020 . .	1,059.5	943.4	[f]	40.1	75.9	1,114.6	1,102.6	6.9	5.1	-55.1	2,828.0	259
2021 . .	1,077.3	963.5	[f]	43.9	70.0	1,178.3	1,166.1	7.1	5.1	-101.0	2,727.0	240
2022 . .	1,107.5	995.4	[f]	47.6	64.4	1,245.6	1,232.8	7.4	5.4	-138.2	2,588.8	219
2023 . .	1,140.3	1,029.4	[f]	51.6	59.3	1,316.9	1,303.8	7.7	5.5	-176.7	2,412.1	197
2024 . .	1,176.7	1,066.2	[f]	56.0	54.6	1,393.8	1,380.2	8.0	5.5	-217.0	2,195.1	173
2025 . .	1,214.0	1,104.1	[f]	60.8	49.1	1,473.8	1,459.9	8.3	5.5	-259.8	1,935.3	149
2026 . .	1,263.8	1,144.3	[f]	76.2	43.3	1,557.4	1,543.1	8.6	5.6	-293.6	1,641.8	124
2027 . .	1,302.7	1,183.7	[f]	82.5	36.6	1,644.8	1,630.3	8.9	5.6	-342.1	1,299.6	100
2028 . .	1,338.1	1,221.7	[f]	89.2	27.2	1,736.3	1,721.4	9.2	5.7	-398.2	901.4	75

[a] Appendix A presents a detailed description of the components of income and cost, along with complete historical values.

[b] Amounts for 2015 and 2016 are adjusted to include in 2016 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2016, which were actually paid on December 31, 2015 as required by the statutory provision for early benefit payments when the normal delivery date is on a weekend or holiday. Such shifts in payments across calendar years have occurred in the past and will occur periodically in the future whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on trust fund operations over time, all trust fund operations in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[c] Includes reimbursements from the General Fund of the Treasury to the OASI and DI Trust Funds for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[d] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.

[e] The "Trust fund ratio" column represents reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.

[f] Between -$50 million and $50 million.

Note: Totals do not necessarily equal the sums of rounded components.

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4. Factors Underlying Changes in 10-Year Trust Fund Ratio Estimates From Last Year's Report

Table IV.A4 presents an analysis of the factors underlying the changes in the intermediate estimates over the short-range projection period for the OASI, DI, and the combined funds from last year's report to this report.

In the 2018 report under the intermediate assumptions, the trust fund ratio for OASI reached 154 percent at the beginning of 2027—the tenth projection year for that report. The change in the short-range valuation period alone, from 2018 through 2027 to 2019 through 2028, lowered the estimated trust fund ratio for the tenth year by 19 percentage points, to 135 percent. All other changes to reflect modifications in law and regulations since last year's report, the most recent data, adjustments to the assumptions for future years, and changes in projection methods combined for a net increase in the ratio for the tenth projection year of 3 percentage points. Therefore, the total change in the tenth year projected trust fund ratio from last year's report to this year's report is a reduction of 16 percentage points to 138 percent.

Legislative and regulatory changes since the 2018 report was published did not have a significant effect on the projected tenth year OASI trust fund ratio. Changes in demographic assumptions over the short-range period increased the projected tenth year trust fund ratio for OASI by 3 percentage points. Several relatively small changes in economic data and assumptions combined to cause a net reduction in the OASI trust fund ratio of 1 percentage point by the beginning of 2028. Incorporating recent programmatic data resulted in an increase of 1 percentage point in the tenth year OASI trust fund ratio. Finally, the tenth year trust fund ratio was not affected significantly by changes in the short-range methodology for this report.

Table IV.A4 also shows corresponding estimates of the factors underlying the changes in the financial projections for the DI Trust Fund and for the combined OASI and DI Trust Funds.

The 48-percentage-point increase in the DI trust fund ratio from the beginning of 2027 in last year's report to the beginning of 2028 in this year's report is the net effect of increases and decreases from the factors described above for the OASI Trust Fund, combined with a large increase of 50 points due to programmatic data and assumptions. This increase reflects lower estimated disabled-worker incidence rates throughout the short-range projection period, incorporating both more favorable recent experience and the lower ultimate disabled-worker incidence rate assumption in this report. Disability applications have been declining steadily since 2010, and the total number of disabled-worker beneficiaries in current payment status has been falling since 2014. In last year's report, the number of disabled-worker beneficiaries

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was projected to remain essentially the same at 8.7 million from the end of 2017 to the end of 2018. In fact, the number dropped to around 8.5 million by the end of 2018. For this report, the ultimate disability incidence rate assumption has been lowered from 5.4 to 5.2 awards per thousand exposed population. This year's report has lower incidence rates throughout the short-range period, and a more gradual rise from recent low levels to the new ultimate DI incidence rate by the end of the short-range period. In addition, the policy change reinstating the reconsideration step in the DI adjudication process in the ten states where this step had previously been eliminated increased the tenth year DI Trust Fund ratio by 2 percentage points.

Table IV.A4.—Reasons for Change in Trust Fund (Unfunded Obligation) Ratios at the Beginning of the Tenth Year of Projection Under Intermediate Assumptions
[In percent]

Item	OASI Trust Fund	DI Trust Fund	OASI and DI Trust Funds, combined
Trust fund ratio shown in last year's report for calendar year 2027	154	20	137
Change in trust fund ratio due to changes in:			
Legislation and regulations	[a]	2	[a]
Valuation period	-19	-4	-17
Demographic data and assumptions	3	[a]	3
Economic data and assumptions	-1	[a]	[a]
Programmatic data and assumptions	1	50	7
Projection methods and data	[a]	[a]	[a]
Total change in trust fund ratio	-16	48	-7
Trust fund ratio shown in this report for calendar year 2028	138	68	130

[a] Between -0.5 and 0.5 percent.

Note: Totals do not necessarily equal the sums of rounded components.

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B. LONG-RANGE ESTIMATES

The Trustees use three types of financial measures to assess the actuarial status of the Social Security trust funds under the financing approach specified in current law: (1) annual cash-flow measures, including income rates, cost rates, and balances; (2) trust fund ratios; and (3) summary measures such as actuarial balances and unfunded obligations.

The difference between the annual income rate and annual cost rate, both expressed as percentages of taxable payroll, is the annual balance. The level and trend of the annual balances at the end of the 75-year projection period are factors that the Trustees use to assess the financial condition of the program.

The trust fund ratio for a year is the proportion of the year's projected cost that could be paid with funds available at the beginning of the year. Critical factors considered by the Trustees in assessing actuarial status include: (1) the level and year of maximum trust fund ratio, (2) the year of depletion of the fund reserves and the percent of scheduled benefits that is still payable after reserves are depleted, and (3) the stability of the trust fund ratio at the end of the long-range period.

Solvency at any point in time requires that sufficient financial resources are available to pay all scheduled benefits at that time. Solvency is generally indicated by a positive trust fund ratio. "Sustainable solvency" for the financing of the program under a specified set of assumptions is achieved when the projected trust fund ratio is positive throughout the 75-year projection period and is either stable or rising at the end of the period.

The Trustees summarize the total income and cost over valuation periods that extend through 75 years and over the infinite horizon.[1] This section presents several summarized measures, including the actuarial balance and the open-group unfunded obligation. The actuarial balance indicates the size of any surplus or shortfall as a percentage of the taxable payroll over the period. The open-group unfunded obligation indicates the size of any shortfall in present-value dollars.

This section also includes additional information that the Trustees use to assess the financial status of the Social Security program, including: (1) a comparison of the number of beneficiaries to the number of covered workers, (2) the test of long-range close actuarial balance, and (3) the reasons for the change in the actuarial balance from the last report.

[1] See appendix F.

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1. Annual Income Rates, Cost Rates, and Balances

The concepts of income rate and cost rate, expressed as percentages of taxable payroll, are important in the consideration of the long-range actuarial status of the trust funds. The annual income rate is the ratio of all non-interest income to the OASDI taxable payroll for the year. Non-interest income includes payroll taxes, taxes on scheduled benefits, and any General Fund transfers or reimbursements. The OASDI taxable payroll consists of the total earnings subject to OASDI taxes with some relatively small adjustments.[1] The annual cost rate is the ratio of the cost of the program to the taxable payroll for the year. The cost includes scheduled benefits, administrative expenses, net interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. For any year, the income rate minus the cost rate is the "balance" for the year.

Table IV.B1 presents a comparison of the estimated annual income rates and cost rates by trust fund and alternative. Table IV.B2 shows the separate components of the annual income rates.

Under the intermediate assumptions, the Trustees project that the OASI income rate will increase from 10.33 percent of payroll for 2018 to 11.01 percent of payroll for 2019. The OASI income rate was lower for 2016 through 2018 because of the payroll tax rate reallocation of 0.57 percentage point from OASI to DI for those years, as enacted in the Bipartisan Budget Act of 2015. After returning to the pre-reallocation level for 2019, the income rate generally rises at a very gradual rate to 11.52 percent of taxable payroll for 2093. Income from taxation of benefits causes a gradual increase in the OASI income rate for two main reasons: (1) total scheduled benefits are rising faster than payroll; and (2) the benefit-taxation threshold amounts are fixed (not indexed), and therefore an increasing share of total benefits will be subject to tax as incomes and benefits rise. There is also a one-time upward shift in the income rate, from 11.17 percent of payroll for 2025 to 11.29 percent of payroll for 2026, because of increased taxation of benefits due to expiration of the personal income tax provisions in Public Law 115-97, the Tax Cuts and Jobs Act.

From 2019 to 2038, the OASI cost rate rises rapidly because the retirement of the baby-boom generation will continue to increase the number of beneficiaries much faster than the number of workers increases, as subsequent lower-birth-rate generations replace the baby-boom generation at working

[1] Adjustments include adding deemed wage credits based on military service for 1983-2001 and reflecting the lower effective tax rates (as compared to the combined employee-employer rate) that apply to multiple-employer "excess wages." Lower rates also applied to net earnings from self-employment before 1984 and to income from tips before 1988.

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ages. From 2039 to 2052, the cost rate declines because the aging baby-boom generation is gradually replaced at retirement ages by the subsequently lower-birth-rate generation born between 1966 and 1989. After 2052, the projected OASI cost rate generally rises, reaching 15.37 percent of taxable payroll for 2093, with the increase primarily because of projected reductions in death rates at older ages.

Projections of income rates under the low-cost and high-cost sets of assumptions are similar to those projected for the intermediate assumptions, because income rates are largely a reflection of the payroll tax rates specified in the law, with the changes from taxation of benefits noted above. In contrast, OASI cost rates for the low-cost and high-cost assumptions are significantly different from those projected for the intermediate assumptions. For the low-cost assumptions, the OASI cost rate decreases between 2019 and 2020, and then rises until it peaks in 2034 at 12.55 percent of payroll. The cost rate then declines to 11.52 percent for 2055, rises to 11.72 percent for 2072, and declines again to 11.10 percent for 2089 before rising to 11.22 percent for 2093, at which point the income rate reaches 11.26 percent. For the high-cost assumptions, the OASI cost rate rises throughout the 75-year period. It rises relatively rapidly through about 2039 because of the aging of the baby-boom generation. Thereafter, the cost rate continues to rise and reaches 21.80 percent of payroll for 2093, at which point the income rate reaches 11.91 percent.

The pattern of the projected OASI annual balance is important in the analysis of the financial condition of the program. Under the intermediate assumptions, the annual balance is negative throughout the projection period. This annual deficit was temporarily higher for 2018 in part because of the 0.57-percentage-point payroll tax rate reallocation from OASI to DI. After the annual deficit declines from 1.42 percent of payroll for 2018 to 0.94 percent for 2019, it then rises relatively rapidly to 3.29 percent for 2039. It then declines to 2.90 percent of payroll for 2052, and generally rises thereafter, reaching 3.85 percent of taxable payroll for 2093.

Under the low-cost assumptions, after the 2016 through 2018 payroll tax rate reallocation period, the OASI annual deficit decreases from 0.82 percent of payroll in 2019 to 0.69 percent in 2021, and then generally rises to 1.25 percent of payroll for 2034. Then the annual deficit declines to 0.25 percent of payroll for 2055, rises through 2072, and then declines until it becomes a positive annual balance in 2085. The annual balance increases to 0.16 percent in 2089, and then decreases to 0.05 percent of payroll in 2093. Under the high-cost assumptions, the OASI balance worsens throughout the projection period. Annual deficits rise to 1.50 percent for 2020, 6.26 percent for 2050, and 9.89 percent of payroll for 2093.

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Table IV.B1.—Annual Income Rates, Cost Rates, and Balances, Calendar Years 1990-2095
[As a percentage of taxable payroll]

Calendar year	OASI			DI			OASDI		
	Income rate[a]	Cost rate[b]	Balance[b]	Income rate[a]	Cost rate[b]	Balance[b]	Income rate[a]	Cost rate[b]	Balance[b]
Historical data:									
1990	11.47	9.65	1.82	1.18	1.09	0.10	12.65	10.74	1.91
1995	10.65	10.23	.42	1.87	1.44	.43	12.52	11.67	.85
2000	10.85	8.98	1.87	1.78	1.42	.36	12.63	10.40	2.23
2005	10.96	9.31	1.65	1.84	1.85	-.02	12.80	11.16	1.63
2010	10.75	11.06	-.30	1.79	2.41	-.62	12.54	13.47	-.92
2011	10.83	11.04	-.21	1.80	2.42	-.62	12.63	13.46	-.83
2012	11.05	11.35	-.30	1.81	2.47	-.66	12.85	13.82	-.96
2013	10.96	11.54	-.57	1.81	2.44	-.63	12.77	13.97	-1.20
2014	10.96	11.60	-.64	1.81	2.36	-.55	12.77	13.96	-1.19
2015	11.01	11.63	-.62	1.81	2.27	-.47	12.81	13.90	-1.09
2016	10.71	11.70	-.99	2.39	2.20	.19	13.10	13.90	-.80
2017	10.65	11.57	-.92	2.43	2.09	.33	13.07	13.66	-.59
2018	10.33	11.75	-1.42	2.34	2.02	.32	12.67	13.77	-1.10
Intermediate:									
2019	11.01	11.95	-.94	1.84	1.97	-.12	12.85	13.91	-1.06
2020	11.05	12.05	-1.00	1.82	1.89	-.07	12.87	13.94	-1.07
2021	11.08	12.24	-1.16	1.82	1.85	-.03	12.90	14.09	-1.19
2022	11.10	12.42	-1.32	1.82	1.81	.01	12.92	14.23	-1.31
2023	11.12	12.61	-1.49	1.82	1.78	.04	12.94	14.40	-1.46
2024	11.15	12.82	-1.67	1.82	1.77	.05	12.97	14.59	-1.62
2025	11.17	13.02	-1.85	1.82	1.77	.05	12.99	14.79	-1.80
2026	11.29	13.22	-1.93	1.82	1.77	.06	13.11	14.99	-1.88
2027	11.31	13.42	-2.11	1.82	1.77	.05	13.13	15.19	-2.06
2028	11.35	13.67	-2.32	1.83	1.76	.07	13.17	15.43	-2.26
2030	11.38	14.04	-2.67	1.83	1.76	.07	13.20	15.81	-2.60
2035	11.42	14.58	-3.16	1.83	1.82	.01	13.25	16.40	-3.15
2040	11.44	14.72	-3.28	1.83	1.89	-.06	13.27	16.62	-3.34
2045	11.44	14.51	-3.07	1.83	1.98	-.15	13.27	16.49	-3.22
2050	11.43	14.35	-2.92	1.84	2.01	-.18	13.27	16.37	-3.10
2055	11.44	14.38	-2.93	1.84	2.03	-.20	13.28	16.41	-3.13
2060	11.46	14.61	-3.15	1.84	2.02	-.18	13.30	16.63	-3.33
2065	11.48	14.87	-3.39	1.84	2.02	-.19	13.32	16.90	-3.58
2070	11.50	15.16	-3.66	1.84	2.03	-.20	13.34	17.20	-3.86
2075	11.52	15.42	-3.90	1.84	2.01	-.17	13.36	17.43	-4.07
2080	11.52	15.46	-3.93	1.84	2.01	-.17	13.36	17.46	-4.10
2085	11.52	15.31	-3.80	1.84	2.04	-.20	13.35	17.36	-4.00
2090	11.51	15.26	-3.74	1.84	2.10	-.26	13.35	17.36	-4.00
2095	11.53	15.48	-3.95	1.84	2.10	-.26	13.37	17.58	-4.21
First year balance becomes negative and remains negative throughout the 75-year projection period			2010			2036			2010

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Table IV.B1.—Annual Income Rates, Cost Rates, and Balances, Calendar Years 1990-2095 (Cont.)
[As a percentage of taxable payroll]

Calendar year	OASI			DI			OASDI		
	Income rate[a]	Cost rate[b]	Balance[b]	Income rate[a]	Cost rate[b]	Balance[b]	Income rate[a]	Cost rate[b]	Balance[b]
Low-cost:									
2019	10.94	11.76	-0.82	1.83	1.91	-0.08	12.77	13.67	-0.90
2020	11.03	11.74	-.70	1.81	1.79	.02	12.85	13.53	-.68
2021	11.05	11.74	-.69	1.81	1.71	.11	12.86	13.45	-.58
2022	11.07	11.77	-.71	1.81	1.64	.18	12.88	13.41	-.53
2023	11.08	11.82	-.74	1.81	1.58	.24	12.89	13.40	-.51
2024	11.10	11.88	-.78	1.82	1.54	.28	12.92	13.42	-.50
2025	11.11	11.94	-.83	1.81	1.50	.31	12.92	13.44	-.52
2026	11.21	12.00	-.79	1.82	1.48	.34	13.03	13.48	-.45
2027	11.23	12.08	-.85	1.82	1.46	.36	13.05	13.53	-.49
2028	11.26	12.19	-.94	1.82	1.43	.39	13.08	13.62	-.54
2030	11.28	12.38	-1.10	1.82	1.40	.42	13.10	13.78	-.68
2035	11.30	12.54	-1.24	1.82	1.38	.44	13.12	13.92	-.80
2040	11.30	12.39	-1.09	1.82	1.38	.44	13.13	13.78	-.65
2045	11.29	11.96	-.68	1.82	1.41	.41	13.11	13.37	-.26
2050	11.27	11.65	-.37	1.82	1.40	.42	13.10	13.05	.05
2055	11.27	11.52	-.25	1.82	1.40	.43	13.09	12.92	.17
2060	11.28	11.59	-.31	1.82	1.37	.45	13.10	12.96	.14
2065	11.28	11.65	-.37	1.82	1.37	.45	13.11	13.03	.08
2070	11.29	11.71	-.42	1.82	1.37	.45	13.11	13.08	.03
2075	11.29	11.71	-.42	1.82	1.35	.47	13.11	13.06	.05
2080	11.28	11.51	-.23	1.82	1.35	.47	13.10	12.86	.24
2085	11.26	11.21	.05	1.82	1.39	.43	13.09	12.60	.49
2090	11.26	11.11	.15	1.82	1.44	.39	13.08	12.54	.54
2095	11.27	11.33	-.06	1.82	1.44	.39	13.10	12.77	.33
First year balance becomes negative and remains negative throughout the 75-year projection period			[c]			[c]			[c]
High-cost:									
2019	11.07	12.14	-1.06	1.85	2.03	-.17	12.93	14.16	-1.23
2020	11.09	12.59	-1.50	1.82	2.04	-.22	12.91	14.62	-1.72
2021	11.12	13.08	-1.96	1.82	2.06	-.24	12.94	15.14	-2.20
2022	11.16	13.45	-2.29	1.82	2.05	-.23	12.98	15.50	-2.52
2023	11.18	13.79	-2.61	1.82	2.05	-.23	13.00	15.84	-2.84
2024	11.21	14.13	-2.92	1.82	2.06	-.24	13.04	16.19	-3.16
2025	11.24	14.44	-3.21	1.82	2.08	-.26	13.06	16.52	-3.46
2026	11.37	14.75	-3.37	1.83	2.10	-.27	13.20	16.85	-3.64
2027	11.40	15.07	-3.66	1.83	2.13	-.29	13.23	17.19	-3.96
2028	11.45	15.46	-4.01	1.83	2.14	-.30	13.29	17.60	-4.31

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Table IV.B1.—Annual Income Rates, Cost Rates, and Balances, Calendar Years 1990-2095 (Cont.)
[As a percentage of taxable payroll]

Calendar year	OASI Income rate[a]	OASI Cost rate[b]	OASI Balance[b]	DI Income rate[a]	DI Cost rate[b]	DI Balance[b]	OASDI Income rate[a]	OASDI Cost rate[b]	OASDI Balance[b]
High-cost (Cont.):									
2030	11.49	16.02	-4.53	1.84	2.18	-0.34	13.33	18.20	-4.87
2035	11.56	16.97	-5.41	1.84	2.34	-.50	13.40	19.30	-5.90
2040	11.60	17.51	-5.91	1.84	2.50	-.66	13.44	20.01	-6.56
2045	11.62	17.69	-6.07	1.85	2.69	-.84	13.47	20.38	-6.91
2050	11.64	17.90	-6.26	1.85	2.78	-.93	13.49	20.68	-7.19
2055	11.67	18.24	-6.57	1.85	2.85	-1.00	13.52	21.09	-7.57
2060	11.71	18.80	-7.09	1.85	2.85	-1.00	13.56	21.64	-8.08
2065	11.75	19.40	-7.65	1.85	2.88	-1.02	13.60	22.27	-8.67
2070	11.79	20.09	-8.29	1.85	2.90	-1.05	13.65	22.99	-9.34
2075	11.84	20.81	-8.97	1.85	2.87	-1.02	13.70	23.68	-9.99
2080	11.88	21.31	-9.43	1.85	2.85	-1.00	13.73	24.16	-10.43
2085	11.89	21.53	-9.64	1.85	2.87	-1.01	13.75	24.40	-10.65
2090	11.90	21.66	-9.75	1.86	2.92	-1.07	13.76	24.58	-10.82
2095	11.92	21.91	-9.99	1.86	2.93	-1.07	13.78	24.84	-11.06
First year balance becomes negative and remains negative throughout the 75-year projection period			2010			2019			2010

[a] Income rates include certain reimbursements from the General Fund of the Treasury.
[b] Benefit payments scheduled to be paid on January 3 are actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.
[c] The annual balance is projected to be negative for a temporary period and return to positive levels before the end of the projection period.

Notes:
1. The income rate excludes interest income.
2. Revisions of taxable payroll may change some historical values.
3. Totals do not necessarily equal the sums of rounded components.

Under the intermediate assumptions, the projected DI cost rate declines from 1.97 percent for 2019 to 1.77 percent for 2025, and remains relatively stable through 2032. After 2032, the DI cost rate increases gradually to 2.03 percent for 2055. From 2055 to 2078, the DI cost rate stays relatively stable before generally increasing slowly to 2.10 percent of payroll for 2093. The projected DI income rate decreases from 2.34 percent of payroll for 2018 to 1.84 percent for 2019 because the temporary payroll tax reallocation of 2016 through 2018 expires. Thereafter, the income rate remains relatively stable, reaching 1.84 percent for 2093. The annual balance is positive for years 2016 through 2018, reflecting the reallocation. The annual balance is negative from 2019 through 2021 before becoming positive in 2022, reaching a peak of 0.07 percent of payroll for 2029. The annual balance then declines and becomes negative in 2036, generally decreasing thereafter, and reaching a deficit of 0.26 percent of payroll for 2093.

Under the low-cost assumptions, the projected DI cost rate declines from 1.91 percent of payroll for 2019 to 1.38 percent for 2033, and remains rela-

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tively stable thereafter, reaching 1.44 percent for 2093. The annual balance is negative for 2019 and positive throughout the remainder of the long-range period. Under the high-cost assumptions, the DI cost rate generally rises throughout the projection period, reaching 2.93 percent for 2093. The annual deficit is negative throughout the projection period, reaching 0.22 percent for 2020, 0.93 percent for 2050, and 1.07 percent for 2093.

Figure IV.B1 shows the patterns of the historical and projected OASI and DI annual cost rates. Annual DI cost rates rose substantially between 1990 and 2010 in large part due to: (1) aging of the working population as the baby-boom generation moved from ages 25-44 in 1990, where disability prevalence is low, to ages 45-64 in 2010, where disability prevalence is much higher; (2) a substantial increase in the percentage of women insured for DI benefits as a result of increased and more consistent rates of employment; and (3) increased disability incidence rates for women to a level similar to those for men by 2010. As of 2010, these three factors have largely stabilized. Other factors that are not yet fully understood have caused age-sex-adjusted incidence rates and cost rates to decline after 2010, and further declines are projected until about 2030. OASI cost rates increase rapidly through about 2040 as the baby-boom generation ages and is replaced by lower birth-rate generations at working ages. Thereafter, increasing life expectancy results in generally much more modest increases in cost rates through the balance of the projection period. Figure IV.B1 shows only the income rates for alternative II because the variation in income rates by alternative is very small. Income rates generally increase slowly for each of the alternatives over the long-range period. Taxation of benefits, which is a relatively small portion of income, is the main source of both the increases in the income rate and the variation among the alternatives. Increases in income from taxation of benefits reflect: (1) increases in the total amount of benefits scheduled to be paid and (2) the increasing share of individual benefits that will be subject to taxation because benefit taxation threshold amounts are not indexed.

Table IV.B1 shows the annual balances for OASI, DI, and OASDI. The pattern of the annual balances is important to the analysis of the financial condition of the Social Security program as a whole. As seen in figure IV.B1, the magnitude of each of the positive balances is the distance between the appropriate cost-rate curve and the income-rate curve above it. The magnitude of each of the deficits is the distance between the appropriate cost-rate curve and the income-rate curve below it. Annual balances follow closely the pattern of annual cost rates after 1990 because the payroll tax rate does not change for the OASDI program, with only small variations in the allocation between DI and OASI except for changes due to the 1994 and the 2016 through 2018 payroll tax rate reallocations.

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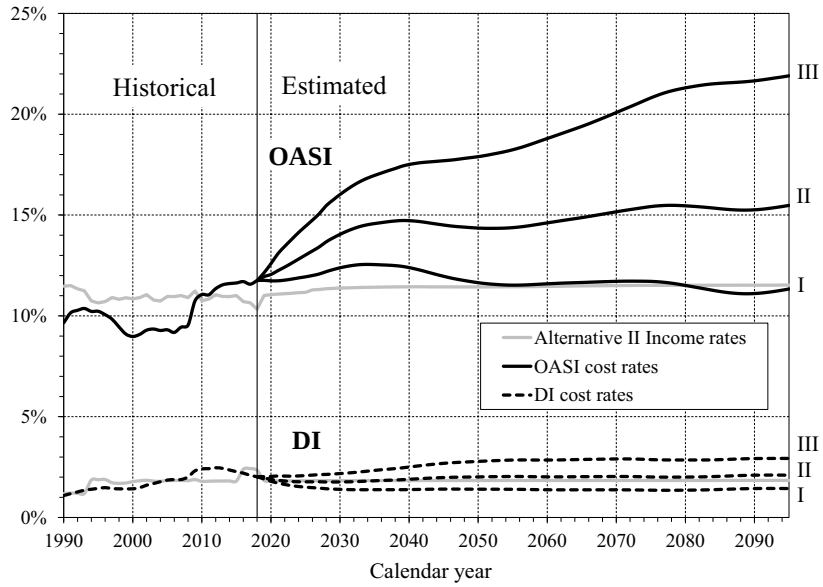
In the future, the costs of OASI, DI, and the combined OASDI programs as a percentage of taxable payroll are unlikely to fall outside the range encompassed by alternatives I and III because alternatives I and III define a wide range of demographic and economic conditions.

Figure IV.B1.—Long-Range OASI and DI Annual Income Rates and Cost Rates
[As a percentage of taxable payroll]



Long-range OASDI cost and income are most often expressed as percentages of taxable payroll. However, the Trustees also present cost and income as shares of gross domestic product (GDP), the value of goods and services produced during the year in the United States. Under alternative II, the Trustees project OASDI cost to increase from about 4.9 percent of GDP for 2019 to about 5.9 percent for 2039. After 2039, OASDI cost as a percentage of GDP declines to a low of about 5.8 percent for 2052 and thereafter generally increases slowly, reaching about 6.0 percent by 2093. Appendix G presents full estimates of income and cost relative to GDP.

Table IV.B2 contains historical and projected annual income rates and their components by trust fund and alternative. The annual income rates consist of the scheduled payroll tax rates, the rates of income from taxation of scheduled benefits, and the rates of income from General Fund reimbursements. Projected income from taxation of benefits increases over time for reasons discussed on page 51.

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Table IV.B2.—Components of Annual Income Rates, Calendar Years 1990-2095
[As a percentage of taxable payroll]

Calendar year	OASI				DI				OASDI			
	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]
Historical data:												
1990 . .	11.29	0.21	-0.03	11.47	1.21	0.01	-0.03	1.18	12.50	0.21	-0.06	12.65
1995 . .	10.46	.19	-.01	10.65	1.87	.01	-.01	1.87	12.33	.20	-.01	12.52
2000 . .	10.56	.29	[d]	10.85	1.78	.02	-.02	1.78	12.34	.31	-.02	12.63
2005 . .	10.68	.29	-.01	10.96	1.81	.02	[d]	1.84	12.49	.31	-.01	12.80
2010 . .	10.30	.42	.04	10.75	1.75	.04	.01	1.79	12.05	.45	.05	12.54
2011 . .	8.82	.41	1.61	10.83	1.50	.03	.27	1.80	10.32	.44	1.88	12.63
2012 . .	8.86	.47	1.72	11.05	1.51	.01	.29	1.81	10.37	.48	2.01	12.85
2013 . .	10.54	.35	.07	10.96	1.79	.01	.01	1.81	12.33	.36	.08	12.77
2014 . .	10.50	.45	.01	10.96	1.78	.03	[d]	1.81	12.28	.48	.01	12.77
2015 . .	10.53	.47	[d]	11.01	1.79	.02	[d]	1.81	12.32	.49	.01	12.81
2016 . .	10.23	.48	[d]	10.71	2.37	.02	[d]	2.39	12.60	.49	[d]	13.10
2017 . .	10.13	.51	[d]	10.65	2.40	.03	[d]	2.43	12.53	.54	[d]	13.07
2018 . .	9.86	.47	[d]	10.33	2.33	.01	[d]	2.34	12.19	.48	[d]	12.67
Intermediate:												
2019 . .	10.54	.46	[d]	11.01	1.82	.02	[d]	1.84	12.36	.48	[d]	12.85
2020 . .	10.57	.48	[d]	11.05	1.80	.02	[d]	1.82	12.37	.50	[d]	12.87
2021 . .	10.57	.51	[d]	11.08	1.80	.02	[d]	1.82	12.37	.53	[d]	12.90
2022 . .	10.58	.52	[d]	11.10	1.80	.02	[d]	1.82	12.37	.55	[d]	12.92
2023 . .	10.58	.54	[d]	11.12	1.80	.02	[d]	1.82	12.37	.57	[d]	12.94
2024 . .	10.58	.57	[d]	11.15	1.80	.02	[d]	1.82	12.38	.59	[d]	12.97
2025 . .	10.58	.59	[d]	11.17	1.80	.02	[d]	1.82	12.37	.61	[d]	12.99
2026 . .	10.58	.71	[d]	11.29	1.80	.03	[d]	1.82	12.37	.74	[d]	13.11
2027 . .	10.57	.74	[d]	11.31	1.80	.03	[d]	1.82	12.37	.77	[d]	13.13
2028 . .	10.58	.77	[d]	11.35	1.80	.03	[d]	1.83	12.38	.80	[d]	13.17
2030 . .	10.58	.79	[d]	11.38	1.80	.03	[d]	1.83	12.38	.83	[d]	13.20
2035 . .	10.58	.84	[d]	11.42	1.80	.03	[d]	1.83	12.38	.87	[d]	13.25
2040 . .	10.58	.86	[d]	11.44	1.80	.04	[d]	1.83	12.38	.89	[d]	13.27
2045 . .	10.58	.86	[d]	11.44	1.80	.04	[d]	1.83	12.38	.89	[d]	13.27
2050 . .	10.58	.85	[d]	11.43	1.80	.04	[d]	1.84	12.38	.89	[d]	13.27
2055 . .	10.58	.86	[d]	11.44	1.80	.04	[d]	1.84	12.38	.90	[d]	13.28
2060 . .	10.58	.88	[d]	11.46	1.80	.04	[d]	1.84	12.38	.92	[d]	13.30
2065 . .	10.58	.90	[d]	11.48	1.80	.04	[d]	1.84	12.38	.94	[d]	13.32
2070 . .	10.58	.92	[d]	11.50	1.80	.04	[d]	1.84	12.38	.96	[d]	13.34
2075 . .	10.58	.94	[d]	11.52	1.80	.04	[d]	1.84	12.38	.98	[d]	13.36
2080 . .	10.58	.94	[d]	11.52	1.80	.04	[d]	1.84	12.38	.98	[d]	13.36
2085 . .	10.58	.94	[d]	11.52	1.80	.04	[d]	1.84	12.38	.98	[d]	13.35
2090 . .	10.58	.93	[d]	11.51	1.80	.04	[d]	1.84	12.38	.98	[d]	13.35
2095 . .	10.58	.95	[d]	11.53	1.80	.04	[d]	1.84	12.38	.99	[d]	13.37
Low-cost:												
2019 . .	10.48	.46	[d]	10.94	1.81	.02	[d]	1.83	12.29	.48	[d]	12.77
2020 . .	10.56	.47	[d]	11.03	1.79	.02	[d]	1.81	12.36	.49	[d]	12.85
2021 . .	10.57	.48	[d]	11.05	1.79	.02	[d]	1.81	12.36	.50	[d]	12.86
2022 . .	10.57	.50	[d]	11.07	1.79	.02	[d]	1.81	12.36	.52	[d]	12.88
2023 . .	10.57	.51	[d]	11.08	1.79	.02	[d]	1.81	12.36	.53	[d]	12.89
2024 . .	10.58	.52	[d]	11.10	1.80	.02	[d]	1.82	12.37	.54	[d]	12.92
2025 . .	10.57	.54	[d]	11.11	1.79	.02	[d]	1.81	12.36	.56	[d]	12.92
2026 . .	10.57	.64	[d]	11.21	1.80	.02	[d]	1.82	12.37	.67	[d]	13.03
2027 . .	10.56	.66	[d]	11.23	1.79	.02	[d]	1.82	12.36	.69	[d]	13.05
2028 . .	10.57	.68	[d]	11.26	1.80	.02	[d]	1.82	12.37	.71	[d]	13.08

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Table IV.B2.—Components of Annual Income Rates, Calendar Years 1990-2095 (Cont.)
[As a percentage of taxable payroll]

Calendar year	OASI				DI				OASDI			
	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]	Payroll tax	Taxation of benefits[a]	General Fund Reimbursements[b]	Total[c]
Low-cost (Cont.):												
2030 . .	10.58	0.70	[d]	11.28	1.80	0.02	[d]	1.82	12.37	0.73	[d]	13.10
2035 . .	10.58	.73	[d]	11.30	1.80	.03	[d]	1.82	12.37	.75	[d]	13.12
2040 . .	10.58	.73	[d]	11.30	1.80	.03	[d]	1.82	12.37	.76	[d]	13.13
2045 . .	10.57	.71	[d]	11.29	1.80	.03	[d]	1.82	12.37	.74	[d]	13.11
2050 . .	10.57	.70	[d]	11.27	1.80	.03	[d]	1.82	12.37	.73	[d]	13.10
2055 . .	10.57	.70	[d]	11.27	1.80	.03	[d]	1.82	12.37	.72	[d]	13.09
2060 . .	10.57	.70	[d]	11.28	1.80	.03	[d]	1.82	12.37	.73	[d]	13.10
2065 . .	10.57	.71	[d]	11.28	1.80	.03	[d]	1.82	12.37	.74	[d]	13.11
2070 . .	10.57	.71	[d]	11.29	1.80	.03	[d]	1.82	12.37	.74	[d]	13.11
2075 . .	10.57	.72	[d]	11.29	1.80	.03	[d]	1.82	12.37	.74	[d]	13.11
2080 . .	10.57	.70	[d]	11.28	1.80	.03	[d]	1.82	12.37	.73	[d]	13.10
2085 . .	10.57	.69	[d]	11.26	1.80	.03	[d]	1.82	12.37	.72	[d]	13.09
2090 . .	10.57	.68	[d]	11.26	1.80	.03	[d]	1.82	12.37	.71	[d]	13.08
2095 . .	10.57	.70	[d]	11.27	1.80	.03	[d]	1.82	12.37	.73	[d]	13.10
High-cost:												
2019 . .	10.60	.47	[d]	11.07	1.83	.02	[d]	1.85	12.44	.49	[d]	12.93
2020 . .	10.58	.50	[d]	11.09	1.80	.02	[d]	1.82	12.38	.53	[d]	12.91
2021 . .	10.58	.54	[d]	11.12	1.80	.02	[d]	1.82	12.38	.56	[d]	12.94
2022 . .	10.59	.57	[d]	11.16	1.80	.02	[d]	1.82	12.39	.59	[d]	12.98
2023 . .	10.58	.60	[d]	11.18	1.80	.03	[d]	1.82	12.38	.62	[d]	13.00
2024 . .	10.59	.62	[d]	11.21	1.80	.03	[d]	1.82	12.39	.65	[d]	13.04
2025 . .	10.58	.65	[d]	11.24	1.80	.03	[d]	1.82	12.38	.68	[d]	13.06
2026 . .	10.58	.79	[d]	11.37	1.80	.03	[d]	1.83	12.38	.82	[d]	13.20
2027 . .	10.58	.83	[d]	11.40	1.80	.04	[d]	1.83	12.37	.86	[d]	13.23
2028 . .	10.59	.87	[d]	11.45	1.80	.04	[d]	1.83	12.38	.90	[d]	13.29
2030 . .	10.59	.90	[d]	11.49	1.80	.04	[d]	1.84	12.39	.94	[d]	13.33
2035 . .	10.59	.97	[d]	11.56	1.80	.04	[d]	1.84	12.39	1.01	[d]	13.40
2040 . .	10.59	1.01	[d]	11.60	1.80	.05	[d]	1.84	12.39	1.06	[d]	13.44
2045 . .	10.59	1.03	[d]	11.62	1.80	.05	[d]	1.85	12.39	1.08	[d]	13.47
2050 . .	10.59	1.05	[d]	11.64	1.80	.05	[d]	1.85	12.39	1.10	[d]	13.49
2055 . .	10.59	1.08	[d]	11.67	1.80	.05	[d]	1.85	12.39	1.13	[d]	13.52
2060 . .	10.59	1.12	[d]	11.71	1.80	.05	[d]	1.85	12.39	1.17	[d]	13.56
2065 . .	10.59	1.16	[d]	11.75	1.80	.06	[d]	1.85	12.39	1.22	[d]	13.60
2070 . .	10.59	1.21	[d]	11.79	1.80	.06	[d]	1.85	12.39	1.26	[d]	13.65
2075 . .	10.59	1.25	[d]	11.84	1.80	.06	[d]	1.85	12.39	1.31	[d]	13.70
2080 . .	10.59	1.29	[d]	11.88	1.80	.06	[d]	1.85	12.39	1.34	[d]	13.73
2085 . .	10.59	1.30	[d]	11.89	1.80	.06	[d]	1.85	12.39	1.36	[d]	13.75
2090 . .	10.59	1.32	[d]	11.90	1.80	.06	[d]	1.86	12.39	1.37	[d]	13.76
2095 . .	10.59	1.33	[d]	11.92	1.80	.06	[d]	1.86	12.39	1.39	[d]	13.78

[a] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.
[b] Includes payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96, and other miscellaneous reimbursements.
[c] Values exclude interest income.
[d] Between -0.005 and 0.005 percent of taxable payroll.

Note: Totals do not necessarily equal the sums of rounded components.

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2. Comparison of Workers to Beneficiaries

Under the intermediate assumptions, the Trustees project the OASDI cost rate will rise rapidly between 2019 and 2038, primarily because the number of beneficiaries rises much more rapidly than the number of covered workers as the baby-boom generation retires. The ratio of OASDI beneficiaries to workers is dominated by the OASI program because all workers eventually die or retire, but only a relatively small minority become disabled. The trends described below are primarily due to demographic changes and thus affect the DI program roughly 20 years earlier than the OASI and OASDI programs. The baby-boom generation had lower fertility rates than their parents, and the Trustees expect that lower fertility rates will persist for all future generations; therefore, the ratio of OASDI beneficiaries to workers will rise rapidly and reach a permanently higher level after the baby-boom generation retires. Due to increasing longevity, the ratio of beneficiaries to workers will generally rise slowly thereafter. Table IV.B3 provides a comparison of the numbers of covered workers and beneficiaries.

Table IV.B3.—Covered Workers and Beneficiaries, Calendar Years 1945-2095

Calendar year	Covered workers[a] (in thousands)	Beneficiaries[b] (in thousands)			Covered workers per OASDI beneficiary	OASDI beneficiaries per 100 covered workers
		OASI	DI	OASDI[c]		
Historical data:						
1945	46,390	1,106	-	1,106	41.9	2
1950	48,280	2,930	-	2,930	16.5	6
1955	65,066	7,564	-	7,564	8.6	12
1960	72,371	13,740	522	14,262	5.1	20
1965	80,539	18,509	1,648	20,157	4.0	25
1970	92,963	22,618	2,568	25,186	3.7	27
1975	100,193	26,998	4,125	31,123	3.2	31
1980	112,651	30,384	4,734	35,117	3.2	31
1985	120,441	32,763	3,874	36,636	3.3	30
1990	133,008	35,255	4,204	39,459	3.4	30
1995	140,803	37,364	5,731	43,096	3.3	31
2000	154,707	38,556	6,606	45,162	3.4	29
2005	159,038	39,961	8,172	48,133	3.3	30
2010	157,058	43,440	9,958	53,398	2.9	34
2011	158,594	44,388	10,428	54,816	2.9	35
2012	160,705	45,377	10,799	56,176	2.9	35
2013	163,012	46,517	10,954	57,471	2.8	35
2014	165,429	47,603	10,971	58,574	2.8	35
2015	168,276	48,663	10,881	59,543	2.8	35
2016	170,964	49,811	10,728	60,539	2.8	35
2017	173,010	50,962	10,517	61,480	2.8	36
2018	175,999	52,168	10,296	62,464	2.8	35
Intermediate:						
2019	177,624	53,527	10,115	63,642	2.8	36
2020	178,484	54,948	9,993	64,941	2.7	36
2025	183,928	62,012	10,065	72,077	2.6	39
2030	187,117	68,517	10,404	78,921	2.4	42
2035	189,589	73,061	10,923	83,983	2.3	44
2040	192,363	75,371	11,613	86,984	2.2	45
2045	196,845	76,200	12,462	88,662	2.2	45

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Table IV.B3.—Covered Workers and Beneficiaries, Calendar Years 1945-2095 (Cont.)

Calendar year	Covered workers[a] (in thousands)	Beneficiaries[b] (in thousands)			Covered workers per OASDI beneficiary	OASDI beneficiaries per 100 covered workers
		OASI	DI	OASDI[c]		
Intermediate (Cont.):						
2050	201,906	77,551	13,024	90,575	2.2	45
2055	206,737	79,664	13,512	93,176	2.2	45
2060	211,082	82,680	13,740	96,419	2.2	46
2065	215,112	85,717	14,088	99,806	2.2	46
2070	219,413	89,061	14,457	103,518	2.1	47
2075	224,375	92,441	14,662	107,103	2.1	48
2080	229,944	94,684	15,003	109,687	2.1	48
2085	235,834	95,990	15,605	111,595	2.1	47
2090	241,609	97,914	16,358	114,273	2.1	47
2095	247,016	101,389	16,757	118,146	2.1	48
Low-cost:						
2019	178,004	53,520	10,071	63,591	2.8	36
2020	179,297	54,926	9,855	64,781	2.8	36
2025	186,997	61,851	9,376	71,228	2.6	38
2030	191,232	68,052	9,233	77,285	2.5	40
2035	194,581	72,155	9,328	81,484	2.4	42
2040	198,875	73,950	9,619	83,570	2.4	42
2045	205,923	74,293	10,107	84,400	2.4	41
2050	213,973	75,206	10,445	85,651	2.5	40
2055	221,808	77,013	10,790	87,802	2.5	40
2060	229,162	79,775	10,992	90,766	2.5	40
2065	236,449	82,582	11,337	93,919	2.5	40
2070	244,586	85,659	11,749	97,408	2.5	40
2075	254,133	88,682	12,093	100,775	2.5	40
2080	264,850	90,538	12,605	103,142	2.6	39
2085	276,048	91,688	13,403	105,092	2.6	38
2090	286,989	94,286	14,311	108,598	2.6	38
2095	297,451	99,270	14,864	114,134	2.6	38
High-cost:						
2019	177,178	53,535	10,164	63,699	2.8	36
2020	177,253	54,972	10,171	65,143	2.7	37
2025	179,231	62,202	10,762	72,964	2.5	41
2030	182,816	69,219	11,558	80,776	2.3	44
2035	184,567	74,267	12,472	86,740	2.1	47
2040	186,023	77,156	13,551	90,708	2.1	49
2045	188,064	78,579	14,767	93,347	2.0	50
2050	190,269	80,500	15,557	96,056	2.0	50
2055	192,233	83,035	16,168	99,202	1.9	52
2060	193,712	86,351	16,384	102,735	1.9	53
2065	194,736	89,630	16,672	106,302	1.8	55
2070	195,577	93,239	16,906	110,144	1.8	56
2075	196,489	96,967	16,848	113,816	1.7	58
2080	197,581	99,583	16,855	116,438	1.7	59
2085	198,868	101,036	17,040	118,076	1.7	59
2090	200,175	102,206	17,425	119,630	1.7	60
2095	201,336	103,956	17,568	121,524	1.7	60

[a] Workers who are paid at some time during the year for employment on which OASDI taxes are due.
[b] Beneficiaries with monthly benefits in current-payment status as of June 30.
[c] This column is the sum of OASI and DI beneficiaries. A small number of beneficiaries receive benefits from both funds.

Notes:
1. The number of beneficiaries does not include uninsured individuals who received benefits under section 228 of the Social Security Act. The General Fund of the Treasury reimbursed the trust funds for the costs of most of these individuals.
2. Historical covered worker and beneficiary data are subject to revision.
3. Totals do not necessarily equal the sums of rounded components.

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The effect of the demographic shift under the three alternatives on the OASDI cost rates is clear when one considers the projected number of OASDI beneficiaries per 100 covered workers. Compared to the 2018 level of 35 beneficiaries per 100 covered workers, the Trustees project that this ratio rises to 45 by 2038 under the intermediate assumptions because the growth in beneficiaries greatly exceeds the growth in workers. By 2095, this projected ratio rises further under the intermediate and high-cost assumptions, reaching 48 under the intermediate assumptions and 60 under the high-cost assumptions. Under the low-cost assumptions, this ratio rises to 42 by 2038 and then generally declines, reaching 38 by 2095. Figure IV.B2 shows beneficiaries per 100 covered workers.

For each alternative, the curve in figure IV.B2 is strikingly similar to the corresponding cost-rate curve in figure IV.B1. This similarity emphasizes the extent to which the cost rate is determined by the age distribution of the population. The cost rate is essentially the product of the number of beneficiaries and their average benefit, divided by the product of the number of covered workers and their average taxable earnings. For this reason, the pattern of the annual cost rates is similar to that of the annual ratios of beneficiaries to workers.

Figure IV.B2.—Number of OASDI Beneficiaries Per 100 Covered Workers

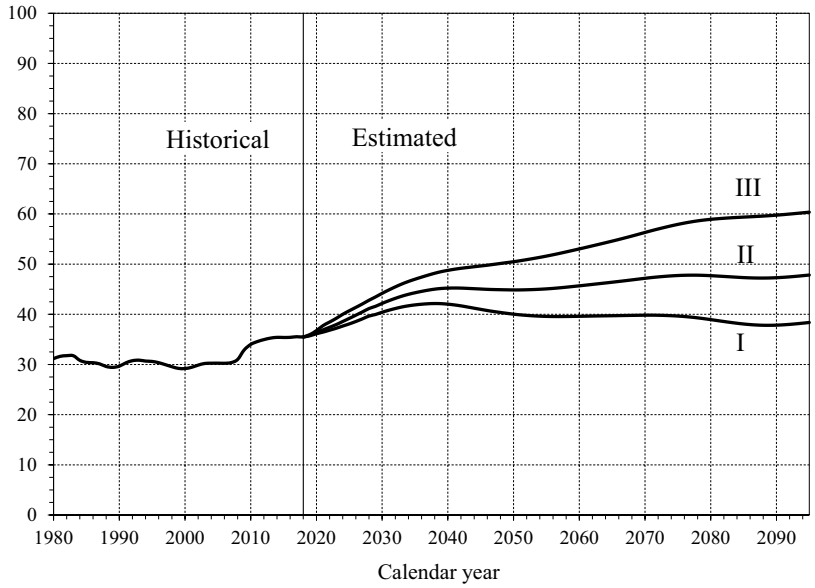

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Table IV.B3 also shows the number of covered workers per OASDI beneficiary, which was about 2.8 for 2018. Under the intermediate assumptions, this ratio declines generally throughout the long-range period, reaching 2.2 for 2038 and 2.1 by 2095. Under the low-cost assumptions, this ratio declines to 2.4 for 2038, then generally rises to 2.6 by 2095. Under the high-cost assumptions, this ratio decreases steadily to 1.7 by 2095.

3. Trust Fund Ratios and Test of Long-Range Close Actuarial Balance

Trust fund ratios are critical indicators of the adequacy of the financial resources of the Social Security program. The trust fund ratio for a year is the amount of asset reserves in a fund at the beginning of a year expressed as a percentage of the cost for the year. Under present law, the OASI and DI Trust Funds do not have the authority to borrow other than in the form of advance tax transfers, which are limited to expected taxes for the current calendar month. If reserves held in either trust fund become depleted during a year, and continuing revenue falls short of the cost of scheduled benefits, then full scheduled benefits would not be payable on a timely basis. For this reason, the trust fund ratio is a critical financial measure.

The trust fund ratio serves an additional important purpose in assessing the actuarial status of the program. If the projected trust fund ratio is positive throughout the period and is either level or increasing at the end of the period, then projected adequacy for the long-range period is likely to continue for subsequent reports. Under these conditions, the program has achieved sustainable solvency.

Table IV.B4 shows the Trustees' projections of trust fund ratios by alternative, without regard to advance tax transfers that would be effected, for the separate and combined OASI and DI Trust Funds. The table also shows the years of trust fund reserve depletion and the percentage of scheduled benefits that would be payable thereafter, by alternative.

Under the intermediate assumptions, the OASI trust fund ratio is projected to decline from 307 percent at the beginning of 2019 until the trust fund reserves become depleted late in 2034 (about the same time as last year's report), at which time 77 percent of scheduled benefits would be payable. The DI trust fund ratio decreases from 65 percent at the beginning of 2019 to 56 percent by 2022. After 2022, the DI trust fund ratio increases for a time, reflecting the period of recent and near-term expected low incidence rates, reaching a peak of 91 percent by 2037. The ratio then declines until the trust fund reserves become depleted in 2052 (20 years later than projected in last year's report). At that time, 91 percent of scheduled benefits would be payable. The difference in depletion year from last year's report is largely due to a combination of a lower assumed ultimate disability incidence rate and a

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more gradual assumed path from recent low rates to the ultimate incidence rate. See page 38 for additional details.

Under the intermediate assumptions, the trust fund ratio for the combined OASI and DI Trust Funds declines from 273 percent at the beginning of 2019 until the combined fund reserves become depleted in 2035 (one year later than projected in last year's report), at which time 80 percent of scheduled benefits would be payable.

Under the low-cost assumptions, the trust fund ratio for the DI program decreases from 66 percent at the beginning of 2019 to 64 percent at the beginning of 2020. The DI trust fund ratio then rises thereafter, reaching the extremely high level of 2,559 percent for 2094. For the OASI program, the trust fund ratio declines steadily, from 307 percent for 2019 until the reserves become depleted in 2057, at which time 98 percent of scheduled benefits would be payable. For the combined OASDI program, the trust fund ratio declines from 274 percent for 2019 to a low of 112 percent in 2047, then rises thereafter, reaching 228 percent by 2094. Because the trust fund ratio is positive throughout the projection period and increasing at the end of the period, under the low-cost assumptions, the DI program and the combined OASDI program achieve sustainable solvency.

Under the high-cost assumptions, the OASI trust fund ratio declines continually until reserves become depleted in 2031, at which time 69 percent of scheduled benefits would still be payable. The DI trust fund ratio declines from 64 percent for 2019 until the reserves become depleted in 2025. At that time, 88 percent of scheduled benefits would still be payable. The combined OASI and DI trust fund ratio declines from 272 percent for 2019 until reserves become depleted in 2030, at which time 72 percent of scheduled benefits would still be payable.

The Trustees project trust fund reserve depletion within the 75-year projection period with the exceptions of the combined OASI and DI Trust Funds and the DI Trust Fund under the low-cost assumptions. It is therefore very likely that lawmakers will need to increase income, reduce program costs, or both, in order to maintain solvency for the trust funds. The stochastic projections discussed in appendix E suggest that trust fund reserve depletion is highly probable by mid-century.

Even under the high-cost assumptions, however, the combined OASI and DI Trust Fund reserves on hand plus their estimated future income are sufficient to fully cover their combined cost until 2030. Under the intermediate assumptions, the combined starting fund reserves plus estimated future income are sufficient to fully cover cost until 2035. In the 2018 report, the Trustees projected that the combined trust fund reserves would become

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depleted in 2030 and 2034 under the high-cost and intermediate assumptions, respectively, and would achieve sustainable solvency under the low-cost assumptions.

Table IV.B4.—Trust Fund Ratios, Calendar Years 2019-2095[a]
[In percent]

Calendar year	Intermediate			Low-cost			High-cost		
	OASI	DI	OASDI	OASI	DI	OASDI	OASI	DI	OASDI
2019	307	65	273	307	66	274	307	64	272
2020	291	60	260	290	64	260	291	56	259
2021	273	57	245	274	66	247	271	46	240
2022	255	56	229	258	73	235	247	34	219
2023	236	56	213	243	85	224	222	23	197
2024	216	58	197	228	100	213	197	12	173
2025	197	60	180	214	119	204	170	1	149
2026	177	62	163	202	140	195	144	[b]	124
2027	158	65	147	190	163	187	117	[b]	100
2028	138	68	130	178	191	180	90	[b]	75
2030	100	76	97	158	253	167	36	[b]	24
2035	[b]	90	10	112	422	143	[b]	[b]	[b]
2040	[b]	87	[b]	71	595	123	[b]	[b]	[b]
2045	[b]	61	[b]	38	751	113	[b]	[b]	[b]
2050	[b]	23	[b]	18	916	114	[b]	[b]	[b]
2055	[b]	[b]	[b]	6	1,088	123	[b]	[b]	[b]
2060	[b]	[b]	[b]	[b]	1,289	132	[b]	[b]	[b]
2065	[b]	[b]	[b]	[b]	1,489	140	[b]	[b]	[b]
2070	[b]	[b]	[b]	[b]	1,692	146	[b]	[b]	[b]
2075	[b]	[b]	[b]	[b]	1,921	152	[b]	[b]	[b]
2080	[b]	[b]	[b]	[b]	2,132	162	[b]	[b]	[b]
2085	[b]	[b]	[b]	[b]	2,284	184	[b]	[b]	[b]
2090	[b]	[b]	[b]	[b]	2,407	210	[b]	[b]	[b]
2095	[b]	[b]	[b]	[b]	2,603	231	[b]	[b]	[b]
Trust fund reserves permanently become depleted in	2034	2052	2035	2057	[c]	[c]	2031	2025	2030
Payable benefits as percent of scheduled benefits:									
At the time of permanent reserve depletion	77	91	80	98	[c]	[c]	69	88	72
For 2093	73	87	75	100	[c]	[c]	52	63	53

[a] Benefit payments scheduled to be paid on January 3 are actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund ratios reflect the 12 months of benefits scheduled for payment each year.

[b] Trust fund reserves would be depleted at the beginning of this year.

[c] Trust fund reserves would not be depleted within the projection period.

Note: The definition of trust fund ratio appears in the Glossary. The ratios shown for the combined trust funds for years after reserve depletion of either the DI or OASI Trust Fund are hypothetical.

Since 2013, when the Trustees modified the test of long-range close actuarial balance, the standard for each trust fund requires meeting two conditions: (1) the test of short-range financial adequacy is satisfied; and (2) the trust fund ratios stay above zero throughout the 75-year projection period, allow-

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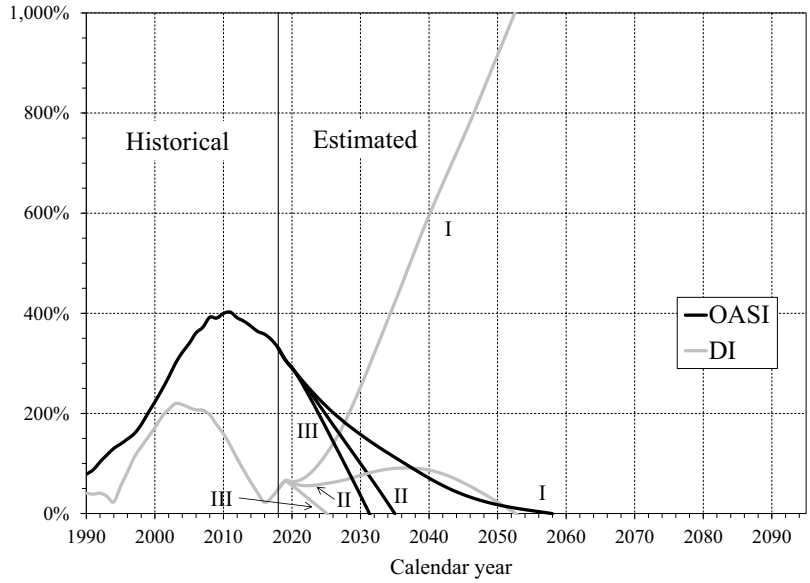
ing scheduled benefits to be paid in a timely manner throughout the period. Both the long-range test and the short-range test are applied based on the intermediate set of assumptions. As discussed in section IV.A, the DI Trust Fund fails the test of short-range financial adequacy because the trust fund ratio does not reach 100 percent at any time during the 10-year period. Under the intermediate assumptions, the OASI Trust Fund reserves become depleted in 2034, DI Trust Fund reserves become depleted in 2052, and the combined OASI and DI Trust Fund reserves become depleted in 2035. Therefore, the OASI, DI, and combined OASI and DI Trust Funds all fail the test of long-range close actuarial balance.

Figure IV.B3 illustrates the trust fund ratios for the separate OASI and DI Trust Funds for each of the alternative sets of assumptions. DI Trust Fund status is more uncertain than OASI Trust Fund status because there is a high degree of uncertainty associated with future disability prevalence. A graph of the trust fund ratios for the combined trust funds appears in figure II.D6.

Figure IV.B3.—Long-Range OASI and DI Trust Fund Ratios
[Asset reserves as a percentage of annual cost]



4. Summarized Income Rates, Summarized Cost Rates, and Actuarial Balances

Summarized values for the full 75-year period are useful in analyzing the program's long-range financial adequacy over the period as a whole, both

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under present law and under proposed modifications to the law. All annual amounts included in a summarized value are present-value discounted to the valuation date. It is important to note that the actuarial balance indicates the solvency status of the fund only for the very end of the period.

Table IV.B5 presents summarized income rates, summarized cost rates, and actuarial balances for 25-year, 50-year, and 75-year valuation periods. Summarized income rates are the sum of the present value of non-interest income for a period (which includes scheduled payroll taxes, the projected income from the taxation of scheduled benefits, and reimbursements from the General Fund of the Treasury) and the starting trust fund asset reserves, expressed as a percentage of the present value of taxable payroll over the period. Under current law, the total OASDI payroll tax rate will remain at 12.4 percent in the future. In contrast, the Trustees expect income from taxation of benefits, expressed as a percentage of taxable payroll, to increase in most years of the long-range period for the reasons discussed earlier on page 51. Summarized cost rates are the sum of the present value of cost for a period (which includes scheduled benefits, administrative expenses, net interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries) and the present value of the cost of reaching a target trust fund of 100 percent of annual cost at the end of the period, expressed as a percentage of the present value of taxable payroll over the period.

The actuarial balance for a valuation period is equal to the difference between the summarized income rate and the summarized cost rate for the period. An actuarial balance of zero for any period indicates that cost for the period could be met for the period as a whole (but not necessarily at all points within the period), with a remaining trust fund reserve at the end of the period equal to 100 percent of the following year's cost. A negative actuarial balance for a period indicates that the present value of income to the program plus the existing trust fund is less than the present value of the cost of the program plus the cost of reaching a target trust fund reserve of one year's cost by the end of the period. Generally, a trust fund is deemed to be adequately financed for a period if the actuarial balance is zero or positive, meaning that the reserves at the end of the period are at least equal to annual cost. Note that solvency is possible with a small negative actuarial balance where reserves are still positive.[1]

[1] A program is solvent over any period for which the trust fund maintains a positive level of asset reserves. In contrast, the actuarial balance for a period includes the cost of having a target fund equal to 100 percent of the following year's cost at the end of the period. Therefore, if a program ends the period with reserves that are positive but not sufficient to cover the following year's costs, it will be solvent at the end of the period and yet still have a small negative actuarial balance for that period.

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Table IV.B5 contains summarized rates for the intermediate, low-cost, and high-cost assumptions. The low-cost and high-cost assumptions define a wide range of possibilities. Financial outcomes as good as the low-cost scenario or as bad as the high-cost scenario are unlikely to occur.

For the 25-year valuation period, the OASDI program has an actuarial balance of 0.08 percent of taxable payroll under the low-cost assumptions, -1.73 percent under the intermediate assumptions, and -3.88 percent under the high-cost assumptions. These balances indicate that the program is adequately financed for the 25-year valuation period under only the low-cost assumptions.

For the 50-year valuation period, the OASDI program has actuarial balances of 0.11 percent under the low-cost assumptions, -2.38 percent under the intermediate assumptions, and -5.50 percent under the high-cost assumptions. These actuarial balances mean that the OASDI program is adequately financed for the 50-year valuation period under only the low-cost assumptions.

For the entire 75-year valuation period, the combined OASDI program has actuarial balances of 0.19 percent of taxable payroll under the low-cost assumptions, -2.78 percent under the intermediate assumptions, and -6.60 percent under the high-cost assumptions. These balances indicate that the combined OASDI program is adequately financed for the 75-year valuation period under only the low-cost assumptions.

Assuming the intermediate assumptions accurately capture future demographic and economic trends, solvency for the program over the next 75 years could be restored using a variety of approaches. For example, revenue could be increased in a manner equivalent to an immediate and permanent increase in the combined Social Security payroll tax rate from 12.40 percent to 15.10 percent (a relative increase of 21.8 percent), cost could be reduced in a manner equivalent to an immediate and permanent reduction in scheduled benefits of about 17 percent, or some combination of approaches could be used.

However, eliminating the actuarial deficit for the next 75-year valuation period requires raising payroll taxes or lowering benefits by more than is required just to achieve solvency, because the actuarial deficit includes the cost of attaining a target trust fund equal to 100 percent of annual program cost by the end of the period. The actuarial deficit could be eliminated for the 75-year period by increasing revenue in a manner equivalent to an immediate and permanent increase in the combined payroll tax from 12.40 percent to

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15.29 percent (a relative increase of 23.3 percent),[1] reducing cost in a manner equivalent to an immediate reduction in scheduled benefits of about 18 percent, or some combination of approaches could be used.

Under the intermediate assumptions, the OASDI program has large annual deficits toward the end of the long-range period that are increasing and reach 4.11 percent of payroll for 2093 (see table IV.B1). These large deficits indicate that annual cost continues to exceed non-interest income after 2093, so continued adequate financing would require larger changes than those needed to maintain solvency for the 75-year period. Over the period extending through the infinite horizon, the actuarial deficit is 4.1 percent of payroll under the intermediate assumptions.

Table IV.B5.—Components of Summarized Income Rates and Cost Rates, Calendar Years 2019-2093
[As a percentage of taxable payroll]

	Summarized income rate			Summarized cost rate			
Valuation period	Non-interest income	Beginning asset reserves[a]	Total	Cost[a]	Ending target fund[a]	Total	Actuarial balance
OASI:							
Intermediate:							
2019-43.	11.33	1.34	12.67	13.81	0.56	14.37	-1.70
2019-68.	11.39	.72	12.12	14.15	.25	14.41	-2.29
2019-93.	11.43	.53	11.96	14.47	.15	14.63	-2.67
Low-cost:							
2019-43.	11.24	1.21	12.45	12.23	.49	12.71	-.27
2019-68.	11.27	.62	11.89	11.95	.22	12.17	-.28
2019-93.	11.27	.44	11.71	11.80	.13	11.93	-.22
High-cost:							
2019-43.	11.44	1.50	12.94	15.71	.65	16.36	-3.43
2019-68.	11.55	.84	12.39	16.92	.30	17.22	-4.83
2019-93.	11.63	.64	12.27	17.93	.18	18.11	-5.85
DI:							
Intermediate:							
2019-43.	1.83	.05	1.88	1.83	.08	1.90	-.03
2019-68.	1.83	.03	1.86	1.92	.03	1.95	-.09
2019-93.	1.83	.02	1.85	1.95	.02	1.97	-.12
Low-cost:							
2019-43.	1.82	.04	1.86	1.47	.06	1.52	.34
2019-68.	1.82	.02	1.84	1.43	.03	1.46	.39
2019-93.	1.82	.02	1.84	1.42	.02	1.43	.41
High-cost:							
2019-43.	1.84	.05	1.89	2.25	.10	2.35	-.46
2019-68.	1.84	.03	1.87	2.50	.04	2.54	-.67
2019-93.	1.85	.02	1.87	2.59	.02	2.62	-.75

[1] The indicated increase in the payroll tax rate of 2.89 percent is somewhat larger than the 2.78 percent 75-year actuarial deficit because the indicated increase reflects a behavioral response to tax rate changes. In particular, the calculation assumes that an increase in payroll taxes results in a small shift of wages and salaries to forms of employee compensation that are not subject to the payroll tax.

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Table IV.B5.—Components of Summarized Income Rates and Cost Rates, Calendar Years 2019-2093 (Cont.)
[As a percentage of taxable payroll]

Valuation period	Summarized income rate: Non-interest income	Summarized income rate: Beginning asset reserves[a]	Summarized income rate: Total	Summarized cost rate: Cost[a]	Summarized cost rate: Ending target fund[a]	Summarized cost rate: Total	Actuarial balance
OASDI:							
Intermediate:							
2019-43.	13.16	1.39	14.55	15.64	0.64	16.28	-1.73
2019-68.	13.23	.75	13.97	16.07	.29	16.36	-2.38
2019-93.	13.27	.55	13.81	16.42	.17	16.60	-2.78
Low-cost:							
2019-43.	13.06	1.25	14.31	13.69	.54	14.23	.08
2019-68.	13.09	.65	13.74	13.38	.24	13.63	.11
2019-93.	13.10	.45	13.55	13.22	.15	13.36	.19
High-cost:							
2019-43.	13.27	1.56	14.83	17.96	.75	18.71	-3.88
2019-68.	13.39	.87	14.26	19.41	.35	19.76	-5.50
2019-93.	13.48	.66	14.13	20.52	.21	20.73	-6.60

[a] Benefit payments scheduled to be paid on January 3 are actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

Note: Totals do not necessarily equal the sums of rounded components.

5. Open-Group Unfunded Obligation

Consistent with practice since 1965, this report focuses on a 75-year open-group valuation to evaluate the long-run financial status of the OASDI program. The open-group valuation includes non-interest income and cost for past, current, and future participants through the year 2093. The open-group unfunded obligation measures the adequacy of financing over the period as a whole for a program financed on a pay-as-you-go basis. On this basis, payroll taxes and scheduled benefits for all participants are included through 2093.

The open-group unfunded obligation increased from $13.2 trillion shown in last year's report to $13.9 trillion in this report. If there had been no changes in starting values, assumptions, laws, or methods for this report, then the open-group unfunded obligation would have increased to $13.7 trillion solely due to the change in the valuation period. This expected increase in the unfunded obligation occurs because: (1) the unfunded obligation is now discounted to January 1, 2019, rather than to January 1, 2018, which tends to increase the unfunded obligation by the annual nominal interest rate; and (2) the unfunded obligation now includes an additional year (2093). However, changes in the law, assumptions, methods, and starting values resulted in a net increase in the unfunded obligation that rounds to $0.1 trillion.

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The 75-year unfunded obligation is equivalent to 2.61 percent of future OASDI taxable payroll and 0.9 percent of GDP through 2093.[1] These percentages were 2.68 and 1.0, respectively, for last year's report. The 75-year unfunded obligation as a percentage of taxable payroll is less than the actuarial deficit, because the unfunded obligation excludes the cost of having an ending target trust fund value.

The actuarial deficit was 2.84 percent of payroll in last year's report, and was expected to increase to a deficit of 2.90 percent of payroll solely due to the change in the valuation period. Changes in the law, assumptions, methods, and starting values combined to account for a 0.11 percent decrease (improvement) in the actuarial deficit to 2.78 percent of payroll. For additional details on these changes, see section IV.B.6.

As mentioned above, the open-group unfunded obligation expressed in dollars increased (worsened) more than would be expected from changing the valuation period alone. In large part, this increase occurred because near-term and ultimate real interest rates are significantly reduced in this report, thus discounting more distant years' annual shortfalls less. The actuarial balance, in contrast, increased (improved) relative to the change based on the valuation period alone. Lower interest rates have a much smaller worsening effect on the actuarial balance because interest rate changes affect the numerator and denominator similarly.

Table IV.B6 presents the components and the calculation of the long-range (75-year) actuarial balance under the intermediate assumptions. The present value of future cost less future non-interest income over the long-range period, minus the amount of trust fund asset reserves at the beginning of the projection period, is $13.9 trillion for the OASDI program. This amount is the 75-year "open-group unfunded obligation" (see row H). The actuarial deficit (which is the negative of the actuarial balance) combines this unfunded obligation with the present value of the ending target trust fund and expresses the total as a percentage of the present value of the taxable payroll for the period. The present value of future non-interest income minus cost, plus starting trust fund reserves, minus the present value of the ending target trust fund, is -$14.8 trillion for the OASDI program.

[1] The present value of future taxable payroll for 2019-93 is $531.2 trillion. The present value of GDP for 2019-93 is $1,497.0 trillion.

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Table IV.B6.—Components of 75-Year Actuarial Balance and Unfunded Obligation Under Intermediate Assumptions

Item	OASI	DI	OASDI
Present value as of January 1, 2019 (in billions):			
A. Payroll tax revenue	$56,247	$9,554	$65,801
B. Reimbursements from general revenue	[a]	[a]	[a]
C. Taxation of benefits revenue	4,473	192	4,665
D. Non-interest income (A + B + C)	60,720	9,745	70,465
E. Cost	76,877	10,352	87,229
F. Cost minus non-interest income (E - D)	16,157	607	16,764
G. Trust fund asset reserves at start of period	2,798	97	2,895
H. Open-group unfunded obligation (F - G)	13,359	510	13,869
I. Ending target trust fund[b]	812	111	923
J. Income minus cost, plus reserves at start of period, minus ending target trust fund (D - E + G - I = - H - I)	-14,171	-621	-14,792
K. Taxable payroll	531,166	531,166	531,166
Percent of taxable payroll:			
Actuarial balance (100 × J ÷ K)	-2.67	-.12	-2.78

[a] Less than $0.5 billion.
[b] The calculation of the actuarial balance includes the cost of accumulating a target trust fund reserve equal to 100 percent of annual cost at the end of the period.

Note: Totals do not necessarily equal the sums of rounded components.

Consideration of summary measures alone (such as the actuarial balance and open-group unfunded obligation) for a 75-year period can lead to incorrect perceptions and to policy prescriptions that do not achieve sustainable solvency. These concerns can be addressed by considering the trend in trust fund ratios toward the end of the period. (See the discussion of "sustainable solvency" beginning on page 50.)

Another measure of trust fund finances, discussed in appendix F, is the infinite horizon unfunded obligation, which takes account of all annual balances, even those after 75 years. The extension of the time period past 75 years assumes that the current-law OASDI program and the demographic and economic trends used for the 75-year projection continue indefinitely. This infinite horizon unfunded obligation is estimated to be 4.1 percent of taxable payroll or 1.4 percent of GDP. These percentages were 4.0 and 1.3, respectively, for last year's report. Of course, the degree of uncertainty associated with estimates increases substantially for years further in the future.

6. Reasons for Change in Actuarial Balance From Last Report

Table IV.B7 shows the effects of changes on the long-range actuarial balance under the intermediate assumptions, by category, between last year's report and this report.

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Table IV.B7.—Reasons for Change in the 75-Year Actuarial Balance, Based on Intermediate Assumptions
[As a percentage of taxable payroll]

Item	OASI	DI	OASDI
Shown in last year's report:			
Income rate	11.99	1.86	13.84
Cost rate	14.62	2.07	16.69
Actuarial balance	**-2.63**	**-.21**	**-2.84**
Changes in actuarial balance due to changes in:			
Legislation / Regulation	.00	.00	.00
Valuation period[a]	-.05	-.01	-.05
Demographic data and assumptions	.06	.00	.06
Economic data and assumptions	-.03	.00	-.04
Disability data and assumptions	-.02	.09	.07
Methods and programmatic data	.00	.02	.01
Total change in actuarial balance	-.04	.09	.06
Shown in this report:			
Actuarial balance	**-2.67**	**-.12**	**-2.78**
Income rate	11.96	1.85	13.81
Cost rate	14.63	1.97	16.60

[a] The change in the 75-year valuation period from last year's report to this report means that the 75-year actuarial balance now includes the relatively large negative annual balance for 2093. This change in the valuation period results in a larger long-range actuarial deficit. The actuarial deficit includes the trust fund reserve at the beginning of the projection period.

Note: Totals do not necessarily equal the sums of rounded components.

If the law, data, assumptions, and methods had all remained unchanged from last year's Trustees Report, the long-range OASDI actuarial balance would have decreased (become more negative) by 0.05 percent of taxable payroll solely due to the change in the valuation period. However, as described below, projections in this report also reflect new data and changes in law, assumptions, and methods. These changes, including the change in the valuation period, combine to increase (improve) the long-range OASDI actuarial balance from -2.84 percent of taxable payroll in last year's report to -2.78 percent in this report.

Since the last report, there have been no new laws, regulations, or policy changes that are expected to have significant long-range financial effects on the OASDI actuarial balance. However, this year's report does incorporate one notable policy change. The Social Security Administration (SSA) started running the Disability Redesign Prototype model in ten states in 1999. Among other features, the prototype model eliminated the reconsideration step in the disability appeals process. Beginning in 2019, SSA is reinstating the reconsideration step in these states, which will make the process uniform nationwide. This reinstatement is expected to decrease disability incidence rates very slightly beginning in 2020 and has a negligible (less than 0.005 percent of taxable payroll) effect on the long-range actuarial balance.

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As mentioned above, changing the 75-year valuation period from 2018 through 2092 for last year's report to 2019 through 2093 for this report decreases the projected long-range OASDI actuarial balance by 0.05 percent of taxable payroll. This decrease is mainly the result of including the relatively large negative annual balance for 2093 in this year's 75-year projection period. Note that the actuarial balance calculation includes trust fund asset reserves at the beginning of the projection period. These reserves reflect the program's net financial flows for all past years, including 2018, up to the start of the projection period.

New demographic data and changes in demographic assumptions combine to increase the long-range OASDI actuarial balance by 0.06 percent of taxable payroll. Ultimate demographic assumptions are unchanged from those in last year's report. However, this year's report does include two changes to the near-term demographic assumptions. First, for this year's report, slightly lower numbers of new lawful permanent residents (LPRs) are assumed for calendar years 2018 and 2019, due to recent lower annual refugee ceilings set by the Administration. These ceilings, 45,000 refugees for fiscal year 2018 and 30,000 refugees for fiscal year 2019, compare to annual ceilings that ranged from 70,000 to 85,000 refugees for fiscal years 2001 through 2016, and 50,000 refugees for fiscal year 2017. This change in assumed LPR immigration levels decreases the actuarial balance by a negligible amount (less than 0.005 percent of taxable payroll). Second, last year's report included a surge in the number of other-than-LPR immigrants for years 2016 through 2021 to a level above the assumed ultimate level of 1.35 million. This surge reflected the assumption that the drop in other-than-LPR immigration levels during the recent economic downturn was, in part, a deferral of migration that would be partially offset during the latter stages of the economic recovery. However, as the economic recovery has continued to near completion, recent estimates have not shown a trend toward levels above the ultimate assumption. Therefore, this year's report eliminates the temporary surge above the ultimate other-than-LPR immigration level and instead incorporates a gradual rise in 2017 and 2018, reaching the ultimate assumed level in 2019. This change in near-term assumed levels of other-than-LPR immigration decreases the actuarial balance by 0.01 percent of taxable payroll.

In addition to these assumption changes, three demographic data updates resulted in significant changes in the long-range OASDI actuarial balance. First, final fertility (birth) data for 2017 indicate somewhat lower birth rates than were assumed in last year's report for 2017. These updated data result in slightly lower birth rates during the transition period to the ultimate levels, decreasing the actuarial balance by 0.02 percent of taxable payroll. Second, incorporating 2016 mortality data for ages under 65 from the National Center

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for Health Statistics (NCHS) and 2016 and preliminary 2017 mortality data for ages 65 and older from Medicare experience resulted in higher death rates for all future years than were projected in last year's report. These higher death rates increase the actuarial balance by 0.09 percent of taxable payroll. Third, updates to LPR immigration data, historical population data, and other minor data updates combine to change the actuarial balance by a negligible amount.

New economic data and changes in economic assumptions combine to decrease the long-range OASDI actuarial balance by 0.04 percent of payroll. Four ultimate economic assumptions were changed for this year's report. First, the ultimate annual rate of change in total-economy labor productivity was lowered from 1.68 percent to 1.63 percent, reflecting an expected slower rate of productivity growth in the long term. This change decreases the actuarial balance by 0.09 percent of taxable payroll. Second, the difference between the ultimate growth rates for the CPI-W and the GDP implicit price deflator (the "price differential"), was decreased from 0.40 percentage point to 0.35 percentage point. Recent data indicate that the part of the price differential that is due to the difference in the composition of the two indices is about 0.05 percentage point, slightly less than the 0.10 percentage point effect assumed for the 2018 report. This assumed change in the compositional component of the price differential increases the long-range actuarial balance by 0.09 percent of taxable payroll. Third, the average real-wage differential over the last 65 years of the projection period is 1.21 percentage points per year in this year's report, increased slightly from the 1.20 value in last year's report. This higher long-term real-wage differential assumption is due to slower assumed growth in employer-sponsored group health insurance premiums, based on updated projections by the Centers for Medicare and Medicaid Services (CMS). Because these premiums are not subject to the payroll tax, slower growth in these premiums means that a larger share of employee compensation will be in the form of wages that are subject to the payroll tax. This change to the real-wage differential assumption increases the long-range actuarial balance by 0.03 percent of taxable payroll. Fourth, the ultimate real interest rate was lowered by 0.2 percentage point, from 2.7 percent for last year's report to 2.5 percent for this year's report. Real interest rates have been low since 2000, and particularly low since the start of the most recent recession. An ongoing and much-debated question among experts is how much of this change is a temporary response to extraordinary events, versus a fundamental permanent change. The Trustees believe that lowering the long-term ultimate real interest rate somewhat is appropriate at this time. This change in the ultimate real interest rate assumption decreases the actuarial balance by 0.08 percent of payroll. Other changes to data and near-term economic assumptions, including the July 2018 revisions in histor-

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ical GDP estimated by the Bureau of Economic Analysis (BEA) of the Department of Commerce, combine for a net increase in the actuarial balance of 0.01 percent of taxable payroll.

New disability data and changes in disability assumptions combine to increase the OASDI actuarial balance by 0.07 percent of payroll. Disabled-worker applications have continued to drop substantially since 2010 and have now reached levels well below those recorded at the peak of the last economic cycle, in 2007-08. As a result, disability incidence rates have continued to fall well below expectations. Based on this experience, the Trustees reduced the ultimate disability incidence rate for this report from 5.4 to 5.2 per thousand exposed, returning to the ultimate rate that was used in the 2008 through 2011 reports. This change in the ultimate disability incidence rate increases the actuarial balance by 0.04 percent of payroll. In addition, recent disability data and changes in near-term assumptions increase the long-range actuarial balance by 0.03 percent of taxable payroll. Recent data have shown significantly lower levels of disability applications and awards than expected in last year's report, and much lower levels than had been assumed in prior recent reports. Based on this experience, estimated disability incidence rates are assumed to increase somewhat more gradually toward the ultimate assumed level for this report through the short-range period. These new disability data and changes in assumptions are almost entirely responsible for the change in the DI Trust Fund reserve depletion date from 2032 in last year's report to 2052 in this year's report. The short-range effects are noted in section IV.A.4.

The projections in this report also reflect several methodological improvements and updates based on new program-specific data. These methodological changes, programmatic data updates, and interactions combine to increase the long-range OASDI actuarial balance by 0.01 percent of taxable payroll. Descriptions of six significant methodological changes and programmatic data updates follow.

First, the fertility model was improved to better incorporate detailed provisional birth rate data available from NCHS. This methodological improvement decreases the actuarial balance by 0.02 percent of taxable payroll.

Second, CMS is now providing Medicare mortality data using a modernized and improved data system. This system allowed for more complete and better specified data, including data from Puerto Rico and the Virgin Islands. This year's report also reflects a minor method change, incorporating data for all Medicare enrollees at ages 65 through 69, rather than just those receiving Social Security benefits. The combined effect of the more comprehensive data and the related method changes is an increase in the actuarial balance of 0.01 percent of taxable payroll.

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The third significant change is an improvement to the way the labor force participation model incorporates projected changes in disability prevalence. In prior years' reports, the labor force model incorporated disability prevalence projections from the immediate prior report (for example, the labor force model for the 2018 Trustees Report incorporated disability prevalence projections from the 2017 Trustees Report). However, the large magnitude of changes in the assumed near-term and long-term disability incidence rates for this year's report has a direct and substantial impact on projected disability prevalence rates. In order to consistently reflect the large change in disability prevalence for this report, the labor force model has been modified to incorporate the current year's disability prevalence projections. This modification increases the actuarial balance by 0.02 percent of payroll.

The fourth significant change is in the long-range model for projecting average benefit levels of retired-worker and disabled-worker beneficiaries newly entitled for benefits. This model uses a large sample of 10 percent of all newly entitled retired-worker beneficiaries in a recent year. For this year's report, the model's projection of earnings for workers becoming newly entitled in future years was improved to better reflect the "dispersion" in taxable earnings levels observed from 1970 to 2010. Over this historical period, increases in taxable earnings were higher for workers with taxable earnings above the median than for workers with taxable earnings below the median. This improvement in the average benefits model increases the actuarial balance by 0.04 percent of payroll.

Fifth, this year's report includes an improvement in the method for projecting future benefits, to better reflect benefit levels for those who are awarded benefits more than two years after their date of initial benefit entitlement. This change mainly affects average DI benefit levels because the appeals process extends the date of disabled worker benefit award more than two years beyond the date of initial benefit entitlement in a significant number of cases. The effect on OASI benefit levels is much smaller. In general, individuals who are awarded benefits more than two years after the initial date of entitlement have lower benefit levels than those who are awarded sooner. This change results in an increase in the actuarial balance of 0.03 percent of taxable payroll.

The sixth significant change is updating of two sets of benefit adjustment factors based on new programmatic data: the post-entitlement adjustment factors and the Windfall Elimination Provision (WEP) reduction factors. Post-entitlement factors are used to account for changes in benefit levels, primarily due to differential mortality by benefit level and earnings after benefit entitlement. WEP reduction factors are used to adjust benefits for individuals who receive a pension based on specified categories of non-covered employ-

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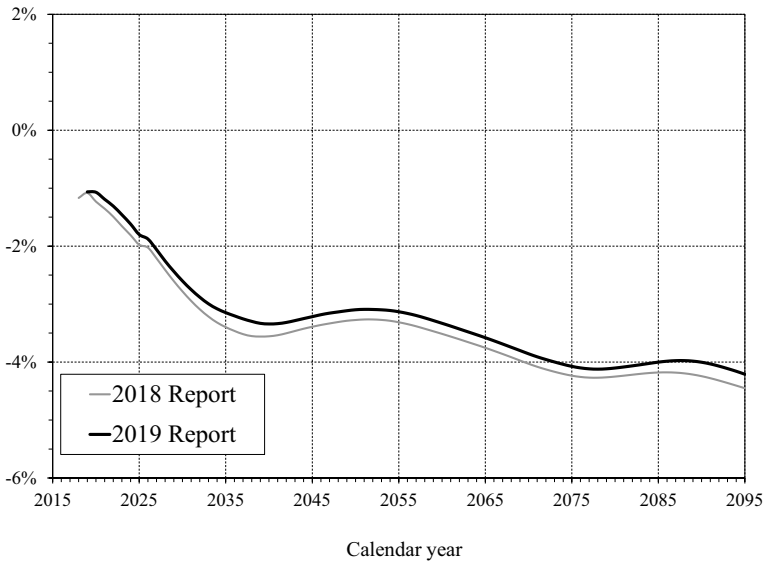
ment. These updates reflecting programmatic data combine to decrease the actuarial balance by 0.02 percent of payroll.

In addition to these six significant methodological changes and programmatic data updates, changes in starting levels and projected levels of OASI and DI beneficiaries and benefit amounts over the first 10 years of the projection period, updating other programmatic data, other small methodological improvements, and interactions among the various method changes and updates to programmatic experience combine to decrease the long-range OASDI actuarial balance by 0.05 percent of taxable payroll.

Figure IV.B4 compares the annual cash-flow balances for this report and the prior year's report for the combined OASDI program over the long-range (75-year) projection period. The figure illustrates the annual effects of the changes described earlier in this section.

Figure IV.B4.—OASDI Annual Balances: 2018 and 2019 Trustees Reports
[As a percentage of taxable payroll, under Intermediate Assumptions]



The annual balances in this year's report are higher (less negative) throughout the 75-year projection period, principally due to higher mortality rates and lower disability incidence rates. For the full 75-year projection period, the annual balances average 0.18 percentage point higher. For 2092, the projected annual deficit is 4.07 percent of taxable payroll in this report, compared to 4.32 percent in last year's report.

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V. ASSUMPTIONS AND METHODS UNDERLYING ACTUARIAL ESTIMATES

The future income and cost of the OASDI program will depend on many demographic, economic, and program-specific factors. Trust fund income will depend on how these factors affect the size and composition of the working population as well as the level and distribution of earnings. Similarly, program cost will depend on how these factors affect the size and composition of the beneficiary population as well as the general level of benefits.

The Trustees make basic assumptions for several of these factors based on analysis of historical trends, historical conditions, and expected future conditions. These factors include fertility, mortality, immigration, marriage, divorce, productivity, inflation, average earnings, unemployment, real interest rates, and disability incidence and termination. Other factors depend on these basic assumptions. These other, often interdependent, factors include total population, life expectancy, labor force participation, gross domestic product, and program-specific factors. Each year the Trustees reexamine these assumptions and methods in light of new information and make appropriate revisions. The assumptions for this report were selected by the middle of January 2019.

Future levels of these factors and their interrelationships are inherently uncertain. To address these uncertainties, this report uses three sets of assumptions, designated as intermediate (alternative II), low-cost (alternative I), and high-cost (alternative III). The intermediate set represents the Trustees' best estimate of the future course of the population and the economy. With regard to the net effect on the actuarial status of the OASDI program, the low-cost set is more optimistic and the high-cost set is more pessimistic. The low-cost and high-cost sets of assumptions reflect significant potential changes in the interrelationships among factors, as well as changes in the values for individual factors.

While it is unlikely that all of the factors and interactions will differ in the specified directions from the intermediate values, many combinations of individual differences in the factors could have a similar overall effect. Outcomes with overall long-range cost as low as the low-cost scenario or as high as the high-cost scenario are very unlikely. This report also includes a section on sensitivity analysis, where factors are changed one at a time (see appendix D), and a section on stochastic projections, which provides a probability distribution of possible future outcomes, with most of the key factors being varied around the intermediate alternative (see appendix E).

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Readers should interpret with care the estimates based on the three sets of alternative assumptions. These estimates are not specific predictions of the future financial status of the OASDI program. Rather, they provide a reasonable range of future income and cost.

All of the key demographic, economic, and program-specific assumptions reach their long-range ultimate values within the next 25 years. For extrapolations beyond the 75-year long-range period, the ultimate levels or trends reached by the end of the 75-year period remain unchanged. The assumed ultimate values represent average annual experience or growth rates. Actual future values will exhibit fluctuations or cyclical patterns, as in the past.

The following sections briefly discuss the various assumptions and methods used in making the estimates of trust fund actuarial status, which are the focus of this report.[1] There are, of course, many interrelationships among these factors that are important but are beyond the scope of this discussion.

A. DEMOGRAPHIC ASSUMPTIONS AND METHODS

This section of the report provides a brief overview of the demographic historical data and the assumptions used for the projections.

1. Fertility Assumptions

Birth rates by single year of age, for women aged 14 to 49,[2] are the basis for the fertility assumptions. These rates apply to the total number of women, across all marital statuses, in the midyear population at each age. Table V.A1 displays the historical and projected total fertility rates.[3]

Historically, birth rates in the United States have fluctuated widely. The total fertility rate decreased from 3.31 children per woman at the end of World War I (1918) to 2.15 during the Great Depression (1936). After 1936, the total fertility rate rose to 3.68 in 1957 and then fell to 1.74 by 1976. After 1976, the total fertility rate rose above 2.00 by 1990, where it generally

[1] Actuarial Studies published by the Office of the Chief Actuary, Social Security Administration, contain further details about the assumptions, methods, and actuarial estimates. A complete list of available studies may be found at www.ssa.gov/OACT/NOTES/actstud.html. To obtain copies of such studies or of this report, please submit a request at www.ssa.gov/OACT/request.html. This entire report, along with supplemental year-by-year tables and additional documentation on assumptions and methods, may be found at www.ssa.gov/OACT/TR/2019/.

[2] Birth rates at age 14 include births to women aged 14 and under, and birth rates at age 49 include births to women aged 49 and over.

[3] The total fertility rate may be interpreted as the average number of children that would be born to a woman if she were to experience, at each age of her life, the birth rate observed in, or assumed for, a specified year, and if she were to survive the entire childbearing period. A rate of about 2.1 would ultimately result in a nearly constant population if immigration and emigration were both zero, and if death rates were to remain at current levels.

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remained through 2009, but dropped below 1.90 for 2011 through 2017 and is estimated to be 1.74 in 2018.

These variations in the total fertility rate resulted from changes in many factors, including social attitudes, economic conditions, birth-control practices, and the racial/ethnic composition of the population. Since the baby-boom era (1946-65), women have had higher educational attainment, higher labor force participation, an older average age at first marriage, a higher propensity to remain unmarried, and higher rates of divorce. All of these factors are consistent with continued lower total fertility rates than those experienced during the baby-boom era. Based on consideration of these factors, the Trustees expect the total fertility rate for future years to remain relatively close to the average level since the end of the baby-boom era. The assumed ultimate total fertility rates are 2.20, 2.00, and 1.80 children per woman for the low-cost, intermediate, and high-cost assumptions, respectively. These ultimate rates are unchanged from last year's report.

For the intermediate assumptions, the projected total fertility rate gradually increases from 2018 through the year the ultimate value is reached (2027) with somewhat more rapid increases in the middle of the 2018-2027 period. The assumed low-cost and high-cost total fertility rates trend away from the intermediate path and reach the ultimate values in 2027 and 2024, respectively.

2. Mortality Assumptions

For the projections in this year's report, ultimate average annual percentage reductions in future mortality rates were assumed by age group and cause of death. These assumptions were then used to estimate future central death rates by age group, sex, and cause of death. From these estimated central death rates, probabilities of death by single year of age and sex were calculated.

Historical death rates were calculated for years 1900 through 2016 for ages below 65 (and for all ages for years prior to 1968) using data from the National Center for Health Statistics (NCHS).[1] For ages 65 and over, final Medicare data on deaths for years 1968 through 2015 and preliminary data for 2016 and 2017 were used.[2] Death rates by cause of death were produced for all ages for years 1979-2016 using data from the NCHS.

[1] These rates reflect NCHS data on deaths and Census estimates of population.
[2] These rates reflect Medicare data on deaths and enrollments.

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The total age-sex-adjusted death rate[1] declined at an average annual rate of 1.03 percent between 1900 and 2016. Between 1979 and 2016, the period for which death rates were analyzed by cause, the total age-sex-adjusted death rate, for all causes combined, declined at an average rate of 0.87 percent per year.

Death rates have declined substantially in the U.S. since 1900, with rapid declines over some periods and slow or no improvement over the other periods. Many factors are responsible for historical reductions in death rates, including medical advances, increased availability of health-care services, and improvements in sanitation and nutrition. Historical death rates generally declined more slowly for older ages and more rapidly for children and infants than for the rest of the population. Between 1900 and 2016, the age-sex-adjusted death rate declined at an average rate of 0.78 percent per year for ages 65 and over, and 3.00 percent per year for ages under 15.

Mortality assumptions differ for the low-cost, intermediate, and high-cost scenarios. Throughout the projection, the low-cost scenario contains annual percentage reductions that are smaller than those in the intermediate scenario, while those in the high-cost scenario are larger. The ultimate annual percentage reductions for each of the three alternatives are the same as those in last year's report.

The trends in the annual reductions in central death rates were calculated for the period from 2006 to 2016 for NCHS data, and 2007 to 2017 for Medicare data, by age group, sex, and cause of death.[2] These trends are the starting reductions for alternative II. For alternatives I and III, 50 and 150 percent of the starting reductions are used, respectively. These annual reductions, by alternative, are assumed to transition rapidly from the starting reductions until they reach the ultimate annual percentage reductions assumed for 2043 and later.

Table V.A1 contains historical and projected age-sex-adjusted death rates for the total population (all ages), for ages under 65, and for ages 65 and over. Age-sex adjustment eliminates the effect of a changing distribution of population by age and sex, allowing the pure effects of changes in death rates to be observed. Under the intermediate assumptions, projected age-sex-adjusted death rates are, in general, slightly higher than the death rates in last year's report for both the age group under 65 and the age group 65 and over. These

[1] Based on the enumerated total population as of April 1, 2010, if that population were to experience the death rates by age and sex for the selected year.

[2] Cause of death is only available for the NCHS data.

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changes primarily result from incorporating more recent historical data, which continue to show low rates of improvement.

The projected average annual rate of decline for the total age-sex-adjusted death rate is about 0.41 percent, 0.77 percent, and 1.16 percent between 2018 and 2093 for alternatives I, II, and III, respectively. In keeping with the patterns observed in the historical data, the assumed future rates of decline are greater for younger ages than for older ages, but to a substantially lesser degree than in the past. Accordingly, the projected age-sex-adjusted death rates for ages 65 and over decline at average annual rates of about 0.37 percent, 0.68 percent, and 1.02 percent between 2018 and 2093 for alternatives I, II, and III, respectively. The projected age-sex-adjusted death rates for ages under 15 decline at average annual rates of about 0.80 percent, 1.58 percent, and 2.57 percent between 2018 and 2093 for alternatives I, II, and III, respectively.

Demographers express a wide range of views on the likely rate of future decline in death rates. For example, some believe that the long-standing historical tendency for mortality to decline more slowly at the oldest ages will cease in the future. Others believe that biological factors, social factors, and limitations on health care spending may slow future rates of decline in mortality.

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Table V.A1.—Fertility and Mortality Assumptions,[a] Calendar Years 1940-2095

Calendar year	Total fertility rate[b]	Age-sex-adjusted death rate[c] per 100,000		
		Total	Under 65	65 and over
Historical data:				
1940	2.23	1,919.8	750.1	9,718.8
1945	2.42	1,716.6	674.8	8,662.9
1950	3.03	1,561.9	570.2	8,173.7
1955	3.50	1,453.8	508.2	7,758.4
1960	3.61	1,454.3	503.2	7,795.4
1965	2.88	1,428.8	495.2	7,653.3
1970	2.43	1,340.0	485.7	7,036.3
1975	1.77	1,204.8	426.6	6,393.6
1980	1.82	1,136.9	384.3	6,154.3
1985	1.83	1,081.0	353.3	5,932.9
1990	2.07	1,022.9	333.6	5,618.9
1995	1.98	1,002.7	317.9	5,568.6
2000	2.05	961.5	281.0	5,498.9
2005	2.06	901.9	270.7	5,110.3
2010	1.93	820.8	248.5	4,636.1
2011	1.89	820.7	249.1	4,631.3
2012	1.87	811.7	248.6	4,565.6
2013	1.85	812.2	249.4	4,564.6
2014	1.86	804.9	251.4	4,495.1
2015	1.84	815.0	254.9	4,549.7
2016	1.82	[d]808.2	260.5	[d]4,460.0
2017	1.76	[d]802.7	[d]250.6	[d]4,483.6
2018	[e]1.74	[e]791.8	[e]249.3	[e]4,408.3
Intermediate:				
2020	1.76	779.9	245.9	4,339.7
2025	1.98	748.2	234.8	4,170.8
2030	2.00	716.5	222.6	4,009.3
2035	2.00	686.2	210.6	3,857.2
2040	2.00	657.7	199.3	3,714.4
2045	2.00	631.0	188.6	3,580.6
2050	2.00	606.0	178.7	3,455.2
2055	2.00	582.6	169.4	3,337.4
2060	2.00	560.6	160.7	3,226.7
2065	2.00	540.0	152.6	3,122.5
2070	2.00	520.6	145.0	3,024.3
2075	2.00	502.3	137.9	2,931.6
2080	2.00	485.1	131.3	2,844.0
2085	2.00	468.8	125.0	2,761.1
2090	2.00	453.5	119.1	2,682.6
2095	2.00	438.9	113.6	2,608.1
Low-cost:				
2020	1.82	792.3	250.1	4,407.3
2025	2.14	778.5	245.6	4,331.3
2030	2.20	762.3	239.5	4,248.2
2035	2.20	745.8	233.0	4,164.8
2040	2.20	729.5	226.5	4,083.1
2045	2.20	713.7	220.2	4,003.7
2050	2.20	698.3	214.1	3,926.8
2055	2.20	683.5	208.2	3,852.6
2060	2.20	669.2	202.5	3,780.7
2065	2.20	655.3	197.0	3,711.2
2070	2.20	642.0	191.7	3,643.9
2075	2.20	629.0	186.6	3,578.8
2080	2.20	616.5	181.6	3,515.7
2085	2.20	604.3	176.8	3,454.5
2090	2.20	592.6	172.2	3,395.3
2095	2.20	581.2	167.8	3,337.8

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Table V.A1.—Fertility and Mortality Assumptions,[a] Calendar Years 1940-2095 (Cont.)

Calendar year	Total fertility rate[b]	Age-sex-adjusted death rate[c] per 100,000		
		Total	Under 65	65 and over
High-cost:				
2020	1.70	766.4	241.4	4,266.7
2025	1.80	714.2	222.5	3,992.9
2030	1.80	665.3	203.4	3,744.9
2035	1.80	620.9	185.8	3,521.8
2040	1.80	580.9	169.8	3,321.2
2045	1.80	544.8	155.6	3,140.3
2050	1.80	512.4	142.8	2,976.6
2055	1.80	483.0	131.3	2,828.0
2060	1.80	456.4	121.0	2,692.6
2065	1.80	432.2	111.8	2,568.7
2070	1.80	410.1	103.4	2,455.0
2075	1.80	389.8	95.8	2,350.3
2080	1.80	371.2	88.9	2,253.5
2085	1.80	354.1	82.6	2,163.8
2090	1.80	338.2	76.9	2,080.4
2095	1.80	323.5	71.7	2,002.7

[a] This table contains basic assumptions along with key summary values that are derived from basic assumptions.
[b] The total fertility rate for any year is the average number of children that would be born to a woman if she were to experience, at each age of her life, the birth rate observed in, or assumed for, the selected year, and if she were to survive the entire childbearing period.
[c] Based on the enumerated total population as of April 1, 2010, if that population were to experience the death rates by age and sex observed in, or assumed for, the selected year.
[d] Estimated.
[e] Estimated, intermediate alternative.

3. Immigration Assumptions

Projections of the total Social Security area population reflect assumptions for annual immigration flows. For this report, four categories of immigration flows are used:

- Lawful permanent resident (LPR) immigration: Persons who enter the Social Security area and are granted LPR status, or who are already in the Social Security area and adjust their status to become LPRs.[1]
- Legal emigration: LPRs and citizens who leave the Social Security area population.
- Other-than-LPR immigration: Persons who enter the Social Security area and stay to the end of the year without being granted LPR status, such as undocumented immigrants, and foreign workers and students entering with temporary visas.

[1] Persons who enter the country with legal visas but without LPR status, such as temporary foreign workers and students, are not included in the "LPR immigration" category.

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- Other-than-LPR emigration: Other-than-LPR immigrants who leave the Social Security area population or who adjust their status to become LPRs.

Net LPR immigration is the difference between LPR immigration and legal emigration. Net other-than-LPR immigration is the difference between other-than-LPR immigration and other-than-LPR emigration. Total net immigration refers to the sum of net LPR immigration and net other-than-LPR immigration.

Immigration assumptions differ for the low-cost, intermediate, and high-cost scenarios. The low-cost scenario includes higher annual net immigration and the high-cost scenario includes lower annual net immigration. Table V.A2 contains historical and projected levels of various immigration flows.

LPR immigration has increased significantly since World War II, due to various factors and legislative changes, including the Immigration Act of 1965 and the Immigration Act of 1990.

For the intermediate alternative, the ultimate level of annual LPR immigration, which includes residents who adjust their status to become LPRs, is assumed to be 1,050,000 persons for 2020 and later. For alternative I, ultimate annual LPR immigration is assumed to be 1,250,000 persons for 2020 and later, and for alternative III, ultimate annual LPR immigration is assumed to be 850,000 persons for 2020 and later. The ultimate levels of LPR immigration are unchanged from last year's report.

The assumed ratios of annual legal emigration to LPR immigration are 20, 25, and 30 percent for alternatives I, II, and III, respectively. This range is consistent with the limited historical data for legal emigration from the Social Security area. These ratios are unchanged from last year's report. Under the intermediate alternative, by combining the ultimate annual LPR immigration and legal emigration assumptions, ultimate annual net LPR immigration is about 788,000 persons. For the low-cost and high-cost scenarios, ultimate annual net LPR immigration is 1,000,000 persons and 595,000 persons, respectively.

The estimated number of other-than-LPR immigrants residing in the Social Security area and the annual level of other-than-LPR immigration have been affected significantly by the most recent recession. Although net other-than-LPR immigration was greatly reduced during the economic downturn, it has begun to rise since then. Under the intermediate assumptions, annual other-than-LPR immigration is expected to continue increasing, reflecting a con-

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tinued recovery from levels experienced during the recession. In last year's report, other-than-LPR immigration under the intermediate assumptions was projected to increase to a peak level in 2018 and then decrease to the ultimate level in 2022, based on the expectation that the continuing economic recovery would result in other-than-LPR immigration levels that would make up for the lower levels experienced during the recession. However, recent other-than-LPR immigration levels have not followed this pattern. Under the intermediate assumptions for this year's report, other-than-LPR immigration is assumed to attain the ultimate level in 2019. The ultimate levels of other-than-LPR immigration are unchanged from last year's report: 1,350,000 persons for alternative II, 1,650,000 persons for alternative I, and 1,050,000 persons for alternative III.

Emigration from the other-than-LPR immigrant population includes those who leave the Social Security area and those who adjust their status to become LPRs. This other-than-LPR immigrant population is highly mobile and far more likely to leave the Social Security area than is the citizen or LPR population. However, as other-than-LPR immigrants stay in the country for longer periods of time, they generally become less likely to leave the country.

Under the intermediate assumptions, the total annual number of other-than-LPR immigrants who leave the Social Security area averages about 422,000 through the 75-year projection period. In addition, the ultimate annual number of other-than-LPR immigrants who adjust status to become LPRs is assumed to be 450,000 for the intermediate assumptions. For the low-cost and high-cost scenarios, the total annual number of other-than-LPR emigrants averages about 496,000 and 346,000, respectively, through the 75-year projection period. The ultimate annual number of people adjusting status to LPR status is assumed to be 550,000 persons and 350,000 persons, for the low-cost and high-cost scenarios, respectively. The ultimate annual number of people adjusting status to become LPRs is one-third as large as the assumed ultimate annual number of the other-than-LPR immigrants entering the Social Security area, and is unchanged from last year's report for all three sets of assumptions.

Under the assumptions described above, the projected size of the other-than-LPR immigrant population grows substantially. This growth reflects the excess of annual immigration over the combined annual numbers of emigrants (including adjustments of status) and deaths that occur within the other-than-LPR immigrant population.

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Under the intermediate assumptions, projected net other-than-LPR immigration gradually decreases over time. Because the projected number of other-than-LPR immigrants leaving the Social Security area is based on rates of departure, an increase in the number of other-than-LPR immigrants residing in the Social Security area results in an increase in the number who emigrate out of the area. All other components of other-than-LPR immigration and emigration are assumed to be stable after 2019, and thus do not contribute toward any change in annual net other-than-LPR immigration. Under the intermediate assumptions, the projected average annual level of net other-than-LPR immigration over the 75-year projection period is about 478,000 persons. For the low-cost and high-cost assumptions, projected average annual net other-than-LPR immigration is about 601,000 persons and 354,000 persons, respectively.

The projected average annual level of total net immigration (LPR and other-than-LPR, combined) is about 1,265,000 persons per year during the 75-year projection period under the intermediate assumptions. For the low-cost and high-cost assumptions, projected average annual total net immigration is about 1,601,000 persons and 949,000 persons, respectively.

Demographers express a wide range of views about the future course of immigration for the United States. Some believe that net immigration will increase substantially in the future. Others believe that potential immigrants may be increasingly attracted to other countries, that the number of potential immigrants may be lower due to lower birth rates in many countries, or that changes in the law or enforcement of the law will reduce immigration.

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Table V.A2.—Immigration Assumptions,[a] Calendar Years 1940-2095
[in thousands]

	LPR immigration				Other-than-LPR immigration[b]				
Calendar year	LPR in	Legal out	Adjustments of status[c d]	Net LPR	Other-than-LPR in	Other-than-LPR out	Adjustments of status[c d]	Net other-than-LPR	Total net immigration
Historical data:									
1940	61	15	-	46	-	-	-	-	-
1945	73	18	-	55	-	-	-	-	-
1950	227	57	-	171	-	-	-	-	-
1955	280	70	-	210	-	-	-	-	-
1960	268	67	-	201	-	-	-	-	-
1965	261	77	49	232	-	-	49	-	-
1970	307	93	65	279	-	-	65	-	-
1975	340	98	53	294	-	-	53	-	-
1980	431	136	112	407	-	-	112	203	610
1985	458	144	119	432	-	-	119	261	693
1990	548	166	114	497	-	-	114	623	1,120
1995	511	192	255	575	-	-	255	560	1,135
2000	482	224	413	672	1,408	294	413	701	1,373
2005	561	290	597	869	1,827	84	597	1,146	2,015
2010	622	262	426	786	681	206	426	50	835
2011	647	264	408	791	590	251	408	-69	722
2012	621	255	401	766	725	443	401	-118	648
2013	589	249	409	748	832	341	409	82	830
2014	627	256	398	769	1,327	156	398	772	1,541
2015	689	271	395	813	1,111	259	395	457	1,270
2016	763	292	407	877	1,192	695	407	90	968
2017	[e]724	[e]282	[e]403	[e]845	[f]1,250	[e]237	[e]403	[f]610	[f]1,456
2018	[f]620	[f]268	[f]450	[f]803	[f]1,300	[f]249	[f]450	[f]601	[f]1,404
Intermediate:									
2020	600	263	450	788	1,350	275	450	625	1,413
2025	600	263	450	788	1,350	329	450	571	1,359
2030	600	263	450	788	1,350	358	450	542	1,329
2035	600	263	450	788	1,350	384	450	516	1,304
2040	600	263	450	788	1,350	407	450	493	1,280
2045	600	263	450	788	1,350	424	450	476	1,263
2050	600	263	450	788	1,350	436	450	464	1,251
2055	600	263	450	788	1,350	445	450	455	1,243
2060	600	263	450	788	1,350	452	450	448	1,236
2065	600	263	450	788	1,350	457	450	443	1,231
2070	600	263	450	788	1,350	461	450	439	1,227
2075	600	263	450	788	1,350	464	450	436	1,223
2080	600	263	450	788	1,350	466	450	434	1,221
2085	600	263	450	788	1,350	468	450	432	1,220
2090	600	263	450	788	1,350	469	450	431	1,218
2095	600	263	450	788	1,350	470	450	430	1,218

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Table V.A2.—Immigration Assumptions,[a] Calendar Years 1940-2095 (Cont.)
[in thousands]

Calendar year	LPR immigration				Other-than-LPR immigration[b]				Total net immigration
	LPR in	Legal out	Adjustments of status[c d]	Net LPR	Other-than-LPR in	Other-than-LPR out	Adjustments of status[c d]	Net other-than-LPR	
Low-cost:									
2020	700	250	550	1,000	1,600	279	550	771	1,771
2025	700	250	550	1,000	1,650	353	550	747	1,747
2030	700	250	550	1,000	1,650	396	550	704	1,704
2035	700	250	550	1,000	1,650	435	550	665	1,665
2040	700	250	550	1,000	1,650	470	550	630	1,630
2045	700	250	550	1,000	1,650	496	550	604	1,604
2050	700	250	550	1,000	1,650	515	550	585	1,585
2055	700	250	550	1,000	1,650	530	550	570	1,570
2060	700	250	550	1,000	1,650	541	550	559	1,559
2065	700	250	550	1,000	1,650	550	550	550	1,550
2070	700	250	550	1,000	1,650	556	550	544	1,544
2075	700	250	550	1,000	1,650	561	550	539	1,539
2080	700	250	550	1,000	1,650	564	550	536	1,536
2085	700	250	550	1,000	1,650	566	550	534	1,534
2090	700	250	550	1,000	1,650	568	550	532	1,532
2095	700	250	550	1,000	1,650	569	550	531	1,531
High-cost:									
2020	500	255	350	595	1,050	265	350	435	1,030
2025	500	255	350	595	1,050	300	350	400	995
2030	500	255	350	595	1,050	316	350	384	979
2035	500	255	350	595	1,050	330	350	370	965
2040	500	255	350	595	1,050	342	350	358	953
2045	500	255	350	595	1,050	350	350	350	945
2050	500	255	350	595	1,050	355	350	345	940
2055	500	255	350	595	1,050	358	350	342	937
2060	500	255	350	595	1,050	360	350	340	935
2065	500	255	350	595	1,050	362	350	338	933
2070	500	255	350	595	1,050	364	350	336	931
2075	500	255	350	595	1,050	365	350	335	930
2080	500	255	350	595	1,050	367	350	333	928
2085	500	255	350	595	1,050	368	350	332	927
2090	500	255	350	595	1,050	368	350	332	927
2095	500	255	350	595	1,050	369	350	331	926

[a] This table contains basic assumptions along with key summary values that are derived from basic assumptions.

[b] Historical other-than-LPR immigration and emigration estimates depend on a residual method. The Office of the Chief Actuary developed these estimates, as well as the resulting other-than-LPR January 1 stock estimates, for years through 2000. For years 2001 and later, the residual method uses stock estimates. For 2001 through 2004, the stock is set to values that linearly grade from the 2000 stock estimate to the DHS 2005 stock estimate. For 2005 through 2012, stock estimates come from DHS. For 2013 through 2016, stock estimates are developed by the Office of the Chief Actuary, based on the same methods used by DHS.

[c] Estimates do not include persons who attained LPR status under the special one-time provisions of the Immigration Reform and Control Act of 1986.

[d] Adjustments of status are a positive for net LPR immigration and a negative for net other-than-LPR immigration.

[e] Estimated.

[f] Estimated, intermediate alternative.

Note: Totals do not necessarily equal the sums of rounded components.

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4. Total Population Estimates

The starting Social Security area population for December 31, 2016, is derived from the Census Bureau's estimate of the residents of the 50 States and D.C. and U.S. Armed Forces overseas. Adjustments are made to reflect mortality assumptions for the aged population since 2010 that are consistent with Medicare and Social Security data, net immigration assumptions for the aged population since 2010, estimates of the net undercount in the 2010 census, inclusion of U.S. citizens living abroad (including residents of U.S. territories), and inclusion of non-citizens living abroad who are insured for Social Security benefits. The Office of the Chief Actuary projects the population in the Social Security area by age, sex, and marital status for December 31 of each year from 2017 through 2095 by combining the assumptions for future fertility, mortality, and immigration with assumptions for marriage and divorce. Previous sections of this chapter present the assumptions for future fertility, mortality, and immigration. Assumptions for future rates of marriage and divorce reflect historical data from the National Center for Health Statistics, the Census Bureau, and selected individual States.

This report presents a July 1 (i.e., midyear) population for each year, which is derived from surrounding December populations. Table V.A3 shows the historical and projected population for July 1 by broad age group, for the three alternatives. It also shows the aged and total dependency ratios (see table footnotes for definitions).

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Table V.A3.—Social Security Area Population on July 1 and Dependency Ratios, Calendar Years 1945-2095

Calendar year	Population (in thousands)				Dependency ratio	
	Under 20	20-64	65 and over	Total	Aged[a]	Total[b]
Historical data:						
1945	49,121	88,109	10,900	148,130	0.124	0.681
1950	53,903	92,382	12,769	159,053	.138	.722
1955	63,293	96,207	15,075	174,576	.157	.815
1960	73,074	99,802	17,277	190,153	.173	.905
1965	80,020	104,885	19,071	203,975	.182	.945
1970	81,020	112,991	20,895	214,906	.185	.902
1975	78,629	122,642	23,307	224,578	.190	.831
1980	74,833	134,108	26,306	235,247	.196	.754
1985	72,946	144,579	29,132	246,656	.201	.706
1990	74,797	152,770	31,924	259,490	.209	.699
1995	79,278	160,733	34,313	274,324	.213	.707
2000	82,003	170,182	35,505	287,689	.209	.690
2005	83,982	181,065	37,172	302,219	.205	.669
2010	85,688	188,334	41,052	315,075	.218	.673
2011	85,337	189,780	42,043	317,160	.222	.671
2012	85,006	190,638	43,449	319,092	.228	.674
2013	84,738	191,364	44,932	321,034	.235	.678
2014	84,660	192,406	46,345	323,412	.241	.681
2015	84,688	193,518	47,786	325,993	.247	.685
2016[c]	84,689	194,261	49,270	328,220	.254	.690
2017[d]	84,707	194,926	50,818	330,451	.261	.695
2018[d]	84,706	195,714	52,401	332,821	.268	.701
Intermediate:						
2020	84,651	197,101	55,763	337,514	.283	.712
2025	85,927	199,694	64,590	350,212	.323	.754
2030	88,162	202,907	72,323	363,391	.356	.791
2035	91,799	206,482	77,020	375,301	.373	.818
2040	95,883	210,276	79,566	385,725	.378	.834
2045	98,211	215,250	81,363	394,824	.378	.834
2050	98,955	220,681	83,752	403,389	.380	.828
2055	100,182	225,380	86,874	412,436	.385	.830
2060	102,340	229,372	90,793	422,506	.396	.842
2065	105,241	233,562	94,459	433,262	.404	.855
2070	108,172	237,474	98,368	444,015	.414	.870
2075	110,527	241,357	102,522	454,407	.425	.883
2080	112,228	247,305	104,975	464,508	.424	.878
2085	113,842	254,297	106,550	474,688	.419	.867
2090	115,884	259,948	109,385	485,218	.421	.867
2095	118,353	264,065	113,636	496,055	.430	.879

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Table V.A3.—Social Security Area Population on July 1 and Dependency Ratios, Calendar Years 1945-2095 (Cont.)

Calendar year	Population (in thousands)				Dependency ratio	
	Under 20	20-64	65 and over	Total	Aged[a]	Total[b]
Low-cost:						
2020	85,055	197,478	55,731	338,265	0.282	0.713
2025	88,253	201,366	64,351	353,970	.320	.758
2030	93,435	205,903	71,684	371,021	.348	.802
2035	100,188	210,789	75,830	386,808	.360	.835
2040	107,246	216,061	77,748	401,055	.360	.856
2045	111,615	223,569	78,935	414,118	.353	.852
2050	113,803	232,562	80,809	427,175	.347	.837
2055	117,073	240,930	83,549	441,553	.347	.833
2060	122,042	248,563	87,195	457,799	.351	.842
2065	128,137	256,469	90,633	475,239	.353	.853
2070	134,090	264,540	94,283	492,913	.356	.863
2075	139,021	273,367	98,111	510,499	.359	.867
2080	143,022	285,036	100,253	528,311	.352	.853
2085	147,129	298,069	101,715	546,913	.341	.835
2090	152,139	309,065	105,384	566,589	.341	.833
2095	157,905	317,916	111,324	587,146	.350	.847
High-cost:						
2020	84,147	196,542	55,796	336,485	.284	.712
2025	83,515	197,900	64,866	346,280	.328	.750
2030	82,851	199,878	73,074	355,803	.366	.780
2035	83,504	202,238	78,431	364,173	.388	.801
2040	84,773	204,645	81,728	371,147	.399	.814
2045	85,306	207,138	84,256	376,699	.407	.819
2050	84,923	209,089	87,258	381,269	.417	.823
2055	84,499	210,271	90,819	385,589	.432	.834
2060	84,379	210,783	95,022	390,184	.451	.851
2065	84,701	211,446	98,881	395,028	.468	.868
2070	85,230	211,475	102,985	399,690	.487	.890
2075	85,610	210,822	107,382	403,814	.509	.915
2080	85,655	211,583	110,052	407,290	.520	.925
2085	85,547	213,173	111,607	410,327	.524	.925
2090	85,551	214,279	113,344	413,175	.529	.928
2095	85,757	214,601	115,551	415,910	.538	.938

[a] Ratio of the population at ages 65 and over to the population at ages 20-64.
[b] Ratio of the population at ages 65 and over and the population under age 20 to the population at ages 20-64.
[c] Estimated.
[d] Estimated, intermediate alternative.

Notes:
1. Historical data are subject to revision.
2. Totals do not necessarily equal the sums of rounded components.

5. Life Expectancy Estimates

Life expectancy, or the average remaining number of years expected prior to death, is an additional way to summarize the Trustees' mortality assumptions. This report includes life expectancy in two different forms (period and cohort), which are useful for two separate purposes.

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- Period life expectancy for a given year incorporates the actual or expected death rates at each age for that year. It is a useful summary statistic for illustrating the overall level of the death rates experienced in a single year. Period life expectancy for a particular year provides an individual's expected average remaining lifetime at a selected age, assuming no change in death rates after that year. Table V.A4 presents historical and projected life expectancy calculated on a period basis.
- Cohort life expectancy does not incorporate death rates for a single year, but for the series of years in which the individual will actually reach each succeeding age if he or she survives. Cohort life expectancy provides an individual's expected average remaining lifetime at a selected age in a given year, using actual or expected future death rates. Table V.A5 presents historical and projected life expectancy calculated on a cohort basis. Cohort life expectancy is somewhat greater than period life expectancy for a given year because: (1) death rates at any age tend to decline over time; and (2) cohort life expectancy uses death rates from future years, while period life expectancy uses death rates only from the given year.

Life expectancy at a given age reflects death rates at that and all older ages. Period life expectancy is somewhat related to the age-sex-adjusted death rate discussed in section V.A.2. However, life expectancy places far greater weight on death rates at relatively younger ages than those at relatively older ages. Therefore, changes in death rates at younger ages have far greater effects in changing life expectancy over time. It is important to keep this concept in mind when considering trends in life expectancy.

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Table V.A4.—Period Life Expectancy[a]

Calendar year	Historical data			
	At birth		At age 65	
	Male	Female	Male	Female
1940	61.4	65.7	11.9	13.4
1945	62.9	68.4	12.6	14.4
1950	65.6	71.1	12.8	15.1
1955	66.7	72.8	13.1	15.6
1960	66.7	73.2	12.9	15.9
1965	66.8	73.8	12.9	16.3
1970	67.2	74.9	13.1	17.1
1975	68.7	76.6	13.7	18.0
1980	69.9	77.5	14.0	18.4
1985	71.1	78.2	14.4	18.6
1990	71.8	78.9	15.0	19.0
1995	72.5	79.1	15.4	19.0
2000	74.0	79.4	15.9	19.0
2005	74.8	80.0	16.7	19.5
2010	76.1	80.9	17.6	20.2
2011	76.2	80.9	17.6	20.2
2012	76.3	81.0	17.7	20.3
2013	76.3	81.0	17.7	20.3
2014	76.3	81.1	17.8	20.4
2015	76.1	81.0	17.8	20.3
2016[b] . . .	76.0	81.0	17.9	20.5
2017[b] . . .	76.4	81.1	17.9	20.5
2018[c] . . .	76.5	81.3	18.1	20.6

Calendar year	Intermediate				Low-cost				High-cost			
	At birth		At age 65		At birth		At age 65		At birth		At age 65	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
2020	76.7	81.4	18.2	20.7	76.5	81.3	18.1	20.6	77.0	81.6	18.4	20.8
2025	77.3	81.9	18.6	21.0	76.8	81.5	18.2	20.7	77.9	82.4	18.9	21.3
2030	77.9	82.4	18.9	21.3	77.1	81.7	18.4	20.9	78.9	83.2	19.5	21.8
2035	78.5	82.8	19.2	21.6	77.4	81.9	18.6	21.0	79.8	83.9	20.0	22.3
2040	79.0	83.3	19.6	21.9	77.7	82.2	18.7	21.2	80.6	84.6	20.5	22.7
2045	79.6	83.7	19.9	22.2	78.0	82.4	18.9	21.3	81.4	85.2	21.0	23.2
2050	80.1	84.2	20.2	22.4	78.2	82.7	19.1	21.5	82.2	85.9	21.4	23.6
2055	80.6	84.6	20.5	22.7	78.5	82.9	19.2	21.6	82.9	86.4	21.9	24.0
2060	81.1	85.0	20.7	23.0	78.8	83.1	19.4	21.8	83.5	87.0	22.3	24.3
2065	81.5	85.4	21.0	23.2	79.1	83.4	19.6	21.9	84.1	87.5	22.7	24.7
2070	82.0	85.7	21.3	23.5	79.3	83.6	19.7	22.1	84.7	88.0	23.0	25.0
2075	82.4	86.1	21.5	23.7	79.6	83.8	19.9	22.2	85.3	88.5	23.4	25.4
2080	82.8	86.4	21.8	23.9	79.9	84.0	20.0	22.3	85.8	88.9	23.7	25.7
2085	83.2	86.7	22.0	24.1	80.1	84.2	20.2	22.5	86.3	89.3	24.1	26.0
2090	83.6	87.1	22.3	24.4	80.4	84.4	20.3	22.6	86.8	89.7	24.4	26.3
2095	84.0	87.4	22.5	24.6	80.6	84.6	20.5	22.7	87.3	90.1	24.7	26.6

[a] The period life expectancy at a given age for a given year is the average remaining number of years expected prior to death for a person at that exact age, born on January 1, using the mortality rates for that year over the course of his or her remaining life.
[b] Estimated.
[c] Estimated, intermediate alternative.

Table V.A5.—Cohort Life Expectancy[a]

Calendar year	Intermediate				Low-cost				High-cost			
	At birth[b]		At age 65[c]		At birth[b]		At age 65[c]		At birth[b]		At age 65[c]	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1940	70.3	76.5	12.7	14.7	70.2	76.4	12.7	14.7	70.4	76.6	12.7	14.7
1945	72.1	78.1	13.0	15.4	71.9	77.9	13.0	15.4	72.3	78.4	13.0	15.4
1950	73.2	79.4	13.1	16.2	72.9	79.1	13.1	16.2	73.6	79.9	13.1	16.2
1955	73.8	80.0	13.1	16.7	73.3	79.5	13.1	16.7	74.3	80.6	13.1	16.7
1960	74.4	80.4	13.2	17.4	73.8	79.7	13.2	17.4	75.2	81.1	13.2	17.4
1965	75.4	80.9	13.5	18.0	74.6	80.1	13.5	18.0	76.4	81.9	13.5	18.0
1970	76.6	81.8	13.8	18.5	75.6	80.8	13.8	18.5	77.8	83.0	13.8	18.5
1975	77.5	82.5	14.2	18.7	76.2	81.3	14.2	18.7	79.0	83.9	14.2	18.7
1980	78.3	83.1	14.7	18.8	76.9	81.8	14.7	18.8	80.0	84.7	14.7	18.8
1985	79.0	83.7	15.4	19.1	77.3	82.2	15.4	19.1	80.9	85.5	15.4	19.1
1990	79.6	84.2	16.0	19.4	77.7	82.5	16.0	19.4	81.8	86.2	16.0	19.4
1995	80.3	84.7	16.7	19.7	78.3	82.9	16.7	19.7	82.7	86.9	16.7	19.7
2000	80.9	85.2	17.4	20.1	78.6	83.2	17.4	20.0	83.5	87.5	17.5	20.2
2005	81.4	85.6	17.9	20.5	78.9	83.4	17.8	20.4	84.1	88.0	18.1	20.7
2010	81.9	86.0	18.4	20.9	79.2	83.7	18.1	20.6	84.8	88.5	18.7	21.2
2011	82.0	86.0	18.4	21.0	79.3	83.7	18.2	20.7	85.0	88.6	18.8	21.3
2012	82.1	86.1	18.5	21.0	79.3	83.7	18.2	20.7	85.1	88.7	18.9	21.4
2013	82.2	86.2	18.6	21.1	79.4	83.8	18.2	20.8	85.2	88.8	19.0	21.5
2014	82.3	86.3	18.6	21.2	79.5	83.8	18.3	20.8	85.3	88.9	19.1	21.6
2015	82.3	86.3	18.7	21.2	79.5	83.9	18.3	20.8	85.4	89.0	19.2	21.7
2016	82.4	86.4	18.8	21.3	79.6	83.9	18.3	20.9	85.6	89.1	19.3	21.8
2017	82.5	86.5	18.8	21.4	79.6	84.0	18.4	20.9	85.7	89.2	19.4	22.0
2018	82.6	86.6	18.9	21.4	79.7	84.0	18.4	20.9	85.8	89.3	19.5	22.1
2020	82.8	86.7	19.1	21.6	79.8	84.1	18.5	21.0	86.1	89.5	19.8	22.3
2025	83.3	87.1	19.4	21.9	80.1	84.3	18.6	21.2	86.7	90.0	20.3	22.8
2030	83.7	87.4	19.7	22.2	80.3	84.5	18.8	21.3	87.2	90.5	20.8	23.2
2035	84.1	87.8	20.0	22.5	80.6	84.8	19.0	21.5	87.8	90.9	21.3	23.7
2040	84.5	88.1	20.4	22.7	80.8	85.0	19.2	21.6	88.3	91.3	21.8	24.1
2045	84.9	88.4	20.7	23.0	81.1	85.2	19.3	21.8	88.8	91.7	22.3	24.5
2050	85.2	88.7	21.0	23.3	81.3	85.4	19.5	21.9	89.2	92.1	22.7	24.8
2055	85.6	89.0	21.2	23.5	81.5	85.6	19.6	22.0	89.7	92.5	23.1	25.2
2060	85.9	89.3	21.5	23.8	81.8	85.7	19.8	22.2	90.1	92.8	23.5	25.6
2065	86.3	89.5	21.8	24.0	82.0	85.9	20.0	22.3	90.5	93.2	23.8	25.9
2070	86.6	89.8	22.0	24.2	82.2	86.1	20.1	22.5	90.9	93.5	24.2	26.2
2075	86.9	90.1	22.3	24.5	82.4	86.3	20.3	22.6	91.3	93.8	24.5	26.5
2080	87.2	90.3	22.5	24.7	82.7	86.5	20.4	22.7	91.7	94.1	24.9	26.8
2085	87.5	90.6	22.8	24.9	82.9	86.6	20.6	22.9	92.0	94.4	25.2	27.1
2090	87.8	90.8	23.0	25.1	83.1	86.8	20.7	23.0	92.4	94.7	25.5	27.4
2095	88.1	91.0	23.2	25.3	83.3	87.0	20.8	23.1	92.7	95.0	25.8	27.7

[a] The cohort life expectancy at a given age for a given year is the average remaining number of years expected prior to death for a person at that exact age, born on January 1, using the mortality rates for the series of years in which the individual will actually reach each succeeding age if he or she survives.

[b] Cohort life expectancy at birth for those born in the calendar year is based on a combination of actual, estimated, and projected death rates for birth years 1940 through 2016. For birth years after 2016, these values depend on estimated and projected death rates.

[c] Age 65 cohort life expectancy for those attaining age 65 in calendar years 1940 though 2015 depends on actual death rates or on a combination of actual, estimated, and projected death rates. After 2015, these values depend on estimated and projected death rates.

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B. ECONOMIC ASSUMPTIONS AND METHODS

The three alternative sets of economic assumptions provide a reasonable range for estimating the financial status of the trust funds. The intermediate assumptions reflect the Trustees' consensus expectation of sustained moderate economic growth after completion of the recovery from the last recession and their best estimate for other economic parameters. The low-cost assumptions represent a more optimistic outlook with recovery to a higher level of economic output, stronger long-term economic growth, and relatively optimistic levels for other parameters. The high-cost assumptions represent a more pessimistic scenario with weaker economic growth interrupted by a recession in the near term, slower economic growth in the long term, and relatively pessimistic levels for other parameters.

Actual economic data were available through the third quarter of 2018 at the time the assumptions for this report were set. The data indicated that economic activity peaked in the fourth quarter of 2007.[1] A severe recession followed, with a low point in the economic cycle reached in the second quarter of 2009 with gross domestic product (GDP) about 7 percent below the estimated sustainable trend level. The annual growth rate in real GDP has been positive in all years since then, but not as rapid as in most past recoveries.

The economy is projected to return to the assumed sustainable trend level of output within the first 10 years of the projection period under all three alternatives and to remain on that trend thereafter. However, the speed of the return varies by alternative. The economy is projected to fully return to its sustainable trend level of output in 2021 under the intermediate assumptions, four years earlier than in last year's report, mainly because economic growth in 2018 exceeded projections from last year's report. Under the low-cost assumptions, the economy is also projected to return to its sustainable trend level of output by 2021, one year earlier than in last year's report. Under the high-cost assumptions, the estimated sustainable trend level of output is lower, and actual output has already exceeded that level. However, due to the assumed recession, GDP is projected to drop to 2.5 percent below the sustainable trend level in the second half of 2020, and the subsequent recovery is assumed to return GDP to the sustainable trend level in 2028. Complete economic cycles have little effect on the long-range estimates of financial status, so the assumptions do not include cycles beyond the short-range period (2019 through 2028).

[1] See www.nber.org/cycles/cyclesmain.html.

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The key economic assumptions underlying the three sets of projections of the future financial status of the OASI and DI Trust Funds are discussed in the remainder of this section.

1. Productivity Assumptions

Total U.S. economy productivity is defined as the ratio of real GDP to hours worked by all workers.[1] The rate of change in total-economy productivity is a major determinant of the growth of average earnings. Over the last five complete economic cycles (1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, measured peak to peak), the annual increases in total-economy productivity averaged 2.65, 1.07, 1.41, 1.85, and 2.19 percent, respectively. For the period from 1969 to 2007, covering those last five complete economic cycles, the annual increase in total-economy productivity averaged 1.73 percent.

The assumed ultimate annual increases in total-economy productivity are 1.93, 1.63, and 1.33 percent for the low-cost, intermediate, and high-cost assumptions, respectively.[2] These rates of increase are 0.05 percentage point lower than in the 2018 report.

The average annual rate of change in total-economy productivity from 2007 (the end of the last complete economic cycle) to 2018 is estimated to be 1.01 percent. For the intermediate assumptions, the annual change in productivity is 1.82 percent for 2019, 2.17 percent for 2020, and declines to its ultimate value of 1.63 percent by 2023. For the low-cost assumptions, the annual change in productivity is 2.45 percent for 2019, then increases to 2.96 percent for 2020, and gradually approaches its ultimate value of 1.93 percent for 2023 and thereafter. For the high-cost assumptions, the annual change in productivity is 1.24 percent for 2019, 1.17 percent for 2020 due to the assumed recession, rebounds to 1.85 percent for 2021, and then averages 1.34 for 2022 through 2028, and stabilizes at its ultimate value of 1.33 thereafter.

2. Price Inflation Assumptions

Changes in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI) directly affect the OASDI program through the automatic

[1] Historical levels of real GDP are from the National Income and Product Accounts (NIPA) produced by the Bureau of Economic Analysis (BEA). Historical total hours worked are provided by the Bureau of Labor Statistics (BLS) and cover all U.S. Armed Forces and civilian employment.

[2] These assumptions are consistent with ultimate annual increases in private non-farm business productivity of 2.36, 2.00, and 1.63 percent. Compared to total-economy productivity, private non-farm business productivity is a more widely known concept that excludes the farm, government, non-profit institution, and private household sectors.

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cost-of-living benefit increases. Changes in the GDP price index (GDP deflator) affect the nominal levels of GDP, wages, self-employment income, average earnings, and taxable payroll.

The annual increases in the CPI averaged 4.91, 8.54, 5.30, 2.73, and 2.63 percent over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. The annual increases in the GDP deflator averaged 5.04, 7.54, 4.61, 2.08, and 2.49 percent for the respective economic cycles. For the period from 1969 to 2007, covering the last five complete economic cycles, the annual increases in the CPI and GDP deflator averaged 4.59 and 4.03 percent, respectively. The estimated average annual change from 2007 (the end of the last complete economic cycle) to 2018 is 1.74 percent for the CPI and 1.62 percent for the GDP deflator.

The assumed ultimate annual increases in the CPI are 3.20, 2.60, and 2.00 percent for the low-cost, intermediate, and high-cost assumptions, respectively.[1] These assumptions are unchanged from the 2018 report. For a given rate of growth in average real earnings, a higher price inflation rate results in faster nominal earnings and revenue growth immediately, while the resulting added growth in benefit levels occurs with a delay, causing an overall improvement in the actuarial balance. Similarly, a lower price inflation rate causes an overall decline in the actuarial balance.

The Federal Reserve Board's monetary policy changed in the 1980s toward more vigilance in preventing high inflation. Consistent with the Board's continued emphasis on containing inflation, as indicated by their current target for the Personal Consumption Expenditures (PCE) price index,[2] the Trustees lowered the assumed ultimate annual rate of increase in the CPI for the intermediate assumptions from 4.00 percent for the 1996 report to 2.80 percent for the 2004 through 2013 reports, to 2.70 percent for the 2014 and 2015 reports, and to 2.60 percent for the 2016 through 2019 reports.

For the intermediate assumptions, the annual change in the CPI is 1.83 percent for 2019, 2.63 percent for 2020, and reaches the ultimate growth rate of 2.60 percent for 2021 and later. For the low-cost assumptions,

[1] BLS produces a series called the Consumer Price Index Research Series Using Current Methods (CPI-U-RS) that approximates the measured rate of inflation over the 1978-2018 period had the method currently used been in effect since 1978. BLS does not revise the CPI values published in earlier years, for which different methods were used. These CPI published values are shown in table V.B1. The Trustees use an adjusted CPI series based on the CPI-U-RS when setting the ultimate price inflation assumption because it provides a time series that is consistent with the current method for computing the CPI.

[2] The Trustees' assumed ultimate annual growth rate for the GDP deflator of 2.25 percent is based on an assumed 2.30 percent annual growth rate for the PCE price index. The Trustees' assumption takes into account the Federal Open Market Committee target, as well as the potential for inflationary shocks during the 2028-2093 projection period.

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the annual change in the CPI is 2.40 percent for 2019, increases to 3.23 percent for 2020, and reaches its ultimate annual growth rate of 3.20 percent for 2021 and later. For the high-cost assumptions, the annual rate of change in the CPI is 1.27 percent for 2019, increases to 2.02 percent for 2020, and reaches its ultimate annual change of 2.00 percent for 2021 and later.

The annual increase in the GDP deflator differs from the annual increase in the CPI because the two indices are constructed using different computational methods and coverage. The difference between the rate of change in the CPI and the rate of change in the GDP deflator is called the price differential in this report. For the period including 1969 through 2007, covering the last five complete economic cycles, the average annual price differential was 0.57 percentage point. From 2007 (the end of the last complete economic cycle) to 2018, the average annual price differential is estimated to be 0.14 percentage point.

The assumed ultimate price differentials are 0.25, 0.35, and 0.45 percentage point for the low-cost, intermediate, and high-cost alternatives, respectively. Varying the ultimate projected price differential across alternatives recognizes the historical variation in this measure. Accordingly, the assumed ultimate annual increases in the GDP deflator are 2.95 (3.20 less 0.25), 2.25 (2.60 less 0.35), and 1.55 (2.00 less 0.45) percent for the low-cost, intermediate, and high-cost alternatives, respectively. The ultimate price differentials for the three alternatives are 0.05 percentage point lower than in the 2018 report.

The price differential was 0.21 percentage point in 2017, is estimated to be 0.36 in 2018, and is assumed to be -0.17 for 2019. The negative price differential assumed for 2019 primarily reflects a recent decline in oil prices. Changes in oil prices affect the CPI much more than the GDP deflator because oil represents a much larger share of U.S. consumption than of U.S. production. For 2020 and later, oil prices are assumed to grow at a relatively stable rate. For the intermediate assumptions, the price differential is 0.30 percentage point for 2020 and 0.35 for 2021 and later.

3. Average Earnings Assumptions

The average level of nominal earnings in OASDI covered employment for each year has a direct effect on the size of the taxable payroll and on the future level of average benefits. In addition, under the automatic adjustment provisions in the law, growth in the average wage in the U.S. economy directly affects certain parameters used in the OASDI benefit formulas as well as the contribution and benefit base, the exempt amounts under the

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retirement earnings test, the amount of earnings required for a quarter of coverage, and in certain circumstances, the automatic cost-of-living benefit increases.

Projected growth rates in average covered earnings are derived from projections of the most inclusive measure, average U.S. earnings. Average U.S. earnings is defined as the ratio of the sum of total U.S. wages and net proprietors' income to the sum of total U.S. civilian employment and Armed Forces. The growth rate in average U.S. earnings for any period is equal to the combined growth rates for total U.S. economy productivity, average hours worked, the ratio of earnings to total labor compensation (which includes fringe benefits), the ratio of total labor compensation to GDP, and the GDP deflator.

The average annual change in average hours worked was -0.26 percent over the last five complete economic cycles covering the period from 1969 to 2007. The annual change in average hours worked averaged -0.87, -0.54, -0.10, 0.10, and -0.50 percent over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. From 2007 (the end of the last complete economic cycle) to 2018, the average annual change in average hours worked is estimated to be 0.00 percent.

The assumed ultimate annual rates of change for average hours worked are 0.05, -0.05, and -0.15 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These values are unchanged from the 2018 report.

The average annual change in the ratio of earnings to total labor compensation was -0.20 percent from 1969 to 2007. Most of this decrease was due to the relative increase in the cost of employer-sponsored group health insurance for wage workers. Assuming that the level of total employee compensation is not affected by the amount of employer-sponsored group health insurance, any increase or decrease in the cost of employer-sponsored group health insurance leads to a commensurate decrease or increase in other components of employee compensation, including wages. Projections of future ratios of earnings to total labor compensation follow this principle. The Trustees assume that the total amount of future employer-sponsored group health insurance premiums will increase more slowly than in the past due to provisions of the Affordable Care Act of 2010, as described in the 2010 report. Data from BEA indicate that the other significant component of nonwage employee compensation is employer contributions to retirement plans. This component is assumed to grow faster than employee compensation in the future as life expectancy and potential time in retirement increase.

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The average annual rates of change in the ratio of wages to employee compensation from 2028 to 2093 are about 0.04, -0.06, and -0.16 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These assumed rates are about 0.02 percentage point higher (less negative) than those assumed for the 2018 report. Under the intermediate assumptions, the ratio of wages to employee compensation declines from 0.814 for 2018 to 0.780 for 2093.

Because earnings and compensation are the same for self-employed workers, the ratio of earnings to total labor compensation includes self-employment income both in the numerator and in the denominator. As a result, the rate of decline in the ratio of earnings to total labor compensation (which, under the intermediate assumptions, averages 0.05 percent from 2028 to 2093) is less than the rate of decline in the ratio of wages to employee compensation.

The ratio of total labor compensation (i.e., employee compensation and net proprietors' income) to GDP varies over the economic cycle and with changes in the relative sizes of different sectors of the economy. Over the last five economic cycles from 1969 to 2007, this ratio has averaged 0.627. The ratio declined from 0.649 for 2001 to 0.602 in 2009, increased to 0.612 in 2012, and is 0.611 in 2017. This ratio is assumed to rise as the economy recovers, reaching a level of 0.632 for 2028. For years after 2028, relative sizes of different sectors of the economy are assumed to remain about constant,[1] and therefore the ratio of total labor compensation to GDP remains at about the 2028 level for each set of assumptions. The ultimate level of this ratio is 0.001 higher than in last year's report due to an upward revision of proprietors' income in the NIPA.[2]

The projected average annual growth rate in average nominal U.S. earnings from 2028 to 2093 is about 3.81 percent for the intermediate assumptions. This growth rate reflects the average annual growth rate of approximately -0.05 percent for the ratio of earnings to total labor compensation, and also reflects the assumed ultimate annual growth rates of 1.63 percent for productivity, -0.05 percent for average hours worked, and 2.25 percent for the GDP deflator. Similarly, the projected average annual growth rates in average nominal U.S. earnings are 5.03 percent for the low-cost assumptions and 2.61 percent for the high-cost assumptions.

[1] However, employment in the uniformed military sector has declined in size over the last 40 years, and is assumed to remain at its 2018 level throughout the 75-year projection period.

[2] In July 2018, BEA released a comprehensive revision to NIPA. Under the revision, BEA increased the estimate of the amount of proprietors' income that goes unreported for tax purposes. Thus, the estimated ratio of reported income to GDP is unchanged from last year's report.

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Over long periods, the average annual growth rate in the average wage in OASDI covered employment (henceforth the "average covered wage") is expected to be very close to the average annual growth rate in average U.S. earnings. The projected average annual growth rates in the average covered wage from 2028 to 2093 are 5.04, 3.81, and 2.60 percent for the low-cost, intermediate, and high-cost assumptions, respectively. The estimated annual rate of change in the average covered wage is 2.98 percent for 2018. For the intermediate assumptions, as the economy continues to recover, the annual rate of change in the average covered wage averages 4.23 percent from 2018 to 2028. Thereafter, the average annual rate of change in the average covered wage is 3.81 percent.

4. Assumed Real-Wage Differential

The real increase in the average covered wage has traditionally been expressed in the form of a real-wage differential—the annual percentage change in the average covered wage minus the annual percentage change in the CPI. For the period from 1969 to 2007, covering the last five complete economic cycles, the real-wage differential averaged 0.80 percentage point, the result of averages of 1.02, 0.04, 0.44, 1.47, and 0.83 percentage points over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively.

For the years 2029-93, the projected average annual real-wage differentials for OASDI covered employment are 1.84, 1.21, and 0.60 percentage points for the low-cost, intermediate, and high-cost assumptions, respectively. The rounded average annual real-wage differentials are 0.02, 0.01, and 0.02 percentage point higher than in the 2018 report.

The estimated real-wage differential averaged 0.56 percentage point for 2008 through 2018 (the years since the peak of the last complete economic cycle). The real-wage differential increased from 0.05 percentage point in 2016 to 1.19 percentage points in 2017, an increase that reflects faster growth in GDP and productivity. For the intermediate assumptions, the real-wage differential is projected to rise from 0.40 in 2018 to 2.19 in 2019 before reaching its long-run average of 1.21 percentage points for 2029 through 2093. For the low-cost assumptions, the real-wage differential is 2.96 percentage points for 2019, increases to 3.29 percentage points in 2020, and reaches its long-run average of 1.84 percentage points for 2029 through 2093. For the high-cost assumptions, the real-wage differential is 1.42 percentage points for 2019, drops to -1.02 percentage points in 2020 due to the assumed recession, and rises to 1.59 percentage points in 2022 before gradually declining to its long-run average of 0.60 percentage point for 2029 through 2093.

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Table V.B1.—Principal Economic Assumptions

Calendar year	Annual percentage change[a] in— Productivity (Total U.S. economy)	Earnings as a percent of total labor compensation	Average hours worked	GDP price index	Average annual wage in covered employment	Consumer Price Index	Real-wage differential[b]
Historical data:							
5-year periods:							
1960 to 1965 . . .	3.28	-0.18	0.15	1.36	3.22	1.24	1.98
1965 to 1970 . . .	2.06	-.30	-.68	4.02	5.84	4.23	1.61
1970 to 1975 . . .	2.08	-.49	-.88	6.61	6.58	6.76	-.22
1975 to 1980 . . .	.95	-.33	-.17	7.21	8.89	8.91	-.04
1980 to 1985 . . .	1.74	-.36	.01	5.24	6.52	5.22	1.29
1985 to 1990 . . .	1.34	-.20	-.06	3.14	4.79	3.83	.96
1990 to 1995 . . .	1.31	-.11	.33	2.45	3.54	3.03	.51
1995 to 2000 . . .	2.32	.28	.14	1.67	5.31	2.43	2.88
2000 to 2005 . . .	2.66	-.38	-.79	2.29	2.69	2.49	.20
2005 to 2010 . . .	1.76	-.02	-.47	1.92	2.51	2.30	.22
2010 to 2015 . . .	.49	.15	.37	1.74	2.93	1.61	1.32
Economic cycles:[c]							
1969 to 1973 . . .	2.65	-.34	-.87	5.04	5.93	4.91	1.02
1973 to 1979 . . .	1.07	-.43	-.54	7.54	8.58	8.54	.04
1979 to 1990 . . .	1.41	-.29	-.10	4.61	5.78	5.30	.44
1990 to 2001 . . .	1.85	.05	.10	2.08	4.19	2.73	1.47
2001 to 2007 . . .	2.19	-.18	-.50	2.49	3.45	2.63	.83
2007 to 2018 . . .	1.01	.05	[d]	1.62	2.30	1.74	.56
Single years:							
2008	1.07	-.22	-.75	1.91	2.42	4.09	-1.66
2009	3.12	-.57	-1.86	.78	-1.56	-.67	-.89
2010	2.59	.21	.55	1.17	2.59	2.07	.53
2011	.04	.32	.94	2.08	3.14	3.56	-.41
2012	.48	.47	-.04	1.92	3.36	2.10	1.26
2013	.60	-.33	.24	1.77	1.20	1.37	-.17
2014	.56	.26	.27	1.88	3.57	1.50	2.07
2015	.76	.03	.43	1.03	3.42	-.41	3.83
2016	.25	.10	-.39	1.09	1.03	.98	.05
2017	.86	.10	.11	1.92	3.32	2.13	1.19
2018[e]	.82	.17	.55	2.22	2.98	2.58	.40
Intermediate:							
2019	1.82	.01	-.04	2.00	4.02	1.83	2.19
2020	2.17	-.01	-.35	2.33	4.71	2.63	2.08
2021	1.88	.02	-.21	2.25	4.45	2.60	1.85
2022	1.66	.02	-.08	2.25	4.21	2.60	1.61
2023	1.63	-.06	-.05	2.25	4.09	2.60	1.49
2024	1.63	-.06	-.05	2.25	4.15	2.60	1.55
2025	1.63	-.04	-.05	2.25	4.21	2.60	1.61
2026	1.63	-.04	-.05	2.25	4.25	2.60	1.65
2027	1.63	-.04	-.05	2.25	4.26	2.60	1.66
2028	1.63	-.04	-.05	2.25	4.01	2.60	1.41
2028 to 2093 . . .	1.63	-.05	-.05	2.25	3.81	2.60	1.21

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Table V.B1.—Principal Economic Assumptions (Cont.)

Calendar year	Annual percentage change[a] in— Productivity (Total U.S. economy)	Earnings as a percent of total labor compensation	Average hours worked	GDP price index	Average annual wage in covered employment	Consumer Price Index	Real-wage differential[b]
Low-cost:							
2019	2.45	0.02	0.04	2.43	5.36	2.40	2.96
2020	2.96	[d]	-.25	2.97	6.52	3.23	3.29
2021	2.41	.05	-.11	2.95	5.99	3.20	2.79
2022	1.99	.05	.02	2.95	5.47	3.20	2.27
2023	1.93	-.02	.05	2.95	5.26	3.20	2.06
2024	1.93	[d]	.05	2.95	5.28	3.20	2.08
2025	1.93	.02	.05	2.95	5.35	3.20	2.15
2026	1.93	.03	.05	2.95	5.42	3.20	2.22
2027	1.93	.04	.05	2.95	5.46	3.20	2.26
2028	1.93	.04	.05	2.95	5.25	3.20	2.05
2028 to 2093	1.93	.03	.05	2.95	5.04	3.20	1.84
High-cost:							
2019	1.24	[d]	-.14	1.54	2.69	1.27	1.42
2020	1.17	-.02	-1.04	1.69	1.00	2.02	-1.02
2021	1.85	.01	-.36	1.55	2.79	2.00	.79
2022	1.43	-.02	-.09	1.55	3.59	2.00	1.59
2023	1.41	-.11	-.06	1.55	3.52	2.00	1.52
2024	1.38	-.11	-.05	1.55	3.49	2.00	1.49
2025	1.33	-.11	-.05	1.55	3.38	2.00	1.38
2026	1.32	-.11	-.05	1.55	3.28	2.00	1.28
2027	1.30	-.12	-.05	1.55	3.24	2.00	1.24
2028	1.30	-.13	-.08	1.55	2.90	2.00	.90
2028 to 2093	1.33	-.13	-.15	1.55	2.60	2.00	.60

[a] For rows with a single year listed, the value is the annual percentage change from the prior year. For rows with a range of years listed, the value is the compound average annual percentage change.

[b] For rows with a single year listed, the value is the annual percentage change in the average annual wage in covered employment less the annual percentage change in the Consumer Price Index. For rows with a range of years listed, the value is the average of annual values of the real wage differential, beginning with the year following the first year of the range. Values are rounded after all computations.

[c] Economic cycles are shown from peak to peak, except for the last cycle, which is not yet complete.

[d] Greater than -0.005 and less than 0.005.

[e] Historical data are not available for the full year. Estimated values vary slightly by alternative and are shown for the intermediate assumptions.

5. Labor Force and Unemployment Projections

The model used by the Office of the Chief Actuary projects the civilian labor force by age, sex, marital status, and presence of children. Projections of the labor force participation rates reflect changes in disability prevalence, educational attainment, the average level of Social Security retirement benefits, the state of the economy, and the change in life expectancy. The projections also include a "cohort effect," which reflects an upward trend in female participation rates across cohorts born through 1948.

The annual rate of growth in the size of the labor force decreased from an average of about 2.6 percent during the 1969-73 economic cycle and 2.7 percent during the 1973-79 cycle to 1.7 percent during the 1979-90 cycle,

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1.2 percent during the 1990-2001 cycle, and 1.1 percent during the 2001-07 cycle. Further slowing of labor force growth is expected to follow from a substantial slowing of growth in the working age population in the future—a consequence of the baby-boom generation reaching retirement ages and succeeding lower-birth-rate cohorts reaching working ages. Under the intermediate assumptions, the labor force is projected to increase by an average of 0.8 percent per year from 2018 to 2028 and 0.4 percent per year over the remainder of the 75-year projection period.

Labor force participation rates are projected with a model that uses demographic and economic assumptions specific to each alternative. More optimistic economic assumptions in the low-cost alternative are consistent with higher labor force participation rates, while demographic assumptions in the low-cost alternative (such as slower improvement in longevity) are consistent with lower labor force participation rates. These economic and demographic influences have largely offsetting effects. Therefore, the projected labor force participation rates do not vary substantially across alternatives.

Historically, labor force participation rates reflect trends in demographics and pensions. Between the mid-1960s and the mid-1980s, labor force participation rates at ages 50 and over declined for males but were fairly stable for females. During this period, the baby-boom generation reached working age and more women entered the labor force. This increasing supply of labor allowed employers to offer attractive early retirement options. Between the mid-1980s and the mid-1990s, participation rates at ages 55 and older roughly stabilized for males and increased for females. Since the mid-1990s, however, participation rates for both sexes at ages 50 and over have generally risen.

Many economic and demographic factors, including longevity, health, disability prevalence, the business cycle, incentives for retirement in Social Security and private pensions, education, and marriage patterns, will influence future labor force participation rates. The Office of the Chief Actuary models some of these factors explicitly. To model the effects of other factors related to increases in life expectancy, projected participation rates are adjusted upward for mid-career and older ages to reflect projected increases in life expectancy. For the intermediate projections, this adjustment increases the total labor force by 2.8 percent for 2093.

For men age 16 and over, the projected age-adjusted labor force participation rates[1] for 2093 are 73.3, 73.3, and 73.0 percent for the low-cost, intermedi-

[1] The Office of the Chief Actuary adjusts the labor force participation rates to the 2011 age distribution of the civilian noninstitutional U.S. population.

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ate, and high-cost assumptions, respectively. The low-cost assumptions result in a larger working-age population and a larger labor force when compared to the intermediate assumptions, but a slightly lower labor force participation rate for men. This occurs because the low-cost assumptions include shorter life expectancies and relatively higher numbers of never-married individuals in the population. Shorter life expectancies tend to reduce work at older ages, while labor force participation rates tend to be lower for never-married men and higher for never-married women compared to their married counterparts.[1] For women age 16 and over, the projected age-adjusted labor force participation rates for 2093 are 62.3, 61.7, and 60.8 percent for the low-cost, intermediate, and high-cost assumptions, respectively.

The age-adjusted rates for 2093 are higher under all three alternatives than the age-adjusted rates for 2017 of 70.7 percent for men and 58.5 percent for women (based on actual age-specific rates published by the Bureau of Labor Statistics), primarily due to the Trustees' projected increases in life expectancy.

The total civilian unemployment rates are presented in table V.B2. For years through 2028, the table presents total civilian rates without adjustment for the changing age-sex distribution of the population. For years after 2028, the table presents age-sex-adjusted rates, using the age-sex distribution of the 2011 civilian labor force. Age-sex-adjusted rates allow for more meaningful comparisons across longer time periods.

The total civilian unemployment rate reflects the projected levels of unemployment for various age-sex groups of the population. Each group's unemployment rate is projected in relation to changes in the economic cycle, as measured by the ratio of actual to potential GDP.[2] For each alternative, the total civilian unemployment rate moves toward the ultimate assumed rate as the economy moves toward the long-range sustainable growth path.

The assumed ultimate age-sex-adjusted unemployment rates are 4.5, 5.5, and 6.5 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These values are unchanged from the 2018 report. Improvements in labor market conditions will eventually draw more nonparticipants back into the labor force and unemployment rate will increase from an estimated 3.9 percent for 2018 to the assumed 5.5 percent for 2023 under the

[1] The labor force participation rate under the high-cost assumptions is also lower than under the intermediate assumptions because life expectancy has a non-linear effect on labor force participation rates in the Office of the Chief Actuary's model.

[2] Potential GDP is the level of GDP assuming the economy is operating at the underlying sustainable trend rate of growth.

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intermediate assumptions. Under the low-cost assumptions, the ultimate unemployment rate is reached in 2022.[1] Under the high-cost assumptions, the ultimate unemployment rate is reached in 2025.

6. Gross Domestic Product Projections

The value of real GDP equals the product of three components: (1) average weekly total employment,[2] (2) productivity, and (3) average hours worked per week. Consequently, the growth rate in real GDP is approximately equal to the sum of the growth rates for total employment, productivity, and average hours worked. For the period from 1969 to 2007, which covers the last five complete economic cycles, the average growth rate in real GDP was 3.1 percent. This average growth rate approximately equals the sum of the average growth rates of 1.6 percent for total employment, 1.7 percent for productivity, and -0.3 percent for average hours worked. The real GDP for 2017 was 15.5 percent above the 2007 level. The estimated real GDP growth from 2017 to 2018 is 2.9 percent.

For the intermediate assumptions, the average annual growth in real GDP is 2.3 percent from 2018 to 2028, the approximate sum of component growth rates of 0.6 percent for total employment, 1.7 percent for productivity, and -0.1 percent for average hours worked. The projected average annual growth in real GDP of 2.3 percent for this period is approximately 0.1 percentage point higher than the underlying sustainable trend rate. This growth of 0.1 percentage point above trend reflects a relatively rapid increase in employment and total economy productivity. After 2028, the assumptions do not explicitly reflect economic cycles. The projected annual growth rate in real GDP combines the projected growth rates for total employment, total U.S. economy productivity, and average hours worked. After 2028, the annual growth in real GDP averages 2.0 percent, based on the projected average annual growth rate of 0.4 percent for total employment and the assumed ultimate growth rates of 1.63 percent for productivity and -0.05 percent for average hours worked. The projected growth rate of real GDP is slower than the past average growth rate mainly because the working-age population is expected to grow more slowly than in the past.

For the low-cost assumptions, the annual growth in real GDP averages 3.0 percent over the decade ending in 2028. The relatively fast growth is due mostly to high assumed rates of growth for employment and worker produc-

[1] The assumed ultimate unemployment rate is an age-sex-adjusted rate.

[2] Total employment is the sum of the U.S. Armed Forces and total civilian employment, which depends on the total civilian labor force and unemployment rate.

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tivity. For the high-cost assumptions, the annual growth in real GDP averages 1.5 percent for the decade ending in 2028.

7. Interest Rates

Table V.B2 presents average annual nominal and real interest rates for newly issued trust fund securities. The nominal rate is the average of the nominal interest rates for special U.S. Government obligations issuable to the trust funds in each of the 12 months of the year. Interest for these securities is generally compounded semiannually. The real interest rate is defined as the annual yield rate for investments in these securities divided by the annual rate of growth in the CPI for the first year after issuance. The real rate shown for each year reflects the actual realized (historical) or expected (future) real yield on securities issuable in the prior year.

To develop a reasonable range of assumed ultimate future real interest rates for the three alternatives, the Office of the Chief Actuary examined historical experience for the last five complete economic cycles. For the period from 1969 to 2007, the real interest rate averaged 2.9 percent per year. The real interest rates averaged 1.6, -1.0, 5.1, 4.1, and 2.0 percent per year over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. The assumed ultimate real interest rates are 3.0 percent, 2.5 percent, and 2.0 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These rates are 0.2 percentage point lower than in the 2018 report.

The actual average annual nominal interest rate was approximately 2.3 percent for 2017, which means that securities newly issued in 2017 would yield 2.3 percent if held one year. Estimated average prices rose from 2017 to 2018 by approximately 2.6 percent. The annual real interest rate for 2018 is -0.2 percent, the approximate difference between the nominal interest rate and the rate of price increase. For the 10-year short-range projection period, projected nominal interest rates depend on changes in the economic cycle and in the CPI. When combined with the ultimate CPI assumptions of 3.2, 2.6, and 2.0 percent, the assumed ultimate real interest rates produce ultimate nominal interest rates of 6.2 percent for the low-cost assumptions, 5.1 percent for the intermediate assumptions, and 4.0 percent for the high-cost assumptions. These nominal rates for newly issued trust fund securities reach their ultimate levels by 2028, the end of the short-range period.

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Table V.B2.—Additional Economic Factors

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in— Labor force[c]	Total employment[d]	Real GDP[e]	Average annual interest rate Nominal[f]	Real[g]
Historical data:						
5-year periods:						
1960 to 1965	5.5	1.3	1.6	5.1	4.0	2.5
1965 to 1970	3.9	2.2	2.1	3.5	5.9	1.0
1970 to 1975	6.1	2.5	1.5	2.7	6.7	[h]
1975 to 1980	6.8	2.7	2.9	3.7	8.5	-.9
1980 to 1985	8.3	1.5	1.5	3.3	12.1	6.9
1985 to 1990	5.9	1.7	2.0	3.3	8.5	5.1
1990 to 1995	6.6	1.0	.9	2.6	7.0	4.3
1995 to 2000	4.6	1.5	1.8	4.3	6.2	3.9
2000 to 2005	5.4	.9	.7	2.6	4.6	2.4
2005 to 2010	6.8	.6	-.4	.9	3.8	1.8
2010 to 2015	7.2	.4	1.3	2.2	2.0	.5
Economic cycles:[i]						
1969 to 1973	5.3	2.6	1.8	3.6	6.5	1.6
1973 to 1979	6.8	2.7	2.4	3.0	7.7	-1.0
1979 to 1990	7.1	1.7	1.7	3.0	10.3	5.1
1990 to 2001	5.5	1.2	1.2	3.2	6.5	4.1
2001 to 2007	5.3	1.1	1.1	2.8	4.5	2.0
2007 to 2018	6.7	.5	.6	1.6	2.4	.8
Single years:						
2008	5.8	.8	-.4	-.1	3.6	.6
2009	9.3	-.1	-3.7	-2.5	2.9	4.4
2010	9.6	-.2	-.6	2.6	2.8	.9
2011	8.9	-.2	.6	1.6	2.4	-.7
2012	8.1	.9	1.8	2.2	1.5	.3
2013	7.4	.3	1.0	1.8	1.9	.1
2014	6.2	.3	1.6	2.5	2.3	.4
2015	5.3	.8	1.7	2.9	2.0	2.7
2016	4.9	1.3	1.7	1.6	1.8	1.0
2017	4.4	.7	1.2	2.2	2.3	-.3
2018[j]	3.9	1.1	1.5	2.9	2.9	-.2

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Table V.B2.—Additional Economic Factors (Cont.)

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in—			Average annual interest rate	
		Labor force[c]	Total employment[d]	Real GDP[e]	Nominal[f]	Real[g]
Intermediate:						
2019	4.1	1.1	1.0	2.8	3.3	1.0
2020	4.5	1.0	.6	2.4	3.5	.7
2021	4.9	1.0	.6	2.3	3.7	.9
2022	5.3	1.0	.6	2.2	4.0	1.1
2023	5.5	.9	.7	2.2	4.3	1.4
2024	5.5	.7	.7	2.3	4.6	1.7
2025	5.5	.6	.6	2.2	4.8	2.0
2026	5.5	.5	.5	2.1	4.9	2.2
2027	5.5	.5	.5	2.1	5.0	2.3
2028	5.5	.5	.5	2.1	5.1	2.4
2030	5.5	.4	.4	2.0	5.1	2.5
2035	5.5	.4	.4	2.0	5.1	2.5
2040	5.5	.4	.4	2.0	5.1	2.5
2045	5.5	.5	.5	2.1	5.1	2.5
2050	5.5	.5	.5	2.1	5.1	2.5
2055	5.5	.5	.5	2.1	5.1	2.5
2060	5.5	.4	.4	2.0	5.1	2.5
2065	5.5	.4	.4	2.0	5.1	2.5
2070	5.5	.4	.4	2.0	5.1	2.5
2075	5.5	.5	.5	2.0	5.1	2.5
2080	5.5	.5	.5	2.1	5.1	2.5
2085	5.5	.5	.5	2.1	5.1	2.5
2090	5.5	.4	.4	2.0	5.1	2.5
2095	5.5	.4	.4	2.0	5.1	2.5
Low-cost:						
2019	3.8	1.2	1.3	3.8	4.2	.5
2020	4.0	1.2	1.0	3.7	4.6	.9
2021	4.2	1.3	1.0	3.4	4.8	1.4
2022	4.5	1.1	.8	2.9	5.1	1.6
2023	4.5	1.0	.9	2.9	5.4	1.9
2024	4.5	.9	.9	2.9	5.6	2.2
2025	4.6	.9	.9	2.9	5.9	2.4
2026	4.6	.7	.7	2.7	6.0	2.7
2027	4.6	.6	.6	2.6	6.1	2.8
2028	4.5	.6	.6	2.6	6.2	2.9
2030	4.5	.5	.5	2.5	6.2	3.0
2035	4.5	.5	.5	2.5	6.2	3.0
2040	4.5	.6	.6	2.6	6.2	3.0
2045	4.5	.8	.7	2.7	6.2	3.0
2050	4.5	.8	.8	2.8	6.2	3.0
2055	4.5	.7	.7	2.7	6.2	3.0
2060	4.5	.6	.7	2.6	6.2	3.0
2065	4.5	.6	.6	2.6	6.2	3.0
2070	4.5	.7	.7	2.7	6.2	3.0
2075	4.5	.8	.8	2.8	6.2	3.0
2080	4.5	.8	.8	2.8	6.2	3.0
2085	4.5	.8	.8	2.8	6.2	3.0
2090	4.5	.7	.7	2.7	6.2	3.0
2095	4.5	.7	.7	2.7	6.2	3.0

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Table V.B2.—Additional Economic Factors (Cont.)

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in— Labor force[c]	Total employment[d]	Real GDP[e]	Average annual interest rate Nominal[f]	Real[g]
High-cost:						
2019	4.3	1.0	0.6	1.7	2.3	1.6
2020	6.1	1.6	-.4	-.3	1.4	.3
2021	7.2	.5	-.6	.9	2.4	-.6
2022	7.0	.3	.5	1.8	3.2	.4
2023	6.8	.3	.5	1.8	3.5	1.2
2024	6.6	.3	.5	1.8	3.7	1.5
2025	6.5	.5	.6	1.9	3.9	1.7
2026	6.5	.7	.6	1.9	4.0	1.9
2027	6.5	.6	.6	1.8	4.0	2.0
2028	6.5	.5	.5	1.7	4.0	2.0
2030	6.5	.3	.3	1.5	4.0	2.0
2035	6.5	.3	.3	1.5	4.0	2.0
2040	6.5	.3	.3	1.5	4.0	2.0
2045	6.5	.3	.2	1.4	4.0	2.0
2050	6.5	.3	.3	1.4	4.0	2.0
2055	6.5	.2	.2	1.4	4.0	2.0
2060	6.5	.1	.1	1.3	4.0	2.0
2065	6.5	.1	.1	1.3	4.0	2.0
2070	6.5	.1	.1	1.3	4.0	2.0
2075	6.5	.1	.1	1.3	4.0	2.0
2080	6.5	.1	.1	1.3	4.0	2.0
2085	6.5	.1	.1	1.3	4.0	2.0
2090	6.5	.1	.1	1.3	4.0	2.0
2095	6.5	.1	.1	1.3	4.0	2.0

[a] The Office of the Chief Actuary adjusts the civilian unemployment rates for 2029 and later to the age-sex distribution of the civilian labor force in 2011. For years through 2028, the values are the total rates without adjustment for the changing age-sex distribution.

[b] For rows with a single year listed, the value is the annual percentage change from the prior year. For rows with a range of years listed, the value is the compounded average annual percentage change.

[c] The U.S. civilian labor force.

[d] Total U.S. military and civilian employment.

[e] The value of the total output of goods and services in 2012 dollars.

[f] The average of the nominal interest rates, compounded semiannually, for special public-debt obligations issuable to the trust funds in each of the 12 months of the year.

[g] The realized or expected annual real yield for each year on securities issuable in the prior year.

[h] Greater than -0.05 and less than 0.05 percent.

[i] Economic cycles are shown from peak to peak, except for the last cycle, which is not yet complete.

[j] Historical data are not available for the full year. Estimated values vary slightly by alternative and are shown for the intermediate assumptions.

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C. PROGRAM-SPECIFIC ASSUMPTIONS AND METHODS

The Office of the Chief Actuary at the Social Security Administration uses a set of models to project future income and cost under the OASDI program. These models rely not only on the demographic and economic assumptions described in the previous sections, but also on a number of program-specific assumptions and methods. Values of many program parameters change from year to year as prescribed by formulas set out in the Social Security Act. These program parameters affect the level of payroll taxes collected and the level of benefits paid. The office uses more complex models to project the numbers of future workers covered under OASDI and the levels of their covered earnings, as well as the numbers of future beneficiaries and the expected levels of their benefits. The following subsections provide descriptions of these program-specific assumptions and methods.

1. Automatically Adjusted Program Parameters

The Social Security Act requires that certain parameters affecting the determination of OASDI benefits and taxes be adjusted annually to reflect changes in particular economic measures. Formulas prescribed in the law, applied to reported statistics, change these program parameters annually. The law bases these automatic adjustments on measured changes in the national average wage index (AWI) and the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI).[1] This section shows values for program parameters adjusted using these indices from the time that these adjustments became effective through 2028. Projected values for future years depend on the economic assumptions described in the preceding section of this report.

Tables V.C1 and V.C2 present the historical and projected values of the CPI-based benefit increases, the AWI series, and the values of many of the wage-indexed program parameters. Each table shows projections under the three alternative sets of assumptions. Table V.C1 includes:

- *The annual cost-of-living benefit increase percentages.* The automatic cost-of-living adjustment provisions in the Social Security Act specify increases in OASDI benefits based on increases in the CPI. Volatility in oil prices has resulted in substantial volatility in recent cost-of-living adjustments. A large cost-of-living adjustment for December 2008 was followed by no cost-of-living adjustments for December 2009 and December 2010. More recent volatility in oil prices again affected the

[1] The *Federal Register* publishes details of these indexation procedures annually. Also see www.ssa.gov/OACT/COLA/.

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CPI, resulting in no cost-of-living adjustment for December 2015. Cost-of-living adjustments resumed in December 2016. All three sets of assumptions include annual cost-of-living adjustments for all future years.

- *The annual levels of and percentage increases in the AWI.* Under section 215(b)(3) of the Social Security Act, Social Security benefit computations index taxable earnings (for most workers first becoming eligible for benefits in 1979 or later) using the AWI for each year after 1950. This procedure converts a worker's past earnings to approximately average-wage-indexed equivalent values near the time of his or her benefit eligibility. Other program parameters presented in this section that are subject to the automatic-adjustment provisions also rely on the AWI.
- *The wage-indexed contribution and benefit base.* For any year, the contribution and benefit base is the maximum amount of earnings subject to the OASDI payroll tax and creditable toward benefit computation. The Social Security Act defers any increase in the contribution and benefit base if there is no cost-of-living adjustment effective for December of the preceding year. There was no increase in the contribution and benefit base for 2010, 2011, or 2016 because there was no cost-of-living adjustment for the immediate prior December in each case. Under all three sets of assumptions, the contribution and benefit base is projected to increase for all future years.
- *The wage-indexed retirement earnings test exempt amounts.* The exempt amounts are the annual amount of earnings below which beneficiaries do not have benefits withheld. A lower exempt amount applies for years prior to the year of attaining normal retirement age. A higher exempt amount applies beginning with the year in which a beneficiary attains normal retirement age. Starting in 2000, the retirement earnings test no longer applies beginning with the month of attaining normal retirement age. The Social Security Act defers any increase in these exempt amounts if there is no cost-of-living adjustment effective for December of the preceding year. There was no increase in these exempt amounts for 2010, 2011, or 2016 because there was no cost-of-living adjustment for the immediate prior December. Under all three sets of assumptions, the exempt amounts increase for all future years.

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Table V.C1.—Cost-of-Living Benefit Increases, Average Wage Index, Contribution and Benefit Bases, and Retirement Earnings Test Exempt Amounts, 1975-2028

Calendar year	Cost-of-living benefit increase[a] (percent)	Average wage index (AWI)[b] Amount	Average wage index (AWI)[b] Increase (percent)	Contribution and benefit base[c]	Retirement earnings test exempt amount Under NRA[d]	Retirement earnings test exempt amount At NRA[e]
Historical data:						
1975	8.0	$8,630.92	7.5	$14,100	$2,520	$2,520
1976	6.4	9,226.48	6.9	15,300	2,760	2,760
1977	5.9	9,779.44	6.0	16,500	3,000	3,000
1978	6.5	10,556.03	7.9	17,700	3,240	4,000
1979	9.9	11,479.46	8.7	22,900	3,480	4,500
1980	14.3	12,513.46	9.0	25,900	3,720	5,000
1981	11.2	13,773.10	10.1	29,700	4,080	5,500
1982	7.4	14,531.34	5.5	32,400	4,440	6,000
1983	3.5	15,239.24	4.9	35,700	4,920	6,600
1984	3.5	16,135.07	5.9	37,800	5,160	6,960
1985	3.1	16,822.51	4.3	39,600	5,400	7,320
1986	1.3	17,321.82	3.0	42,000	5,760	7,800
1987	4.2	18,426.51	6.4	43,800	6,000	8,160
1988	4.0	19,334.04	4.9	45,000	6,120	8,400
1989	4.7	20,099.55	4.0	48,000	6,480	8,880
1990	5.4	21,027.98	4.6	51,300	6,840	9,360
1991	3.7	21,811.60	3.7	53,400	7,080	9,720
1992	3.0	22,935.42	5.2	55,500	7,440	10,200
1993	2.6	23,132.67	.9	57,600	7,680	10,560
1994	2.8	23,753.53	2.7	60,600	8,040	11,160
1995	2.6	24,705.66	4.0	61,200	8,160	11,280
1996	2.9	25,913.90	4.9	62,700	8,280	12,500
1997	2.1	27,426.00	5.8	65,400	8,640	13,500
1998	1.3	28,861.44	5.2	68,400	9,120	14,500
1999	[f]2.5	30,469.84	5.6	72,600	9,600	15,500
2000	3.5	32,154.82	5.5	76,200	10,080	17,000
2001	2.6	32,921.92	2.4	80,400	10,680	25,000
2002	1.4	33,252.09	1.0	84,900	11,280	30,000
2003	2.1	34,064.95	2.4	87,000	11,520	30,720
2004	2.7	35,648.55	4.6	87,900	11,640	31,080
2005	4.1	36,952.94	3.7	90,000	12,000	31,800
2006	3.3	38,651.41	4.6	94,200	12,480	33,240
2007	2.3	40,405.48	4.5	97,500	12,960	34,440
2008	5.8	41,334.97	2.3	102,000	13,560	36,120
2009	.0	40,711.61	-1.5	106,800	14,160	37,680
2010	.0	41,673.83	2.4	106,800	14,160	37,680
2011	3.6	42,979.61	3.1	106,800	14,160	37,680
2012	1.7	44,321.67	3.1	110,100	14,640	38,880
2013	1.5	44,888.16	1.3	113,700	15,120	40,080
2014	1.7	46,481.52	3.5	117,000	15,480	41,400
2015	.0	48,098.63	3.5	118,500	15,720	41,880
2016	.3	48,642.15	1.1	118,500	15,720	41,880
2017	2.0	50,321.89	3.5	127,200	16,920	44,880
Intermediate:						
2018	[g]2.8	51,794.15	2.9	[g]128,400	[g]17,040	[g]45,360
2019	1.8	53,863.71	4.0	[g]132,900	[g]17,640	[g]46,920
2020	2.7	56,396.34	4.7	136,800	18,120	48,360
2021	2.6	58,914.00	4.5	142,200	18,840	50,280
2022	2.6	61,399.77	4.2	149,100	19,800	52,560
2023	2.6	63,918.72	4.1	155,700	20,640	54,960
2024	2.6	66,573.32	4.2	162,300	21,480	57,240
2025	2.6	69,374.02	4.2	168,900	22,440	59,640
2026	2.6	72,318.20	4.2	175,800	23,280	62,160
2027	2.6	75,397.14	4.3	183,300	24,360	64,680
2028	2.6	78,425.26	4.0	191,100	25,320	67,440

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Table V.C1.—Cost-of-Living Benefit Increases, Average Wage Index, Contribution and Benefit Bases, and Retirement Earnings Test Exempt Amounts, 1975-2028 (Cont.)

Calendar year	Cost-of-living benefit increase[a] (percent)	Average wage index (AWI)[b] Amount	Average wage index (AWI)[b] Increase (percent)	Contribution and benefit base[c]	Retirement earnings test exempt amount Under NRA[d]	Retirement earnings test exempt amount At NRA[e]
Low-cost:						
2018	[g]2.8	$51,842.68	3.0	[g]$128,400	[g]$17,040	[g]$45,360
2019	2.6	54,589.52	5.3	[g]132,900	[g]17,640	[g]46,920
2020	3.2	58,130.23	6.5	137,100	18,120	48,360
2021	3.2	61,621.98	6.0	144,300	19,080	50,880
2022	3.2	65,003.71	5.5	153,600	20,400	54,240
2023	3.2	68,429.04	5.3	162,900	21,600	57,480
2024	3.2	72,040.30	5.3	171,900	22,800	60,600
2025	3.2	75,890.46	5.3	180,900	24,000	63,840
2026	3.2	79,999.01	5.4	190,200	25,200	67,200
2027	3.2	84,362.57	5.5	200,400	26,640	70,800
2028	3.2	88,796.52	5.3	211,500	28,080	74,640
High-cost:						
2018	[g]2.8	51,774.91	2.9	[g]128,400	[g]17,040	[g]45,360
2019	1.2	53,181.27	2.7	[g]132,900	[g]17,640	[g]46,920
2020	2.1	53,756.15	1.1	136,800	18,120	48,360
2021	2.0	55,258.23	2.8	140,400	18,600	49,560
2022	2.0	57,220.89	3.6	141,900	18,840	50,160
2023	2.0	59,231.07	3.5	146,100	19,320	51,600
2024	2.0	61,293.18	3.5	151,200	20,040	53,400
2025	2.0	63,356.81	3.4	156,600	20,760	55,320
2026	2.0	65,432.29	3.3	162,000	21,480	57,240
2027	2.0	67,555.34	3.2	167,400	22,200	59,160
2028	2.0	69,521.87	2.9	172,800	22,920	61,080

[a] Effective with benefits payable for June in each year 1975-82, and for December in each year after 1982.
[b] See table VI.G6 for projected dollar amounts of the AWI for years beyond the last year of this table.
[c] Public Law 95-216 specified amounts for 1978-81. Public Law 101-239 changed the indexing procedure and caused slightly higher bases after 1989.
[d] Normal retirement age. See table V.C3 for specific values.
[e] In 1955-82, the retirement earnings test did not apply at ages 72 and over. In 1983-99, the test did not apply at ages 70 and over. Beginning in 2000, the test does not apply beginning with the month of normal retirement age attainment. In the year of normal retirement age attainment, the higher exempt amount applies to earnings prior to the month of normal retirement age attainment. Public Law 95-216 specified amounts for 1978-82. Public Law 104-121 specified amounts for 1996-2002.
[f] Originally determined as 2.4 percent. Pursuant to Public Law 106-554, effectively 2.5 percent.
[g] Actual amount, as determined under automatic-adjustment provisions.

Table V.C2 shows values for other wage-indexed parameters. The table provides historical values from 1978, when indexing of the amount of earnings required for a quarter of coverage first began, through 2019, and also shows projected values through 2028. These other wage-indexed program parameters are:

- *The bend points in the formula for computing the primary insurance amount (PIA) for workers who reach age 62, become disabled, or die in a given year.* As figure V.C1 illustrates, these two bend points define three ranges in a worker's average indexed monthly earnings (AIME). The formula for the worker's PIA multiplies a 90, 32, or 15 percent fac-

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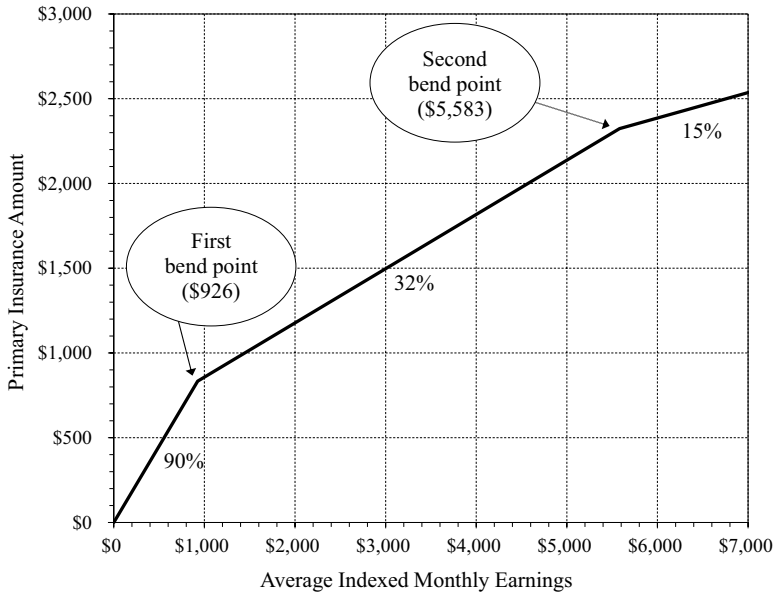
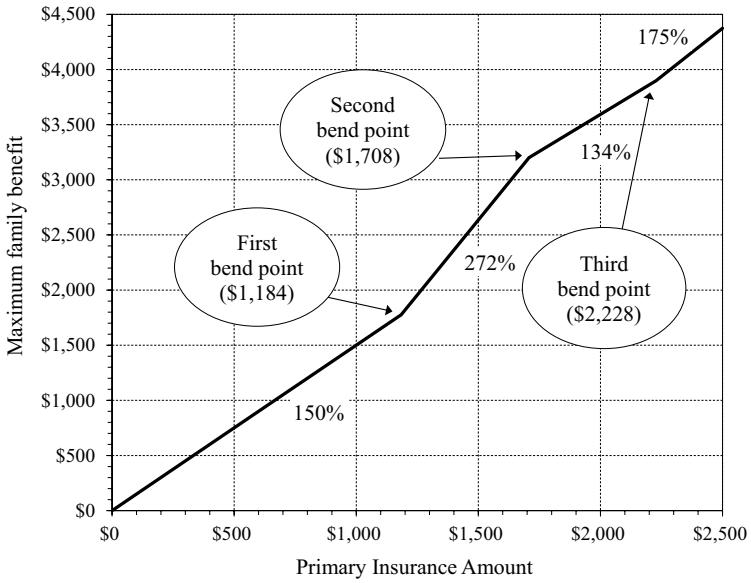
tor by the portion of the worker's AIME that falls within the three respective ranges, and then adds the resulting products together.

Figure V.C1.—Primary-Insurance-Amount Formula for Those Newly Eligible in 2019



- *The bend points in the formula for computing the maximum total amount of monthly benefits payable based on the earnings record of a retired or deceased worker (maximum family benefit).* As figure V.C2 illustrates, these three bend points define four ranges in a worker's PIA. The formula for the maximum family benefit multiplies a 150, 272, 134, or 175 percent factor by the portion of the worker's PIA that falls within the four respective ranges, and then adds the resulting products together.

Figure V.C2.—OASI Maximum-Family-Benefit Formula for Those Newly Eligible in 2019



- *The amount of earnings required in a year to earn a quarter of coverage (QC).* The number and timing of QCs earned determines an individual's insured status—the basic requirement for benefit eligibility under OASDI.
- *The old-law contribution and benefit base—the contribution and benefit base that would have been in effect without enactment of the 1977 amendments.* This old-law base is used in determining special-minimum benefits for certain workers who have many years of low earnings in covered employment. Since 1986, the calculation of OASDI benefits for certain workers who are eligible to receive pensions based on non-covered employment uses the old-law base. In addition, the Railroad Retirement program and the Employee Retirement Income Security Act of 1974 use the old-law base for certain purposes.

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Table V.C2.—Values for Selected Wage-Indexed Program Parameters, Calendar Years 1978-2028

Calendar year	AIME bend points in PIA formula[a] First	AIME bend points in PIA formula[a] Second	PIA bend points in OASI maximum-family-benefit formula[b] First	PIA bend points in OASI maximum-family-benefit formula[b] Second	PIA bend points in OASI maximum-family-benefit formula[b] Third	Earnings required for a quarter of coverage	Old-law contribution and benefit base[c]
Historical data:							
1978	[d]	[d]	[d]	[d]	[d]	[e] $250	[e] $17,700
1979	[e] $180	[e] $1,085	[e] $230	[e] $332	[e] $433	260	18,900
1980	194	1,171	248	358	467	290	20,400
1981	211	1,274	270	390	508	310	22,200
1982	230	1,388	294	425	554	340	24,300
1983	254	1,528	324	468	610	370	26,700
1984	267	1,612	342	493	643	390	28,200
1985	280	1,691	358	517	675	410	29,700
1986	297	1,790	379	548	714	440	31,500
1987	310	1,866	396	571	745	460	32,700
1988	319	1,922	407	588	767	470	33,600
1989	339	2,044	433	626	816	500	35,700
1990	356	2,145	455	656	856	520	38,100
1991	370	2,230	473	682	890	540	39,600
1992	387	2,333	495	714	931	570	41,400
1993	401	2,420	513	740	966	590	42,900
1994	422	2,545	539	779	1,016	620	45,000
1995	426	2,567	544	785	1,024	630	45,300
1996	437	2,635	559	806	1,052	640	46,500
1997	455	2,741	581	839	1,094	670	48,600
1998	477	2,875	609	880	1,147	700	50,700
1999	505	3,043	645	931	1,214	740	53,700
2000	531	3,202	679	980	1,278	780	56,700
2001	561	3,381	717	1,034	1,349	830	59,700
2002	592	3,567	756	1,092	1,424	870	63,000
2003	606	3,653	774	1,118	1,458	890	64,500
2004	612	3,689	782	1,129	1,472	900	65,100
2005	627	3,779	801	1,156	1,508	920	66,900
2006	656	3,955	838	1,210	1,578	970	69,900
2007	680	4,100	869	1,255	1,636	1,000	72,600
2008	711	4,288	909	1,312	1,711	1,050	75,900
2009	744	4,483	950	1,372	1,789	1,090	79,200
2010	761	4,586	972	1,403	1,830	1,120	79,200
2011	749	4,517	957	1,382	1,803	1,120	79,200
2012	767	4,624	980	1,415	1,845	1,130	81,900
2013	791	4,768	1,011	1,459	1,903	1,160	84,300
2014	816	4,917	1,042	1,505	1,962	1,200	87,000
2015	826	4,980	1,056	1,524	1,987	1,220	88,200
2016	856	5,157	1,093	1,578	2,058	1,260	88,200
2017	885	5,336	1,131	1,633	2,130	1,300	94,500
2018	895	5,397	1,144	1,651	2,154	1,320	95,400
2019	926	5,583	1,184	1,708	2,228	1,360	98,700
Intermediate:							
2020	953	5,746	1,218	1,758	2,293	1,400	101,700
2021	991	5,976	1,267	1,829	2,385	1,460	105,600
2022	1,038	6,257	1,326	1,915	2,497	1,530	110,700
2023	1,084	6,536	1,386	2,000	2,609	1,600	115,500
2024	1,130	6,812	1,444	2,084	2,719	1,660	120,600
2025	1,176	7,092	1,503	2,170	2,830	1,730	125,400
2026	1,225	7,386	1,566	2,260	2,948	1,800	130,500
2027	1,277	7,697	1,632	2,355	3,072	1,880	136,200
2028	1,331	8,023	1,701	2,455	3,202	1,960	141,900

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Table V.C2.—Values for Selected Wage-Indexed Program Parameters, Calendar Years 1978-2028 (Cont.)

Calendar year	AIME bend points in PIA formula[a] First	AIME bend points in PIA formula[a] Second	PIA bend points in OASI maximum-family-benefit formula[b] First	PIA bend points in OASI maximum-family-benefit formula[b] Second	PIA bend points in OASI maximum-family-benefit formula[b] Third	Earnings required for a quarter of coverage	Old-law contribution and benefit base[c]
Low-cost:							
2020	$954	$5,752	$1,219	$1,760	$2,295	$1,400	$101,700
2021	1,005	6,057	1,284	1,853	2,417	1,480	107,100
2022	1,070	6,449	1,367	1,973	2,574	1,580	114,000
2023	1,134	6,837	1,449	2,092	2,728	1,670	120,900
2024	1,196	7,212	1,529	2,207	2,878	1,760	127,500
2025	1,260	7,592	1,609	2,323	3,030	1,850	134,400
2026	1,326	7,993	1,694	2,446	3,190	1,950	141,300
2027	1,397	8,420	1,785	2,576	3,360	2,060	148,800
2028	1,472	8,876	1,881	2,716	3,542	2,170	156,900
High-cost:							
2020	953	5,744	1,218	1,758	2,292	1,400	101,700
2021	979	5,900	1,251	1,805	2,355	1,440	104,400
2022	989	5,964	1,264	1,825	2,380	1,460	105,600
2023	1,017	6,131	1,300	1,876	2,447	1,500	108,300
2024	1,053	6,348	1,346	1,943	2,534	1,550	112,200
2025	1,090	6,572	1,393	2,011	2,623	1,600	116,100
2026	1,128	6,800	1,442	2,081	2,714	1,660	120,300
2027	1,166	7,029	1,490	2,151	2,805	1,720	124,200
2028	1,204	7,260	1,539	2,221	2,897	1,770	128,400

[a] The formula to compute a PIA is: (1) 90% of AIME below the first bend point, plus (2) 32% of AIME in excess of the first bend point but not in excess of the second, plus (3) 15% of AIME in excess of the second bend point. The bend points are determined based on the first year a beneficiary becomes eligible for benefits.

[b] The formula to compute an OASI family maximum is: (1) 150% of PIA below the first bend point, plus (2) 272% of PIA in excess of the first bend point but not in excess of the second, plus (3) 134% of PIA in excess of the second bend point but not in excess of the third, plus (4) 175% of PIA in excess of the third bend point. This formula also determines family maximums for disabled workers first eligible after 1978 and entitled before July 1980.

[c] Contribution and benefit base that would have been in effect without enactment of the Social Security Amendments of 1977. Public Law 101-239 changed the indexing procedure and caused slightly higher bases after 1989.

[d] No provision in law for this amount in this year.

[e] Amount specified by Social Security Amendments of 1977.

In addition to the economic factors that affect the determination of OASDI benefits, there are certain legislated changes that affect current and future benefit amounts. Two such changes are the scheduled increases in the normal retirement age and in the delayed retirement credits. Table V.C3 shows the scheduled changes in these parameters and the resulting effects on benefit levels expressed as a percentage of PIA.

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Table V.C3.—Legislated Changes in Normal Retirement Age and Delayed Retirement Credits for Persons Attaining Age 62 in Each Year 1986 and Later

Year of birth	Year of attainment of age 62	Normal retirement age (NRA)	Credit for each year of delayed retirement after NRA (percent)	Benefit, as a percentage of PIA, beginning at age —				
				62	65	66	67	70
1924	1986	65	3	80	100	103	106	115
1925	1987	65	3 1/2	80	100	103 1/2	107	117 1/2
1926	1988	65	3 1/2	80	100	103 1/2	107	117 1/2
1927	1989	65	4	80	100	104	108	120
1928	1990	65	4	80	100	104	108	120
1929	1991	65	4 1/2	80	100	104 1/2	109	122 1/2
1930	1992	65	4 1/2	80	100	104 1/2	109	122 1/2
1931	1993	65	5	80	100	105	110	125
1932	1994	65	5	80	100	105	110	125
1933	1995	65	5 1/2	80	100	105 1/2	111	127 1/2
1934	1996	65	5 1/2	80	100	105 1/2	111	127 1/2
1935	1997	65	6	80	100	106	112	130
1936	1998	65	6	80	100	106	112	130
1937	1999	65	6 1/2	80	100	106 1/2	113	132 1/2
1938	2000	65, 2 mo	6 1/2	79 1/6	98 8/9	105 5/12	111 11/12	131 5/12
1939	2001	65, 4 mo	7	78 1/3	97 7/9	104 2/3	111 2/3	132 2/3
1940	2002	65, 6 mo	7	77 1/2	96 2/3	103 1/2	110 1/2	131 1/2
1941	2003	65, 8 mo	7 1/2	76 2/3	95 5/9	102 1/2	110	132 1/2
1942	2004	65, 10 mo	7 1/2	75 5/6	94 4/9	101 1/4	108 3/4	131 1/4
1943-54	2005-16	66	8	75	93 1/3	100	108	132
1955	2017	66, 2 mo	8	74 1/6	92 2/9	98 8/9	106 2/3	130 2/3
1956	2018	66, 4 mo	8	73 1/3	91 1/9	97 7/9	105 1/3	129 1/3
1957	2019	66, 6 mo	8	72 1/2	90	96 2/3	104	128
1958	2020	66, 8 mo	8	71 2/3	88 8/9	95 5/9	102 2/3	126 2/3
1959	2021	66, 10 mo	8	70 5/6	87 7/9	94 4/9	101 1/3	125 1/3
1960 & later	2022 & later	67	8	70	86 2/3	93 1/3	100	124

2. Covered Employment

Projections of the total U.S. civilian labor force and unemployment rate (see table V.B2) are based on Bureau of Labor Statistics definitions from the Current Population Survey (CPS). These projections represent the average weekly number of employed and unemployed persons, age 16 and over, in the U.S. in a calendar year. Covered employment for a calendar year is defined as the total number of persons who have any OASDI covered earnings (that is, earnings subject to the OASDI payroll tax) at any time during that year. For those age 16 and over, projected covered employment is the sum of age-sex groups, each reflecting the growth projected for the group's total U.S employment and average weeks worked per year.[1] For the short-range period, the age-sex-adjusted average weeks worked declines slightly as the age-sex-adjusted unemployment rate rises to its ultimate assumed value of 5.5 percent. After 2028, the average weeks worked for each age-sex group

[1] For those under age 16, projected covered employment is the sum of age-sex components, each of which is projected as a ratio to the Social Security area population.

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is assumed to remain constant. The projection method also accounts for changes in non-OASDI-covered employment and the increase in coverage of Federal civilian employment as a result of the 1983 Social Security Amendments. It also reflects changes in the number and employment status of other-than-LPR immigrants residing within the Social Security coverage area, such as undocumented immigrants and foreign workers and students with temporary visas.

The covered-worker rate is the ratio of OASDI covered workers to the Social Security area population. For men age 16 and over, the projected age-adjusted covered-worker rates[1] for 2093 are 69.7, 69.3, and 68.6 percent for the low-cost, intermediate, and high-cost assumptions, respectively. For women age 16 and over, the projected age-adjusted covered-worker rates for 2093 are 67.0, 65.8, and 64.3 percent for the low-cost, intermediate, and high-cost assumptions, respectively. For men, the intermediate projected rate for 2093 is slightly lower than the 2017 age-adjusted rate of 69.6 percent primarily due to the projected increase in the portion of the Social Security area population that consists of other-than-LPR immigrants. For women, the intermediate projected rate for 2093 is higher than the 2017 age-adjusted rate of 64.2 percent because the projected increase in the age-adjusted labor force participation rate more than offsets the projected increase in the portion of the population that will be other-than-LPR immigrants.

3. Insured Population

Eligibility for worker benefits under the OASDI program requires some threshold level of work in covered employment. A worker satisfies this requirement by his or her accumulation of quarters of coverage (QCs). Prior to 1978, a worker earned one QC for each calendar quarter in which he or she earned at least $50. In 1978, when annual earnings reporting replaced quarterly reporting, the amount required to earn a QC (up to a maximum of four per year) was set at $250. As specified in the law, the Social Security Administration has adjusted this amount each year since then according to changes in the AWI. Its value in 2019 is $1,360.

There are three types of insured status that a worker can earn under the OASDI program. The number and recency of QCs earned determine each status. A worker is fully insured when his or her total number of QCs is greater than or equal to the number of years elapsed after the year of attainment of age 21 (but not less than six). After a worker has accumulated

[1] Age-adjusted covered-worker rates are adjusted to the 2011 age distribution of the Social Security area population.

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40 QCs, he or she remains permanently fully insured. A worker is disability insured if he or she is: (1) a fully insured worker who has accumulated 20 QCs during the 40-quarter period ending with the current quarter, (2) a fully insured worker aged 24-30 who has accumulated QCs during one-half of the quarters elapsed after the quarter of attainment of age 21 and up to and including the current quarter, or (3) a fully insured worker under age 24 who has accumulated six QCs during the 12-quarter period ending with the current quarter. A worker is currently insured when he or she has accumulated six QCs during the 13-quarter period ending with the current quarter. Periods of disability reduce the number of quarters required for insured status, but not below the minimum of six QCs.

There are many types of benefits payable to workers and their family members under the OASDI program. A worker must be fully insured to be eligible for a primary retirement benefit and for his or her spouse or children to be eligible for auxiliary retirement benefits. A deceased worker must have been either currently insured or fully insured at the time of death for his or her children (and their mother or father) to be eligible for benefits. If there are no eligible surviving children, the deceased worker must have been fully insured at the time of death for his or her surviving spouse to be eligible. A worker must be disability insured to be eligible for a primary disability benefit and for his or her spouse or children to be eligible for auxiliary disability benefits.

The Office of the Chief Actuary estimates the fully insured population, as a percentage of the Social Security area population, by single year of age and sex starting in 1969. The short-range model extrapolates the historical trend in these rates from data in the Continuous Work History Sample (CWHS). The model uses information on quarters of coverage earned due to employment covered by Social Security derived from tabulations of the CWHS. The model also uses historical administrative data on beneficiaries in force and estimated historical mortality rates. The model combines this information to estimate the proportion of individuals who were alive and fully insured as of the end of each historical year. Using projected mortality rates and covered workers, the model extrapolates these rates into the future and applies them to the historical and projected population to arrive at the fully insured population by age and sex through the end of the short-range period.

The long-range fully insured model uses 30,000 simulated work histories for each sex and birth cohort, representing everyone except the other-than-LPR immigrant population. For the other-than-LPR immigrant population, the model generates substantially lower percentages attaining fully insured status. The model constructs simulated work histories using past coverage rates,

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earnings distributions, and amounts required for crediting QCs, and develops them in a manner that replicates historical individual variations in work patterns. The probability of covered employment in any year is assumed to be higher for those who have worked more consistently in the recent past. Model parameters are selected so that simulated fully insured percentages are consistent with the fully insured percentages estimated by the short-range model for the recent historical period.

The Office of the Chief Actuary estimates the disability insured population, as a percentage of the fully insured population, by age and sex starting in 1969. The office bases historical values on a tabulation of the disability insured population from the CWHS and estimates of the fully insured population. The short-range model projects these percentages by using the relationship between the historical percentages and covered-worker rates. The long-range model projects these percentages by using the same simulated work histories used to project the fully insured percentages. The long-range model makes additional adjustments to the model simulations in order to bring the disability insured percentages in the historical and short-range periods into close agreement with those estimated from the CWHS and the short-range model.

The office does not project the currently insured population because the number of beneficiaries who are entitled to benefits based solely on currently insured status has been very small recently and is likely to remain small in the future.

Using these insured models, the percentage of the Social Security area population aged 62 and over that is fully insured is projected to increase from its estimated level of 87.0 for December 31, 2016, to 87.1, 87.8, and 88.7 for December 31, 2095, under the low-cost, intermediate, and high-cost alternatives, respectively. Over the projection period, the percentages for both males and females change significantly. The percentage for males declines, reflecting, in part, increases in the percent of the population that is classified as other-than-LPR immigrants and is thus less likely to have earnings reported and credited to them. The percentage for females increases, reflecting the past substantial growth in the employment of younger cohorts of women. Under the intermediate assumptions, for example, the percentage for males decreases from 93.7 to 87.3, and the percentage for females increases from 81.5 to 88.4.

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4. Old-Age and Survivors Insurance Beneficiaries

The Office of the Chief Actuary projects the number of OASI beneficiaries for each type of benefit separately by the sex of the worker on whose earnings the benefits are based and by the age of the beneficiary. For the long-range period, the office also projects the number of beneficiaries by marital status for several types of benefits. The office uses two separate models in making these projections. The short-range model makes projections during the first 10 years of the projection period and the long-range model makes projections thereafter.

The short-range model develops the number of retired-worker beneficiaries by applying award rates to the aged fully insured population, excluding those already receiving retired-worker, disabled-worker, aged-widow(er), or aged-spouse benefits, and by applying termination rates to the number of retired-worker beneficiaries.

The long-range model projects the number of retired-worker beneficiaries who were not previously converted from disabled-worker beneficiary status as a percentage of the exposed population.[1] For age 62, the model projects this percentage by using a linear regression based on the historical relationship between this percentage, the labor force participation rate at age 62, and the number of months from age 62 to normal retirement age. The percentage for ages 70 and over is nearly 100 because delayed retirement credits cannot be earned after age 70. The long-range model projects the percentage for each age 63 through 69 based on historical experience with an adjustment for changes in the portion of the primary insurance amount that is payable at each age of entitlement. The model adjusts these percentages for ages 62 through 69 to reflect changes in the normal retirement age.

The long-range model calculates the number of retired-worker beneficiaries previously converted from disabled-worker beneficiary status using an extension of disabled-worker death rates by age, sex, and duration.

The Office of the Chief Actuary estimates the number of aged-spouse beneficiaries, excluding those who are also receiving a retired-worker benefit, from the population projected by age and sex. Benefits of aged-spouse beneficiaries depend on the earnings records of their husbands or wives, who are referred to as "earners." The short-range model projects insured aged-spouse beneficiaries in conjunction with the retired-worker beneficiaries. This model projects uninsured aged-spouse beneficiaries by applying award rates

[1] The exposed population is the fully insured population age 62 and over, excluding persons entitled to or converted from disabled-worker benefits and fully insured persons entitled only to widow(er) benefits.

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to the aged uninsured male or female population and by applying termination rates to the population already receiving such benefits.

The long-range model estimates aged-spouse beneficiaries separately for those married and divorced. The model projects the number of married aged-spouse beneficiaries, by age and sex, by applying a series of factors to the number of spouses, aged 62 and over, in the population. These factors are the probabilities that the spouse and the earner meet all of the conditions of eligibility—that is, the probabilities that: (1) the earner is 62 or over, (2) the earner is insured, (3) the earner is either receiving benefits or has suspended benefits, (4) the spouse is not receiving a benefit for the care of an entitled child, (5) the spouse is either not insured or is insured but not receiving benefits, and (6) the spouse is not eligible to receive a significant government pension based on earnings from noncovered employment. To calculate the estimated number of aged-spouse beneficiaries, the model applies a projected prevalence rate to the resulting number of spouses. Due to the Bipartisan Budget Act of 2015, aged spouses are no longer eligible to receive an aged-spouse benefit if the earner suspends their benefit after April 29, 2016. Additionally, for those turning age 62 in 2016 and later, deemed filing now applies to all retired workers and spouses even after initial entitlement, regardless of age. Thus, spouses who are insured are no longer eligible to delay their retired-worker benefit while receiving an aged-spouse benefit.

The long-range model estimates the number of divorced aged-spouse beneficiaries, by age and sex, by applying the same factors to the number of divorced persons aged 62 and over in the population, with three differences. First, the model applies a factor to reflect the probability that the earner (former spouse) is still alive. If the former spouse is not alive, the person may be entitled to a divorced widow(er) benefit. Second, the model applies a factor to reflect the probability that the marriage to the former spouse lasted at least 10 years. Third, the model does not apply factor (3) in the previous paragraph because, effective January 1985, a divorced person is generally no longer required to wait for the former spouse to receive benefits.

The Office of the Chief Actuary bases the projected numbers of children under age 18, and students aged 18 and 19, who are eligible for benefits as children of retired-worker beneficiaries, on the projected number of children in the population. The short-range model develops the number of entitled children by applying award rates to the number of children in the population who have two living parents and by applying termination rates to the number of children already receiving benefits.

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The long-range model projects separately the number of entitled children by sex of the earner parent. For each age under 18, the model multiplies the projected number of children with a parent aged 62 and over by the ratio of the number of retired workers aged 62 to 71 to the number of members of the population aged 62 to 71. For student beneficiaries, the model multiplies the number of children aged 18 and 19 in the population by the probabilities that: (1) the parent is alive, aged 62 or over, insured, and receiving a retired-worker benefit; and (2) the child is attending high school.

The Office of the Chief Actuary projects the number of disabled children, aged 18 and over, of retired-worker beneficiaries from the adult population. The short-range model applies award rates to the population and applies termination rates to the number of disabled children already receiving benefits. The long-range model projects the number of disabled children in a manner similar to that used for student children except for a factor that reflects the probability of being disabled before age 22.

The short-range model develops the number of spouses of retired workers, who are entitled to spouse benefits because they are caring for a child who is under age 16 or disabled, by applying award rates to the number of awards to children of retired workers and by applying termination rates to the number of young spouses with a child in their care who are already receiving benefits. The long-range model projects the number of young-spouse beneficiaries with a child in their care as a proportion of the number of child beneficiaries of retired workers, including projected changes in average family size.

The Office of the Chief Actuary projects the number of aged-widow(er) beneficiaries, excluding those who are also receiving a retired-worker benefit, from the population by age and sex. The short-range model projects fully insured aged-widow(er) beneficiaries in conjunction with the retired-worker beneficiaries. The model projects the number of uninsured aged-widow(er) beneficiaries by applying award rates to the aged uninsured male or female population and by applying termination rates to the population already receiving such benefits. The long-range model projects uninsured aged-widow(er) beneficiaries by marital status. The model multiplies the number of widow(er)s in the population aged 60 and over by the probabilities that: (1) the deceased earner is fully insured at death, (2) the widow(er) is not receiving a benefit for the care of an entitled child, (3) the widow(er) is not fully insured, and (4) the widow(er) benefits are not withheld because of receipt of a significant government pension based on earnings in noncovered employment. In addition, the model applies the same factors to the number of divorced persons aged 60 and over in the population and includes addi-

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tional factors representing the probability that the person's former earner spouse has died and that the marriage lasted at least 10 years. The model projects the number of insured aged-widow(er) beneficiaries who are ages 60 through 70 in a manner similar to that for uninsured aged-widow(er) beneficiaries. In addition, the model assumes that some insured widow(er)s who had not applied for their retired-worker benefits will receive widow(er) benefits. The model projects insured aged-widow(er) beneficiaries over age 70 by applying termination rates to the population that started receiving such benefits prior to age 70.

The short-range model develops the number of disabled-widow(er) beneficiaries by applying award rates to the uninsured male or female population and by applying termination rates to the population already receiving a disabled-widow(er) benefit. The long-range model projects the number for each cohort by age from 50 to normal retirement age as percentages of the widowed and divorced populations, adjusted for the insured status of the deceased spouse, the prevalence of disability, and the probability that the disabled spouse is not receiving another type of benefit.

The Office of the Chief Actuary bases the projected number of children under age 18, and students aged 18 and 19, who are entitled to benefits as survivors of deceased workers, on the number of children in the population whose mothers or fathers are deceased. The short-range model develops the number of entitled children by applying award rates to the number of orphaned children and by applying termination rates to the number of children already receiving benefits.

The long-range model projects the number of surviving-child beneficiaries in a manner similar to that for student beneficiaries of retired workers, except that the model replaces the probability that the parent is aged 62 or over with the probability that the parent is deceased.

The Office of the Chief Actuary projects the number of surviving-disabled-child beneficiaries, aged 18 and over, from the adult population. The short-range model applies award rates to the population and applies termination rates to the number of surviving-disabled-child beneficiaries already receiving benefits. The long-range model projects the number of surviving-disabled-child beneficiaries in a manner similar to that for surviving-student-child beneficiaries, except for including an additional factor to reflect the probability of being disabled before age 22.

The short-range model develops the numbers of entitled surviving-mother and surviving-father beneficiaries by applying award rates to the number of awards to surviving-child beneficiaries, in cases where the children are either

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under age 16 or disabled, and by applying termination rates to the number of surviving-mother and surviving-father beneficiaries already receiving benefits. The long-range model estimates the numbers of surviving-mother and surviving-father beneficiaries, assuming they are not remarried, from the number of surviving-child beneficiaries.

The Office of the Chief Actuary projects the number of surviving-parent beneficiaries based on the historical pattern of the number of such beneficiaries.

Table V.C4 shows the projected number of beneficiaries under the OASI program by type of benefit. The retired-worker beneficiary counts include those persons who receive a residual auxiliary benefit in addition to their retired-worker benefit. The office makes estimates of the number and amount of residual payments separately for spouses and widow(er)s.

Table V.C4.—OASI Beneficiaries With Benefits in Current-Payment Status at the End of Calendar Years 1945-2095
[In thousands]

	Retired workers and auxiliaries			Survivors				
Calendar year	Worker[a]	Spouse	Child	Widow-widower	Mother-father	Child	Parent	Total
Historical data:								
1945	518	159	13	94	121	377	6	1,288
1950	1,771	508	46	314	169	653	15	3,477
1955	4,474	1,192	122	701	292	1,154	25	7,961
1960	8,061	2,269	268	1,544	401	1,577	36	14,157
1965	11,101	2,614	461	2,371	472	2,074	35	19,128
1970	13,349	2,668	546	3,227	523	2,688	29	23,030
1975	16,589	2,867	643	3,888	582	2,919	21	27,509
1980	19,564	3,018	639	4,415	563	2,610	15	30,823
1985	22,435	3,069	456	4,862	372	1,918	10	33,122
1990	24,841	3,104	421	5,098	304	1,777	6	35,551
1995	26,679	3,027	441	5,213	275	1,884	4	37,522
2000	28,505	2,798	459	4,901	203	1,878	3	38,747
2005	30,461	2,524	488	4,569	178	1,903	2	40,126
2010	34,593	2,316	580	4,285	159	1,913	2	43,847
2011	35,600	2,291	594	4,239	158	1,907	2	44,791
2012	36,720	2,280	612	4,193	154	1,907	1	45,868
2013	37,893	2,285	625	4,139	150	1,899	1	46,992
2014	39,009	2,303	635	4,092	143	1,892	1	48,075
2015	40,089	2,335	648	4,050	140	1,893	1	49,155
2016	41,233	2,370	661	4,004	133	1,893	1	50,296
2017	42,447	2,375	675	3,961	128	1,904	1	51,491
2018	43,721	2,391	690	3,908	121	1,911	1	52,743
Intermediate:								
2019	45,120	2,395	710	3,877	117	1,926	1	54,146
2020	46,637	2,297	728	3,853	114	1,941	1	55,571
2025	53,990	1,868	808	3,753	107	1,998	1	62,525
2030	60,589	1,852	928	3,576	111	2,056	1	69,112
2035	64,924	1,837	1,037	3,361	125	2,081	1	73,366
2040	67,204	1,741	1,112	3,161	132	2,131	1	75,482

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Table V.C4.—OASI Beneficiaries With Benefits in Current-Payment Status at the End of Calendar Years 1945-2095 (Cont.)
[In thousands]

	Retired workers and auxiliaries			Survivors				
Calendar year	Worker[a]	Spouse	Child	Widow-widower	Mother-father	Child	Parent	Total
Intermediate (Cont.):								
2045	68,246	1,680	1,109	3,015	129	2,110	1	76,288
2050	69,838	1,662	1,132	2,894	124	2,058	1	77,709
2055	72,179	1,664	1,162	2,802	119	1,997	1	79,924
2060	75,346	1,670	1,193	2,724	115	1,940	1	82,989
2065	78,439	1,685	1,203	2,679	114	1,908	1	86,029
2070	81,781	1,722	1,235	2,660	113	1,904	1	89,416
2075	85,073	1,751	1,277	2,637	111	1,902	1	92,754
2080	87,183	1,766	1,293	2,593	108	1,888	1	94,833
2085	88,496	1,792	1,298	2,557	105	1,862	1	96,111
2090	90,512	1,863	1,325	2,556	103	1,838	1	98,199
2095	93,982	1,929	1,377	2,557	101	1,824	1	101,771
Low-cost:								
2019	45,107	2,395	710	3,876	117	1,927	1	54,133
2020	46,606	2,297	729	3,850	115	1,944	1	55,541
2025	53,788	1,871	814	3,743	109	2,026	1	62,352
2030	59,932	1,840	950	3,606	108	2,170	1	68,607
2035	63,664	1,834	1,080	3,423	122	2,289	1	72,413
2040	65,291	1,726	1,179	3,248	130	2,438	1	74,013
2045	65,768	1,645	1,191	3,117	128	2,483	1	74,334
2050	66,886	1,605	1,233	3,003	126	2,474	1	75,328
2055	68,897	1,573	1,286	2,909	125	2,457	1	77,248
2060	71,766	1,548	1,346	2,820	125	2,454	1	80,060
2065	74,578	1,527	1,380	2,759	128	2,495	1	82,870
2070	77,593	1,518	1,440	2,723	133	2,576	1	85,984
2075	80,469	1,495	1,514	2,683	136	2,654	1	88,953
2080	82,166	1,466	1,548	2,630	138	2,704	1	90,652
2085	83,314	1,465	1,568	2,608	138	2,732	1	91,827
2090	85,981	1,521	1,632	2,643	140	2,767	1	94,687
2095	90,842	1,589	1,737	2,694	142	2,821	1	99,827
High-cost:								
2019	45,134	2,395	709	3,879	117	1,924	1	54,160
2020	46,671	2,297	727	3,855	114	1,938	1	55,603
2025	54,224	1,865	803	3,765	105	1,970	1	62,732
2030	61,495	1,882	911	3,524	113	1,934	1	69,859
2035	66,486	1,879	1,000	3,269	124	1,864	1	74,622
2040	69,483	1,805	1,046	3,043	127	1,821	1	77,326
2045	71,178	1,771	1,025	2,883	120	1,747	1	78,725
2050	73,356	1,784	1,028	2,760	112	1,667	1	80,708
2055	76,122	1,817	1,031	2,671	104	1,581	1	83,328
2060	79,603	1,860	1,031	2,599	96	1,495	1	86,685
2065	82,944	1,924	1,018	2,562	90	1,425	1	89,964
2070	86,579	2,013	1,024	2,546	85	1,377	1	93,625
2075	90,239	2,092	1,039	2,532	80	1,337	1	97,320
2080	92,712	2,150	1,039	2,490	75	1,298	1	99,764
2085	94,145	2,202	1,031	2,438	70	1,253	1	101,140
2090	95,376	2,275	1,031	2,401	65	1,211	1	102,361
2095	97,152	2,340	1,043	2,367	62	1,174	1	104,139

[a] Retired-worker beneficiaries include persons who also receive a residual benefit consisting of the excess of an auxiliary benefit over their retired-worker benefit.

Notes:
1. The number of beneficiaries does not include uninsured individuals who receive benefits under section 228 of the Social Security Act. Transfers from the General Fund of the Treasury reimburse the OASI Trust Fund for the cost of most of these individuals.
2. Totals do not necessarily equal the sums of rounded components.

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5. Disability Insurance Beneficiaries

The DI Trust Fund pays for benefits to disabled workers who: (1) satisfy the disability insured requirements, (2) are unable to engage in any substantial gainful activity due to a medically determinable physical or mental impairment severe enough to satisfy the requirements of the program, and (3) have not yet attained normal retirement age. Spouses and children of such disabled workers may also receive DI benefits provided they satisfy certain criteria, primarily age and earnings requirements.

The Office of the Chief Actuary projects the number of disabled-worker beneficiaries in current-payment status (disability prevalence) for each future year. The projections start with the number in current-payment status as of December 2018. Projections of the number of new beneficiaries awarded benefits each year (disability incidence) and the number of beneficiaries leaving the disability rolls each year then determine the number in current-payment status in later years. Beneficiaries leave the rolls due to death and recovery (disability terminations) and due to conversion from disabled-worker to retired-worker beneficiary status at normal retirement age, after which the OASI Trust Fund pays for benefits. The remainder of this section describes the concepts of disability incidence, termination, and prevalence.

a. Disability Incidence

The disability incidence rate is the ratio of the number of new beneficiaries awarded benefits each year to the number of individuals who meet insured requirements but are not yet receiving benefits (the disability-exposed population[1]). The Office of the Chief Actuary projects the number of newly awarded beneficiaries for each future year by multiplying assumed age-sex-specific disability incidence rates and the projected disability-exposed population by age and sex.

Figure V.C3 illustrates the historical and estimated incidence rates under the three alternatives. Incidence rates have varied substantially during the historical period since 1970 due to a variety of demographic and economic factors, along with changes in legislation and program administration. The solid lines in figure V.C3 show the incidence rate adjusted to the age-sex distribution of the disability-exposed population for 2000. This adjustment allows a comparison of incidence rates over time by focusing on the likelihood of becom-

[1] The disability-exposed population excludes those receiving benefits, while the disability insured population includes them. Section V.C.3 of this report describes the projection of the disability insured population.

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ing disabled, and by excluding the effects of a changing distribution of the population toward ages where disability is more or less likely.

The dashed lines in figure V.C3 represent the gross (unadjusted) incidence rates. The changing age-sex distribution of the exposed population over time influences these unadjusted rates. The gross incidence rate fell below the age-sex-adjusted rate between 1975 and 2000 as the baby-boom generation increased the size of the younger working-age population, where disability incidence is lower than in older populations. After 1995, the gross rate generally increased relative to the age-sex-adjusted rate as the baby-boom generation moved into an age range where disability incidence peaks. The projected gross incidence rate generally declines relative to the age-sex-adjusted rate as the baby-boom generation moves above the normal retirement age and the lower-birth-rate cohorts of the 1970s enter prime disability ages (50 to normal retirement age). As these smaller cohorts age beyond normal retirement age, by about 2050, the gross incidence rate returns to a higher relative level under the intermediate assumptions. Thereafter, the gross rate remains higher than the age-sex-adjusted rate, and reflects the persistently higher average age of the working-age population, which is largely due to lower birth rates since 1965, and to the increase in the normal retirement age.

For the first 10 years of the projection period (through 2028), incidence rates reflect several factors including: (1) aspects of program administration, such as efforts to reduce the disability determination backlogs and recent changes in procedures for adjudicating claims; (2) assumed future unemployment rates; and (3) recent trends in incidence. At the beginning of the recent period of high unemployment, disability incidence rates were well above the general trend level, with rates reaching a peak in 2010. Over the last few years, incidence rates have subsided as the economy has recovered, and have persisted at levels well below those expected over the long-term. Some of the elevation of disability incidence rates experienced during the recession and the lowering of incidence rates experienced during the recovery are likely due to many individuals applying for disability benefits earlier than they would have otherwise. For 2018, the actual incidence rate (4.1 per thousand) was below the level projected in last year's report (4.6 per thousand). In this year's report, incidence rates are assumed to rise more gradually early in the short-range period than in last year's report, and are lower later in the period. Incidence rates are assumed to be somewhat elevated during the period 2019 through 2022, when the Social Security Administration is expected to eliminate a backlog of individuals who have appealed for a hearing on a prior disability claim denial. In 2028, at the end of the short-range period, age-sex-specific incidence rates reach the ultimate rates assumed for the long-range

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projections. These ultimate age-sex-specific disability incidence rates were selected based on careful analysis of historical levels and patterns and expected future conditions, including the impact of scheduled increases in the normal retirement age.[1] The ultimate incidence rates represent the expected average rates of incidence for the future.

For the intermediate alternative, the Trustees assume that the ultimate age-sex-adjusted incidence rate (adjusted to the disability-exposed population for the year 2000) will be 5.2 awards per thousand exposed, which is lower than in last year's report by 0.2 awards per thousand exposed. See page 37 for more information. Figure V.C3 illustrates that the assumed ultimate age-sex-adjusted incidence rate of 5.2 is slightly higher than the average rate for the historical period 1970 through 2018 (5.1 per thousand). However, a similar comparison using gross incidence rates gives a very different result. The estimated ultimate gross incidence rate is substantially greater than the average gross rate over the historical period due to the large changes in the age-sex distribution of the disability-exposed population between 1970 and 2010.

The Trustees assume that the ultimate age-sex-adjusted incidence rates for the low-cost and high-cost alternatives will be 4.2 and 6.2 awards per thousand exposed, or about 1.0 awards per thousand lower and 1.0 awards per thousand higher, respectively, than the ultimate incidence rate for the intermediate alternative. The low-cost and high-cost ultimate age-sex-adjusted incidence rates are lower than those in last year's report by 0.1 and 0.2 awards per thousand exposed, respectively.

[1] Projected incidence rates are adjusted upward to account for additional workers who are expected to file for disability benefits (rather than retirement benefits) in response to reductions in retirement benefits as the normal retirement age rises.

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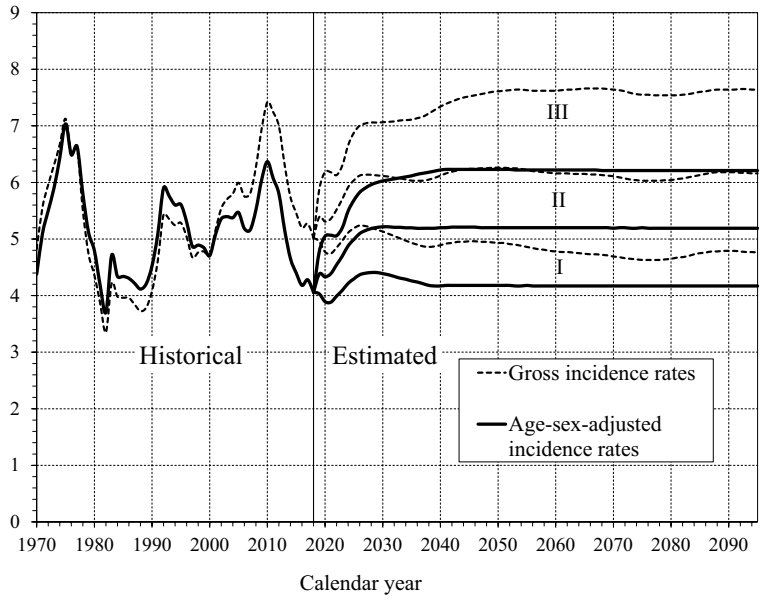
Figure V.C3.—DI Disability Incidence Rates, 1970-2095
[Awards per thousand disability-exposed]



b. Disability Termination

Beneficiaries stop receiving disability benefits when they die, recover from their medically-determinable disabling condition, or return to substantial work. Disabled-worker beneficiaries who return to substantial work for an extended period are deemed to have recovered, and their benefits are then terminated. The termination rate is the ratio of the number of terminations for these reasons to the average number of disabled-worker beneficiaries during the year.

The Office of the Chief Actuary projects termination rates by age, sex, and reason for termination. In addition, the office projects termination rates by duration of entitlement to disabled-worker benefits in the long-range period (post-2028).

In the short-range period (through 2028), the projected age-sex-adjusted death rate (adjusted to the 2000 disabled-worker population) under the intermediate assumptions gradually declines from 25.2 deaths per thousand beneficiaries for 2018 to about 24.3 per thousand for 2028. The projected age-sex-adjusted recovery rate (medical improvement and return to work) under the intermediate assumptions decreases from the relatively high level of

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20.2 per thousand beneficiaries for 2018 to 11.4 per thousand beneficiaries for 2028. The recovery rate has been high in recent years due to an ongoing administrative effort to work down a backlog of continuing disability reviews. The rate is expected to decrease as the backlog is reduced. Under the low-cost and high-cost assumptions, total age-sex-adjusted termination rates due to death and recovery are roughly 10-15 percent higher or lower, respectively, than under the intermediate assumptions.

For the long-range period (post-2028), the Office of the Chief Actuary projects death and recovery rates by age, sex, and duration of entitlement relative to the average level of rates experienced over the base period 2006 through 2010. The assumed ultimate age-sex-adjusted recovery rate for disabled workers is about 10.3 per thousand beneficiaries. The assumed ultimate age-sex-adjusted recovery rates for the low-cost and high-cost alternatives are about 12.5 and 8.2 recoveries per thousand beneficiaries, respectively. Recovery rates by age, sex, and duration of entitlement reach ultimate levels in the twentieth year of the projection period (2038) for all three sets of assumptions. In contrast, death rates by age and sex change throughout the long-range period at the same rate as death rates in the general population. From the age-sex-adjusted death rate of 25.2 per thousand beneficiaries in 2018, this rate decreases to 18.7, 11.8, and 6.9 per thousand disabled-worker beneficiaries for 2095 under the low-cost, intermediate, and high-cost assumptions, respectively.

Figure V.C4 illustrates gross and age-sex-adjusted total termination rates (including both recoveries and deaths) for disabled-worker beneficiaries for the historical period since 1970, and for the projection period through 2095. As with incidence rates, the age-sex-adjusted termination rate illustrates the real change in the tendency to terminate benefits. Changes in the age-sex distribution of the beneficiary population influence the gross termination rate. A shift in the disabled-worker beneficiary population to older ages, as occurred over the past 20 years when the baby-boom generation moved into pre-retirement ages, increases gross death termination rates relative to the age-sex-adjusted rates.

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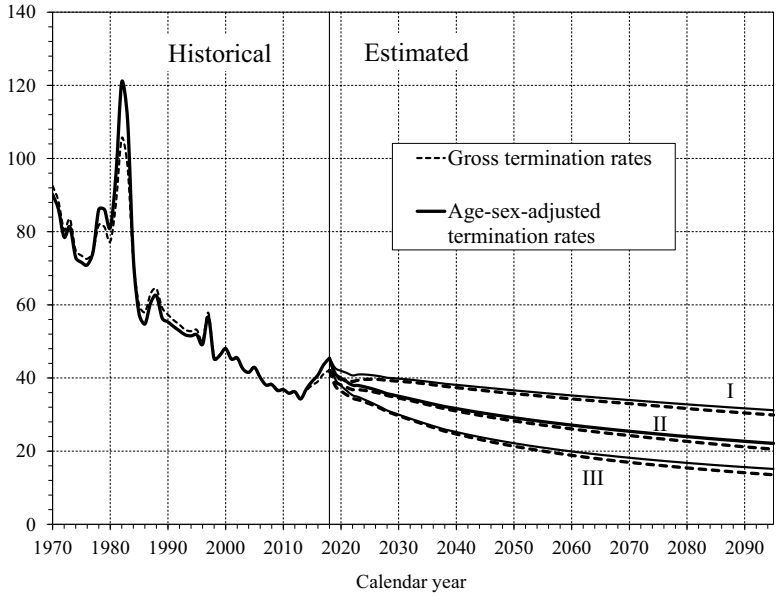
Figure V.C4.—DI Disability Termination Rates, 1970-2095
[Terminations per thousand disabled-worker beneficiaries]



c. Comparison of Incidence, Termination, and Conversion

Incidence and termination rates are the foundation for projecting the number of disabled-worker beneficiaries in current-payment status. At normal retirement age, all disabled-worker beneficiaries convert to retired-worker status and leave the DI rolls.

Figure V.C5 compares the historical and projected (intermediate) levels of incidence, termination, and conversion on both a gross basis and an age-sex-adjusted basis. Incidence rates have varied widely, and the Trustees expect the age-sex adjusted rates under the intermediate assumptions to remain near the middle of the high and low extremes experienced since 1970. Termination rates have declined and the Trustees expect them to continue to decline, largely because of declining death rates.

Conversions are a transfer of beneficiaries at normal retirement age from the DI program to the OASI program. Therefore, the disability "conversion" rate is 100 percent for disabled-worker beneficiaries reaching normal retirement age in a given year and zero at all other ages. After conversion, recovery from the disabling condition is no longer relevant for benefit eligibility. The conversion ratio is the number of conversions in a given year (that is, benefi-

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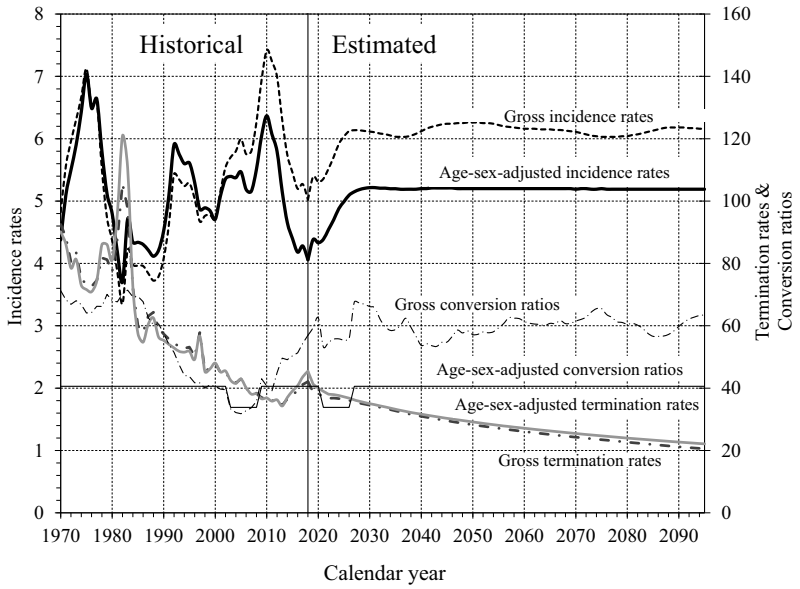
ciaries who reach normal retirement age) divided by the average number of disabled-worker beneficiaries at all ages in that year. The ratio is constant on an age-sex-adjusted basis, except for the two periods during which normal retirement age increases under current law. On a gross basis, however, the conversion ratio rises and falls with the changing proportion of all disabled-worker beneficiaries who attain normal retirement age in a given year. The gross conversion ratio generally increases from 2005 to 2030 due to aging of the beneficiary population.

Figure V.C5.—Comparison of DI Disability Incidence Rates, Termination Rates and Conversion Ratios Under Intermediate Assumptions, 1970-2095
[Awards per thousand disability-exposed;
terminations and conversions per thousand disabled-worker beneficiaries]



d. DI Beneficiaries and Disability Prevalence Rates

The Office of the Chief Actuary makes detailed projections of disabled-worker awards, terminations, and conversions and combines these to project the number of disabled workers receiving benefits over the next 75 years. Table V.C5 presents the projected numbers of disabled workers in current-payment status. The number of disabled workers in current-payment status grows from 8.5 million at the end of 2018, to 12.0 million, 13.8 million, and 14.8 million at the end of 2095, under the low-cost, intermediate, and high-cost assumptions, respectively. Of course, much of this growth results from

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the growth and aging of the population described earlier in this chapter. Table V.C5 also presents projected numbers of auxiliary beneficiaries and disability prevalence rates on both a gross basis and an age-sex-adjusted basis.

Table V.C5.—DI Beneficiaries With Benefits in Current-Payment Status at the End of Calendar Years 1960-2095

[Beneficiaries in thousands; prevalence rates per thousand persons insured for disability benefits]

Calendar year	Disabled-worker beneficiaries	Auxiliary beneficiaries		Total beneficiaries	Disability prevalence rates	
		Spouse	Child		Gross	Age-sex-adjusted[a]
Historical data:						
1960	455	77	155	687		
1965	988	193	558	1,739		
1970	1,493	283	889	2,665	20	18
1975	2,488	453	1,411	4,351	29	28
1980	2,856	462	1,359	4,677	28	31
1985	2,653	306	945	3,904	24	26
1990	3,007	266	989	4,261	25	28
1995	4,179	264	1,409	5,852	33	35
2000	5,036	165	1,466	6,667	36	36
2005	6,519	157	1,633	8,309	45	40
2010	8,204	161	1,820	10,185	55	44
2011	8,576	164	1,874	10,614	58	45
2012	8,827	163	1,900	10,890	59	46
2013	8,941	157	1,889	10,987	60	46
2014	8,955	150	1,828	10,932	59	46
2015	8,909	143	1,756	10,808	59	45
2016	8,809	136	1,667	10,612	58	44
2017	8,695	127	1,590	10,412	56	42
2018	8,537	119	1,507	10,164	55	41
Intermediate:						
2019	8,465	115	1,474	10,054	54	40
2020	8,370	115	1,447	9,932	54	40
2025	8,597	134	1,437	10,167	54	39
2030	8,734	135	1,563	10,433	54	41
2035	9,078	137	1,774	10,989	55	42
2040	9,557	139	2,011	11,708	56	43
2045	10,246	155	2,135	12,536	59	44
2050	10,719	157	2,204	13,080	61	45
2055	11,142	159	2,247	13,549	61	45
2060	11,331	156	2,279	13,766	61	46
2065	11,630	162	2,334	14,125	62	46
2070	11,899	169	2,423	14,491	62	46
2075	11,986	168	2,518	14,672	62	47
2080	12,288	170	2,594	15,052	62	47
2085	12,857	178	2,651	15,686	62	47
2090	13,518	191	2,706	16,415	64	47
2095	13,829	192	2,769	16,789	64	47

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Table V.C5.—DI Beneficiaries With Benefits in Current-Payment Status at the End of Calendar Years 1960-2095 (Cont.)

[Beneficiaries in thousands; prevalence rates per thousand persons insured for disability benefits]

Calendar year	Disabled-worker beneficiaries	Auxiliary beneficiaries		Total beneficiaries	Disability prevalence rates	
		Spouse	Child		Gross	Age-sex-adjusted[a]
Low-cost:						
2019	8,395	115	1,457	9,967	54	40
2020	8,217	114	1,412	9,743	53	39
2025	7,965	131	1,326	9,423	50	36
2030	7,695	117	1,405	9,217	47	35
2035	7,669	112	1,573	9,355	46	35
2040	7,797	106	1,768	9,672	45	35
2045	8,179	113	1,859	10,151	46	35
2050	8,466	111	1,906	10,482	46	35
2055	8,764	110	1,944	10,818	46	35
2060	8,921	107	1,990	11,018	45	35
2065	9,192	108	2,075	11,375	45	35
2070	9,476	112	2,203	11,791	45	36
2075	9,676	111	2,336	12,123	44	36
2080	10,113	113	2,445	12,671	44	36
2085	10,847	122	2,533	13,501	45	36
2090	11,629	133	2,623	14,385	46	36
2095	12,047	134	2,729	14,910	46	36
High-cost:						
2019	8,543	116	1,493	10,151	55	41
2020	8,578	116	1,497	10,191	55	41
2025	9,241	135	1,540	10,916	59	43
2030	9,764	157	1,707	11,628	62	46
2035	10,477	169	1,931	12,577	64	49
2040	11,337	181	2,170	13,688	68	51
2045	12,358	206	2,308	14,873	74	54
2050	13,025	214	2,391	15,630	77	55
2055	13,560	221	2,429	16,210	79	56
2060	13,753	219	2,435	16,407	80	57
2065	14,030	228	2,441	16,699	82	57
2070	14,215	239	2,468	16,922	82	58
2075	14,087	235	2,502	16,824	82	58
2080	14,104	234	2,529	16,867	82	58
2085	14,299	239	2,543	17,081	83	58
2090	14,647	249	2,552	17,448	84	59
2095	14,767	251	2,560	17,578	84	59

[a] Adjusted to the age-sex distribution of the disability insured population for the year 2000.

Note: Totals do not necessarily equal the sums of rounded components.

The disability prevalence rate is the ratio of the number of disabled-worker beneficiaries in current-payment status to the number of persons insured for disability benefits. Figure V.C6 illustrates the historical and projected disability prevalence rates on both a gross basis and on an age-sex-adjusted basis (adjusted to the age-sex distribution of the disability insured population for the year 2000).

Changes in prevalence rates are a direct result of changes in incidence rates and termination rates. Figure V.C5 depicts patterns for incidence and termi-

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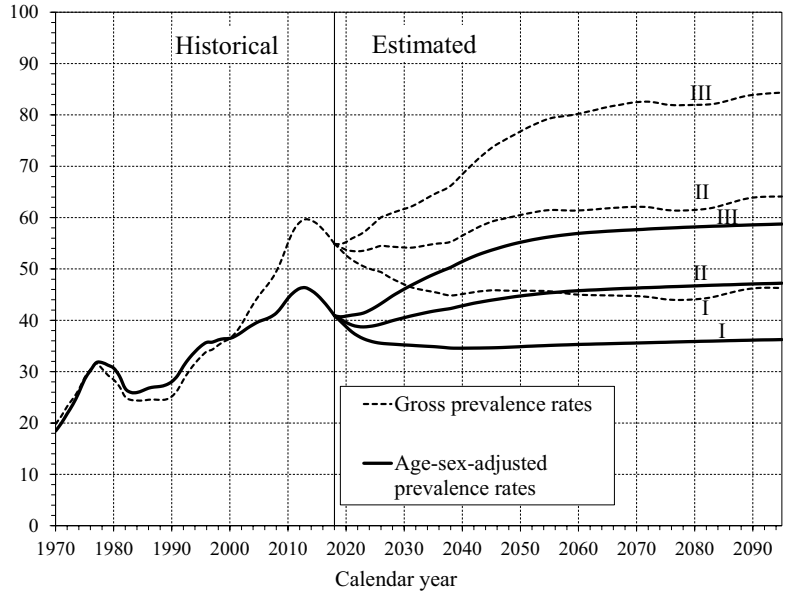
nation rates, which are helpful for understanding the trend in prevalence rates. Annual incidence and termination rates are not directly comparable or combinable because their denominators differ.

Figure V.C6.—DI Disability Prevalence Rates, 1970-2095
[Rate per thousand persons insured for disability benefits]



Age-sex-adjusted prevalence rates have increased primarily because: (1) termination rates, in particular death termination rates, have declined, (2) incidence rates at younger ages have increased relative to rates at older ages (new beneficiaries at younger ages have more potential years on the disability rolls), and (3) incidence rates have increased substantially for women to parity with men. Gross prevalence rates have increased more than age-sex-adjusted prevalence rates since the baby-boom generation began to reach ages 45 through normal retirement age, a time of life when disability incidence rates are relatively high. The Office of the Chief Actuary projects both gross and age-sex adjusted prevalence rates to grow at a slower pace based on assumed stabilization in three factors: (1) the age distribution of the general population, (2) the age distribution of the disability insured population, and (3) incidence rates by age and gender. As these factors gradually stabilize, the declining death termination rate continues to have a small influence toward higher disability prevalence rates.

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As mentioned above in the discussion of incidence and termination rates, the age-sex-adjusted prevalence rate isolates the changing trend in the underlying likelihood of receiving benefits for the insured population, without reflecting changes in the age distribution of the population. As with incidence rates, gross disability prevalence rates declined relative to the age-sex-adjusted rate when the baby-boom generation reached working age between 1970 and 1990; this trend reflects the lower disability prevalence rates associated with younger ages. Conversely, the gross rate of disability prevalence has increased relative to the age-sex-adjusted rate after 1990 due to the aging of the baby-boom generation into ages with higher disability prevalence rates.

Under the intermediate assumptions, the projected age-sex-adjusted disability prevalence rate grows from 40.9 per thousand disability insured at the end of 2018 to 47.2 per thousand at the end of 2095. As mentioned above, the Office of the Chief Actuary projects that the growth in prevalence will slow relative to the historical period.

Under the low-cost and high-cost assumptions, the age-sex-adjusted disability prevalence rate decreases to 36.3 per thousand and increases to 58.8 per thousand insured workers at the end of 2095, respectively.

Table V.C5 presents projections of the numbers of auxiliary beneficiaries paid from the DI Trust Fund. As indicated at the beginning of this subsection, auxiliary beneficiaries are qualifying spouses and children of disabled workers. A spouse must either be at least age 62 or have an eligible child beneficiary in his or her care who is either under age 16 or disabled prior to age 22. A child must be: (1) under age 18, (2) age 18 or 19 and still a student in high school, or (3) age 18 or older and disabled prior to age 22.

The projection of the number of auxiliary beneficiaries relies on the projected number of disabled-worker beneficiaries. In the short-range period (2019 through 2028), the Office of the Chief Actuary projects incidence and termination rates for each category of auxiliary beneficiary. After 2028, the office projects child beneficiaries at ages 18 and under in relation to the projected number of children in the population using the probability that either of their parents is a disabled-worker beneficiary. The office projects the remaining categories of children and spouses in a similar manner.

6. Covered and Taxable Earnings, Taxable Payroll, and Payroll Tax Contributions

Covered earnings include both covered wages and covered self-employment net earnings. The Office of the Chief Actuary projects covered wages for

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component sectors of the economy (i.e., private, State and local, Federal civilian, and military) based on the projected overall growth of sectoral and total wages in the U.S. economy. The projections of covered wages also reflect changes in covered employment due to a relative increase in non-covered undocumented immigrants and to the mandatory coverage of new hires in the Federal civilian sector. The office projects covered self-employment net earnings based on the growth in net proprietors' income in the U.S. economy.

Taxable earnings are the portion of covered earnings subject to the Social Security payroll tax. Taxable wages for an employee are total covered wages from all wage employment up to the contribution and benefit base. Taxable wages for an employer are the sum of all covered wages paid to each employee up to the base. Employees with multiple jobs whose total wages exceed the base are eligible for a refund of excess employee taxes withheld; employers are not eligible for a refund on this basis. For self-employed workers with no taxable wages, taxable earnings are the amount of covered self-employment net earnings up to the base. For self-employed workers with taxable wages less than the base, covered self-employment net earnings are taxable up to the difference between the base and their taxable wages. For projection purposes, the Office of the Chief Actuary computes taxable earnings based on a proportion of covered earnings that is at or below the base.

The OASDI taxable payroll (see table VI.G6) for a year is computed as the amount of earnings which, when multiplied by the combined OASDI employee-employer payroll tax rate for that year, yields the total amount of payroll taxes due from wages paid and self-employment net earnings for the year. The Trustees use taxable payroll to determine income rates, cost rates, and actuarial balances. Taxable payroll is derived by adjusting total taxable earnings to account for categories of earnings that are taxed at rates other than the combined employee-employer rate and to take into account amounts credited as wages that were not included in normally reported wages. For 1951 and later, taxable earnings are reduced by one-half of the amount of wages paid to employees with multiple jobs that exceed the contribution and benefit base. For 1983 through 2001, deemed wage credits for military service after 1956 are added to taxable earnings. The self-employment tax rates for 1951 through 1983 were less than the combined employee-employer rates; therefore, the self-employment component of taxable payroll for those years is reduced by multiplying the ratio of the self-employment rate to the combined employee-employer rate times the taxable self-employment net earnings. Finally, for 1966 through 1979, employers were exempt from pay-

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ing their share of payroll tax on their employees' tips and, for 1980 through 1987, employers paid tax on only part of their employees' tips. For those years, the taxable payroll is reduced by half of the amount of tips for which the employer owed no payroll tax.

The ratio of taxable payroll to covered earnings (the taxable ratio) fell from 88.7 percent for 1984 to 82.6 percent for 2000, mostly due to much higher increases in wage levels for very high earners than for all other earners. From 2000 to 2010, the taxable ratio varied with the business cycle, rising during economic downturns and falling during recoveries. Specifically, the taxable ratio rose to 85.7 percent for 2002, declined to 82.4 percent for 2007, rose to 85.2 percent for 2009, and was 83.2 percent for 2017.

For this report, the Trustees assume a level for the taxable ratio at the end of the short-range period (2028) of 82.5 percent for the intermediate assumptions, 81.0 percent for the high-cost assumptions, and 84.0 percent for the low-cost assumptions. These are the same assumptions that the Trustees made for the end of the short-range period (2027) for the 2018 report.

The Office of the Chief Actuary projects payroll tax contributions using the patterns of tax collection required by Federal laws and regulations. The office determines payroll tax liabilities by multiplying the scheduled tax rates for each year by the amount of taxable wages and self-employment net earnings for that year. The office then splits these liabilities into amounts by collection period. For wages, Federal law requires that employers withhold OASDI and HI payroll taxes and Federal individual income taxes from employees' pay. As an employer's accumulation of such taxes (including the employer share of payroll taxes) meets certain thresholds, which the Department of the Treasury determines, the employer must deposit these taxes with the U.S. Treasury by a specific day, depending on the amount of money involved.[1] For projection purposes, the office splits the payroll tax contributions related to wages into amounts paid in the same quarter as incurred and in the following quarter. Self-employed workers must make estimated tax payments on their earnings four times during the year and make up any underestimate on their individual income tax returns. The projection splits the self-employed tax liabilities by collection quarter to reflect this pattern.

The projected tax contributions also reflect the method used to ensure that money transferred to the trust funds is adjusted, over time, to equal the actual

[1] Generally, the higher the amount of liability, the sooner the taxes must be paid. For smaller employers, payment is due by the middle of the month following when the liability was incurred. Medium-size employers have three banking days in which to make their deposits. Larger employers must make payment on the next business day after paying their employees.

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liability owed. Because payers generally make tax payments without identifying the separate OASDI contribution amounts, Treasury makes daily transfers of money from the General Fund to the trust funds on an initial estimated basis. The Social Security Administration periodically certifies the amounts of wages and self-employment net earnings on which tax contributions are owed for each year, at which time Treasury determines adjustments to appropriations to reconcile tax liabilities with deposits in the trust funds. This process also includes periodic transfers from the trust funds to the General Fund for contributions on wages in excess of the contribution and benefit base.

Table V.C6 shows the payroll tax contribution rates applicable under current law in each calendar year and the allocation of these rates between the OASI and DI Trust Funds.[1] It also shows the contribution and benefit base for each year through 2019.

[1] Table VI.G1 shows the payroll tax contribution rates for the Hospital Insurance (HI) program.

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Table V.C6.—Contribution and Benefit Base and Payroll Tax Contribution Rates

Calendar years	Contribution and benefit base	Payroll tax contribution rates (percent)					
		Employees and employers, combined[a]			Self-employed[b]		
		OASDI	OASI	DI	OASDI	OASI	DI
1937-49	$3,000	2.00	2.00	—	—	—	—
1950	3,000	3.00	3.00	—	—	—	—
1951-53	3,600	3.00	3.00	—	2.2500	2.2500	—
1954	3,600	4.00	4.00	—	3.0000	3.0000	—
1955-56	4,200	4.00	4.00	—	3.0000	3.0000	—
1957-58	4,200	4.50	4.00	0.50	3.3750	3.0000	0.3750
1959	4,800	5.00	4.50	.50	3.7500	3.3750	.3750
1960-61	4,800	6.00	5.50	.50	4.5000	4.1250	.3750
1962	4,800	6.25	5.75	.50	4.7000	4.3250	.3750
1963-65	4,800	7.25	6.75	.50	5.4000	5.0250	.3750
1966	6,600	7.70	7.00	.70	5.8000	5.2750	.5250
1967	6,600	7.80	7.10	.70	5.9000	5.3750	.5250
1968	7,800	7.60	6.65	.95	5.8000	5.0875	.7125
1969	7,800	8.40	7.45	.95	6.3000	5.5875	.7125
1970	7,800	8.40	7.30	1.10	6.3000	5.4750	.8250
1971	7,800	9.20	8.10	1.10	6.9000	6.0750	.8250
1972	9,000	9.20	8.10	1.10	6.9000	6.0750	.8250
1973	10,800	9.70	8.60	1.10	7.0000	6.2050	.7950
1974	13,200	9.90	8.75	1.15	7.0000	6.1850	.8150
1975	14,100	9.90	8.75	1.15	7.0000	6.1850	.8150
1976	15,300	9.90	8.75	1.15	7.0000	6.1850	.8150
1977	16,500	9.90	8.75	1.15	7.0000	6.1850	.8150
1978	17,700	10.10	8.55	1.55	7.1000	6.0100	1.0900
1979	22,900	10.16	8.66	1.50	7.0500	6.0100	1.0400
1980	25,900	10.16	9.04	1.12	7.0500	6.2725	.7775
1981	29,700	10.70	9.40	1.30	8.0000	7.0250	.9750
1982	32,400	10.80	9.15	1.65	8.0500	6.8125	1.2375
1983	35,700	10.80	9.55	1.25	8.0500	7.1125	.9375
1984[c]	37,800	11.40	10.40	1.00	11.4000	10.4000	1.0000
1985[c]	39,600	11.40	10.40	1.00	11.4000	10.4000	1.0000
1986[c]	42,000	11.40	10.40	1.00	11.4000	10.4000	1.0000
1987[c]	43,800	11.40	10.40	1.00	11.4000	10.4000	1.0000
1988[c]	45,000	12.12	11.06	1.06	12.1200	11.0600	1.0600
1989[c]	48,000	12.12	11.06	1.06	12.1200	11.0600	1.0600
1990	51,300	12.40	11.20	1.20	12.4000	11.2000	1.2000
1991	53,400	12.40	11.20	1.20	12.4000	11.2000	1.2000
1992	55,500	12.40	11.20	1.20	12.4000	11.2000	1.2000
1993	57,600	12.40	11.20	1.20	12.4000	11.2000	1.2000
1994	60,600	12.40	10.52	1.88	12.4000	10.5200	1.8800
1995	61,200	12.40	10.52	1.88	12.4000	10.5200	1.8800
1996	62,700	12.40	10.52	1.88	12.4000	10.5200	1.8800
1997	65,400	12.40	10.70	1.70	12.4000	10.7000	1.7000
1998	68,400	12.40	10.70	1.70	12.4000	10.7000	1.7000
1999	72,600	12.40	10.70	1.70	12.4000	10.7000	1.7000
2000	76,200	12.40	10.60	1.80	12.4000	10.6000	1.8000
2001	80,400	12.40	10.60	1.80	12.4000	10.6000	1.8000
2002	84,900	12.40	10.60	1.80	12.4000	10.6000	1.8000
2003	87,000	12.40	10.60	1.80	12.4000	10.6000	1.8000
2004	87,900	12.40	10.60	1.80	12.4000	10.6000	1.8000
2005	90,000	12.40	10.60	1.80	12.4000	10.6000	1.8000

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Table V.C6.—Contribution and Benefit Base and Payroll Tax Contribution Rates (Cont.)

Calendar years	Contribution and benefit base	Payroll tax contribution rates (percent)					
		Employees and employers, combined[a]			Self-employed[b]		
		OASDI	OASI	DI	OASDI	OASI	DI
2006	$94,200	12.40	10.60	1.80	12.4000	10.6000	1.8000
2007	97,500	12.40	10.60	1.80	12.4000	10.6000	1.8000
2008	102,000	12.40	10.60	1.80	12.4000	10.6000	1.8000
2009	106,800	12.40	10.60	1.80	12.4000	10.6000	1.8000
2010[d]	106,800	12.40	10.60	1.80	12.4000	10.6000	1.8000
2011[d]	106,800	10.40	8.89	1.51	10.4000	8.8900	1.5100
2012[d]	110,100	10.40	8.89	1.51	10.4000	8.8900	1.5100
2013	113,700	12.40	10.60	1.80	12.4000	10.6000	1.8000
2014	117,000	12.40	10.60	1.80	12.4000	10.6000	1.8000
2015	118,500	12.40	10.60	1.80	12.4000	10.6000	1.8000
2016[e]	118,500	12.40	10.03	2.37	12.4000	10.0300	2.3700
2017[e]	127,200	12.40	10.03	2.37	12.4000	10.0300	2.3700
2018[e]	128,400	12.40	10.03	2.37	12.4000	10.0300	2.3700
2019	132,900	12.40	10.60	1.80	12.4000	10.6000	1.8000
2020 and later	[f]	12.40	10.60	1.80	12.4000	10.6000	1.8000

[a] Except as noted below, the combined employee/employer rate is divided equally between employees and employers.
[b] Beginning in 1990, self-employed persons receive a deduction, for purposes of computing their net earnings, equal to half of the combined OASDI and HI contributions that would be payable without regard to the contribution and benefit base. The OASDI contribution rate then applies to net earnings after this deduction, but subject to the OASDI base.
[c] In 1984 only, employees received an immediate credit of 0.3 percent of taxable wages against their OASDI payroll tax contributions. The self-employed received similar credits of 2.7 percent, 2.3 percent, and 2.0 percent against their combined OASDI and Hospital Insurance (HI) contributions on net earnings from self-employment in 1984, 1985, and 1986-89, respectively. The General Fund of the Treasury reimbursed the trust funds for these credits.
[d] Public Law 111-147 exempted most employers from paying the employer share of OASDI payroll tax on wages paid during the period March 19, 2010 through December 31, 2010 to certain qualified individuals hired after February 3, 2010. Public Law 111-312 reduced the OASDI payroll tax rate for 2011 by 2 percentage points for employees and for self-employed workers. Public Law 112-96 extended the 2011 rate reduction through 2012. These laws require that the General Fund of the Treasury reimburse the OASI and DI Trust Funds for these temporary reductions in 2010 through 2012 payroll tax revenue, in order to "replicate to the extent possible" revenue that would have been received if the combined employee/employer payroll tax rates had remained at 12.4 percent for OASDI (10.6 percent for OASI and 1.8 percent for DI).
[e] Section 833 of the Bipartisan Budget Act of 2015 reallocated payroll tax rates on a temporary basis. For earnings in calendar years 2016 through 2018, 0.57 percentage point of the 12.40 percent OASDI payroll tax rate is reallocated from OASI to DI.
[f] Subject to automatic adjustment based on increases in average wages.

7. Income From Taxation of Benefits

Under current law, the OASI and DI Trust Funds are credited with income tax revenue from the taxation of up to the first 50 percent of taxpayers' OASI and DI benefit payments. (The HI Trust Fund receives the remainder of the income tax revenue from the taxation of up to 85 percent of taxpayers' OASI and DI benefit payments.) Benefits are taxed for beneficiaries with "combined income" (adjusted gross income, plus half of benefits and all non-taxable interest) exceeding specified threshold amounts. The threshold amounts are $25,000 for single filers, $32,000 for joint filers, and $0 for those married but filing separately.

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For the short-range period, the Office of the Chief Actuary estimates the income to the trust funds from taxation of benefits by applying the following two factors (projected by the Office of Tax Analysis, Department of the Treasury) to total OASI and DI scheduled benefits: (1) the percentage of taxpayers' scheduled benefits (limited to 50 percent) that is taxable and (2) the average marginal tax rate applicable to those benefits.

For the long-range period, the office estimates the income to the trust funds from taxation of benefits by applying projected ratios of taxation of OASI and DI benefits to total OASI and DI scheduled benefits. The income thresholds used for benefit taxation are, by law, constant in the future, while income and benefit levels continue to rise. Accordingly, projected ratios of income from taxation of benefits to the amount of benefits increase gradually. Ultimate tax ratios for OASI and DI benefits used in the projection rely on estimates from the Office of Tax Analysis in the Department of the Treasury.

8. Average Benefits

Projections of average benefits for each benefit type reflect recent historical averages, projected average primary insurance amounts (PIAs), and projected ratios of average benefits to average PIAs. Calculations of average PIAs are based on projected distributions of beneficiaries by duration from year of initial entitlement, average PIAs at initial entitlement, and increases in PIAs after initial entitlement. Projected increases in average PIAs after initial entitlement depend on automatic benefit increases, recomputations to reflect additional covered earnings, and differences in mortality by level of lifetime earnings. Calculations of future average PIAs at initial entitlement are based on projected earnings histories, which in turn reflect a combination of the actual earnings histories associated with a sample of 2015 initial entitlements and more recent actual earnings levels by age and sex for covered workers.

For retired-worker, aged-spouse, and aged-widow(er) benefits, the percentage of the PIA that is payable depends on the age at initial entitlement to benefits. Projected ratios of average benefits to average PIAs for these types of benefits are based on projections of age distributions at initial entitlement.

9. Scheduled Benefits

For each type of benefit, scheduled benefits are the product of the number of beneficiaries and the corresponding average monthly benefit. The short-range model calculates scheduled benefits on a quarterly basis. The long-

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range model calculates all scheduled benefits on an annual basis, using the number of beneficiaries at the beginning and end of the year. Adjustments to these annual scheduled benefits include retroactive payments to newly awarded beneficiaries and other amounts not reflected in the regular monthly scheduled benefits.

Scheduled lump-sum death benefits are estimated as the product of: (1) the number of lump-sum death payments projected on the basis of the assumed death rates, the projected fully insured population, and the estimated percentage of the fully insured population that will qualify for lump-sum death payments; and (2) the amount of the lump-sum death payment, which is $255 (unindexed since 1973).

10. Illustrative Scheduled Benefit Amounts

Table V.C7 shows, under the intermediate assumptions, future benefit amounts payable upon retirement at the normal retirement age and at age 65, for various hypothetical workers attaining age 65 in 2019 and subsequent years. The illustrative benefit amounts in table V.C7 are presented in CPI-indexed 2019 dollars—that is, adjusted to 2019 levels by the CPI indexing series shown in table VI.G6. As a point of comparison, table V.C7 also shows the national average wage index (AWI) for 2019 and subsequent years in CPI-indexed 2019 dollars.

The normal retirement age was 65 for individuals who reached age 62 before 2000. It increased to age 66 during the period 2000 through 2005, at a rate of 2 months per year as workers attained age 62. Under current law, the normal retirement age increases to age 67 during the period 2017 through 2022, also by 2 months per year as workers attain age 62. The illustrative benefit amounts shown in table V.C7 for retirees at age 65 are lower than the amounts shown for retirees at normal retirement age because the statute requires an actuarial reduction for monthly benefits taken before normal retirement age to reflect the expected additional years benefits will be collected. For example, those who collect benefits starting in 2027 at age 65 will receive benefits for two more years than if they instead claim benefits at the normal retirement age (age 67) unless they die between the ages of 65 and 67.

Table V.C7 shows five different pre-retirement earnings patterns. Four of these patterns assume the earnings history of workers with scaled-earnings patterns[1] and reflect very low, low, medium, and high career-average levels

[1] Actuarial Note 2019.3 has more details on scaled-earnings patterns. See www.ssa.gov/OACT/NOTES/ran3/.

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of pre-retirement earnings starting at age 21. The fifth pattern assumes the earnings history of a steady maximum earner starting at age 22. The four scaled-earnings patterns derive from earnings experienced by insured workers during 1996-2015. These earnings levels differ by age. The career-average level of earnings for each scaled case targets a percent of the AWI.

For the scaled medium earner, the career-average earnings level is about equal to the AWI (or $53,864 for 2019). For the scaled very low, low, and high earners, the career-average earnings level is about 25 percent, 45 percent, and 160 percent of the AWI, respectively (or $13,466, $24,239, and $86,182, respectively, for 2019). The steady maximum earner has earnings at or above the contribution and benefit base for each year starting at age 22 through the year prior to retirement (or $132,900 for 2019).

Table V.C7.—Annual Scheduled Benefit Amounts for Retired Workers With Various Pre-Retirement Earnings Patterns Based on Intermediate Assumptions, Calendar Years 2019-2095

Year attain age 65[b]	Age at retirement	Scaled very low earnings[c]	Scaled low earnings[d]	Scaled medium earnings[e]	Scaled high earnings[f]	Steady maximum earnings[g]	National Average Wage Index in 2019 dollars[h]
		Benefits in 2019 dollars[a] with retirement at normal retirement age					
2019	66:0	$10,125	$13,243	$21,843	$28,934	$35,355	$53,864
2020	66:2	10,451	13,671	22,545	29,867	36,513	54,951
2025	67:0	10,917	14,294	23,586	31,212	38,428	59,454
2030	67:0	11,807	15,466	25,516	33,757	41,601	63,817
2035	67:0	12,672	16,595	27,366	36,220	44,642	67,950
2040	67:0	13,497	17,668	29,133	38,560	47,493	72,155
2045	67:0	14,327	18,756	30,933	40,947	50,445	76,437
2050	67:0	15,183	19,873	32,773	43,384	53,389	81,136
2055	67:0	16,119	21,097	34,796	46,051	56,568	86,237
2060	67:0	17,129	22,424	36,984	48,949	60,058	91,656
2065	67:0	18,208	23,833	39,305	52,024	63,786	97,297
2070	67:0	19,327	25,299	41,721	55,221	67,711	103,121
2075	67:0	20,486	26,812	44,216	58,527	71,769	109,179
2080	67:0	21,688	28,386	46,813	61,963	75,991	115,493
2085	67:0	22,942	30,028	49,517	65,543	80,390	122,122
2090	67:0	24,258	31,753	52,360	69,308	85,012	129,158
2095	67:0	25,657	33,584	55,380	73,302	89,920	136,637
		Benefits in 2019 dollars[a] with retirement at age 65					
2019	65:0	9,518	12,451	20,538	27,208	33,134	53,864
2020	65:0	9,621	12,598	20,766	27,515	33,539	54,951
2025	65:0	9,461	12,378	20,427	27,034	33,043	59,454
2030	65:0	10,234	13,398	22,092	29,244	35,789	63,817
2035	65:0	10,979	14,375	23,705	31,382	38,423	67,950
2040	65:0	11,691	15,302	25,240	33,416	40,878	72,155
2045	65:0	12,416	16,253	26,801	35,480	43,425	76,437
2050	65:0	13,156	17,220	28,396	37,592	45,958	81,136
2055	65:0	13,963	18,281	30,144	39,902	48,692	86,237
2060	65:0	14,845	19,429	32,041	42,412	51,700	91,656
2065	65:0	15,778	20,651	34,055	45,078	54,912	97,297
2070	65:0	16,748	21,920	36,145	47,850	58,296	103,121

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Table V.C7.—Annual Scheduled Benefit Amounts for Retired Workers With Various Pre-Retirement Earnings Patterns Based on Intermediate Assumptions, Calendar Years 2019-2095 (Cont.)

2075	65:0	$17,749	$23,233	$38,309	$50,714	$61,792	$109,179
2080	65:0	18,792	24,597	40,560	53,692	65,428	115,493
2085	65:0	19,880	26,020	42,904	56,796	69,217	122,122
2090	65:0	21,022	27,513	45,367	60,058	73,195	129,158
2095	65:0	22,233	29,099	47,982	63,519	77,422	136,637

[a] Annual amounts are the total for the 12-month period starting with the month of retirement, adjusted to be in 2019 dollars by using the CPI indexing series from table VI.G6.

[b] Attains age 65 on January 1 of the year.

[c] Career-average earnings at about 25 percent of the AWI.

[d] Career-average earnings at about 45 percent of the AWI.

[e] Career-average earnings at about 100 percent of the AWI. Such a worker would have career-average earnings at approximately the 56th percentile of all new retired-worker beneficiaries.

[f] Career-average earnings at about 160 percent of the AWI.

[g] Earnings for each year at or above the contribution and benefit base.

[h] Average Wage Index from table VI.G6, adjusted to be in 2019 dollars by using the CPI indexing series from table VI.G6.

Note: Benefits shown at age 65 reflect adjustments for early retirement. For early retirement as early as age 62, the benefit amount is reduced 5/9 of one percent for each month before normal retirement age, up to 36 months. If the number of months exceeds 36, then the benefit is further reduced 5/12 of one percent per month. For example, if the number of reduction months is 60 (the maximum number for retirement at 62 when normal retirement age is 67), then the benefit is reduced by 30 percent. *Delayed retirement credit* is generally given for retirement after the normal retirement age. The delayed retirement credit is 2/3 of one percent per month for persons born in 1943 and later. No credit is given for delaying benefits after attaining age 70. See table V.C3 for additional details, including adjustments applying to other birth years.

11. Administrative Expenses

The projection of administrative expenses through the short-range period is based on historical experience and the projected growth in average wages. The Office of Budget of the Social Security Administration provides estimates for the first several years of the projection. For years after the short-range period, projected administrative expenses reflect increases in the number of beneficiaries in current-payment status, and increases in the average wage. However, the increases in average wage are partially offset by assumed administrative productivity gains.

12. Railroad Retirement Financial Interchange

Railroad workers are covered under a separate multi-tiered benefit plan, with a first tier of coverage similar to OASDI coverage. An annual financial interchange between the Railroad Retirement fund and the OASI and DI Trust Funds is made to resolve the difference between: (1) the amount of OASDI benefits that would be paid to railroad workers and their families if railroad employment had been covered under the OASDI program, plus administrative expenses associated with these benefits; and (2) the amount of OASDI payroll tax and income tax that would be received with allowances for interest from railroad workers.

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Calculation of the financial interchange with the Railroad Retirement reflects trends similar to those used in estimating the cost of OASDI benefits. The annual short-range net cost for the OASI and DI Trust Funds is about $5-$6 billion and the long-range summarized net cost for the OASI and DI Trust Funds is 0.05 percent of taxable payroll.

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VI. APPENDICES

A. HISTORY OF OASI AND DI TRUST FUND OPERATIONS

The Federal Old-Age and Survivors Insurance (OASI) Trust Fund was established on January 1, 1940 as a separate account in the United States Treasury. The Federal Disability Insurance (DI) Trust Fund, another separate account in the United States Treasury, was established on August 1, 1956. These funds conduct the financial operations of the OASI and DI programs. The Board of Trustees is responsible for overseeing the financial operations of these funds. The following paragraphs describe the various components of trust fund income and cost. Following this description, tables VI.A1 and VI.A2 present the historical operations of the separate trust funds since their inception, and table VI.A3 presents the operations of the hypothetical combined trust funds[1] during the period when they have co-existed.

The primary income of these two funds comes from appropriations under permanent authority on the basis of payroll tax contributions. Federal law requires that all employees who work in OASDI covered employment, and their employers, make payroll tax contributions on their wages. Employees and their employers must also make payroll tax contributions on monthly cash tips if such tips are at least $20. Self-employed persons must make payroll tax contributions on their covered net earnings from self-employment. The Federal Government pays amounts equivalent to the combined employer and employee contributions that would be paid on deemed wage credits attributable to military service performed between 1957 and 2001, if such wage credits were covered wages. Treasury initially deposits payroll tax contributions to the trust funds each day on an estimated basis. Subsequently, Treasury makes adjustments based on the certified amount of wages and self-employment earnings in the records of the Social Security Administration.

Income also includes various reimbursements from the General Fund of the Treasury, such as: (1) the cost of noncontributory wage credits for military service before 1957, and periodic adjustments to previous determinations of this cost; (2) the cost in 1971 through 1982 of deemed wage credits for military service performed after 1956; (3) the cost of benefits to certain uninsured persons who attained age 72 before 1968; (4) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984 through 1989 by Public Law 98-21; (5) the cost in 2009 through 2017 of excluding certain self-employment earnings from SECA taxes under Public

[1] The OASI and DI Trust Funds are distinct legal entities which operate independently. To illustrate the actuarial status of the program as a whole, the fund operations are often combined on a hypothetical basis.

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Law 110-246; and (6) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

Beginning in 1984, Federal law subjected up to 50 percent of an individual's or couple's OASDI benefits to Federal income taxation under certain circumstances. Effective for taxable years beginning after 1993, the law increased the maximum percentage from 50 percent to 85 percent. Treasury credits the proceeds from this taxation of up to 50 percent of benefits to the OASI and DI Trust Funds in advance, on an estimated basis, at the beginning of each calendar quarter, with no reimbursement to the General Fund for interest costs attributable to the advance transfers.[1] Treasury makes subsequent adjustments based on the actual amounts shown on annual income tax records. Each of the OASI and DI Trust Funds receives the income taxes paid on the benefits from that trust fund.[2]

Another source of income to the trust funds is interest received on investments held by the trust funds. On a daily basis, Treasury invests trust fund income not required to meet current operating expenses, primarily in interest-bearing obligations of the U.S. Government. These investments include the special public-debt obligations described in the next paragraph. The Social Security Act also authorizes the trust funds to hold obligations guaranteed as to both principal and interest by the United States. The act therefore permits the trust funds to hold certain Federally sponsored agency obligations and marketable obligations.[3] The trust funds may acquire any of these obligations on original issue at the issue price or by purchase of outstanding obligations at their market price.

The Social Security Act authorizes the issuance of special public-debt obligations for purchase exclusively by the trust funds. The act provides that the interest rate for special obligations newly issued in any month is the average market yield, as of the last business day of the prior month, on all of the outstanding marketable U.S. obligations that are due or callable more than 4 years in the future. This rate is rounded to the nearest one-eighth of one percent. Beginning January 1999, in calculating the average market yield rate for this purpose, the Treasury incorporates the yield to the call date when a callable bond's market price is above par.

Although the Social Security Act does not authorize the purchase or sale of special issue securities in the open market, Treasury redeems special issue

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[1] The HI Trust Fund receives the additional tax revenue resulting from the increase to 85 percent.

[2] A special provision applies to benefits paid to nonresident aliens. Effective for taxable years beginning after 1994, Public Law 103-465 subjects benefits to a flat-rate tax, usually 25.5 percent, before they are paid. Therefore, this tax remains in the trust funds. From 1984 to 1994, the flat-rate tax was usually 15 percent.

[3] The Social Security Act requires the trust funds to acquire special-issue obligations unless the Managing Trustee determines that the purchase of marketable obligations is in the public interest. The purchase of marketable obligations has been quite limited and has not occurred since 1980.

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securities prior to maturity at par value when needed to meet current operating expenses. As a result, changes in market yield rates after issuance of special issue securities do not cause fluctuations in the principal value of these securities. As is true for marketable Treasury securities held by the public, the full faith and credit of the U.S. Government backs all of the investments held by the trust funds.

Annual cost for the OASI and DI Trust Funds primarily consists of: (1) OASDI benefit payments[1], net of any reimbursements from the General Fund of the Treasury for unnegotiated benefit checks; and (2) expenses incurred by the Social Security Administration and the Department of the Treasury in administering the OASDI program and the provisions of the Internal Revenue Code relating to the collection of contributions. Such administrative expenses include, among other items, the cost of (1) payroll, (2) construction, rental, lease, or purchase of office buildings and related facilities for the Social Security Administration, and (3) information technology systems. The Social Security Act prohibits payments from the OASI and DI Trust Funds for any purpose not related to the payment of benefits or administrative costs for the OASDI program.

Annual cost also includes: (1) the costs of vocational rehabilitation services furnished to disabled persons receiving cash benefits because of their disabilities, where such services contributed to their successful rehabilitation; and (2) net costs of the provisions of the Railroad Retirement Act that provide for a system of coordination and financial interchange between the Railroad Retirement program and the Social Security program. Under the financial interchange provisions, the Railroad Retirement program's Social Security Equivalent Benefit Account and the trust funds interchange amounts on an annual basis so that each trust fund is in the same position it would have been had railroad employment always been covered under Social Security.

The statements of the operations of the trust funds in this report do not include the net worth of facilities and other fixed capital assets because the value of fixed capital assets is not available in the form of a financial asset redeemable for the payment of benefits or administrative costs. As a result of this unavailability, the actuarial status of the trust funds does not take these assets into account.

[1] Periodically, benefit payments which were scheduled to be paid on January 3 were actually paid on December 31 of the preceding year as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Such advance payments have occurred about every 7 years, first for benefits scheduled for January 3, 1982. The most recent such accelerated payment affected benefits scheduled to be paid on January 3, 2016. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year without regard to the accelerated payments described above.

Table VI.A1.— Operations of the OASI Trust Fund, Calendar Years 1937-2018
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[ad]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
1937[f]	$0.8	$0.8	—	—	[g]	[g]	[g]	—	—	$0.8	$0.8	—
1938[f]	.4	.4	—	—	[g]	[g]	[g]	—	—	.4	1.1	7,660
1939[f]	.6	.6	—	—	[g]	[g]	[g]	—	—	.6	1.7	8,086
1940	.4	.3	—	—	[g]	$0.1	[g]	[g]	—	.3	2.0	2,781
1941	.8	.8	—	—	$0.1	.1	$0.1	[g]	—	.7	2.8	1,782
1942	1.1	1.0	—	—	.1	.2	.1	[g]	—	.9	3.7	1,737
1943	1.3	1.2	—	—	.1	.2	.2	[g]	—	1.1	4.8	1,891
1944	1.4	1.3	—	—	.1	.2	.2	[g]	—	1.2	6.0	2,025
1945	1.4	1.3	—	—	.1	.3	.3	[g]	—	1.1	7.1	1,975
1946	1.4	1.3	—	—	.2	.4	.4	[g]	—	1.0	8.1	1,704
1947	1.7	1.6	[g]	—	.2	.5	.5	[g]	—	1.2	9.4	1,592
1948	2.0	1.7	[g]	—	.3	.6	.6	$0.1	—	1.4	10.7	1,542
1949	1.8	1.7	[g]	—	.1	.7	.7	.1	—	1.1	11.8	1,487
1950	2.9	2.7	[g]	—	.3	1.0	1.0	.1	—	1.9	13.7	1,156
1951	3.8	3.4	[g]	—	.4	2.0	1.9	.1	—	1.8	15.5	698
1952	4.2	3.8	—	—	.4	2.3	2.2	.1	—	1.9	17.4	681
1953	4.4	3.9	—	—	.4	3.1	3.0	.1	—	1.3	18.7	564
1954	5.6	5.2	—	—	.4	3.7	3.7	.1	[g]	1.9	20.6	500
1955	6.2	5.7	—	—	.5	5.1	5.0	.1	[g]	1.1	21.7	405
1956	6.7	6.2	—	—	.5	5.8	5.7	.1	[g]	.9	22.5	371
1957	7.4	6.8	—	—	.6	7.5	7.3	.2	[g]	-.1	22.4	300
1958	8.1	7.6	—	—	.6	8.6	8.3	.2	$0.1	-.5	21.9	259
1959	8.6	8.1	—	—	.5	10.3	9.8	.2	.3	-1.7	20.1	212
1960	11.4	10.9	—	—	.5	11.2	10.7	.2	.3	.2	20.3	180
1961	11.8	11.3	—	—	.5	12.4	11.9	.2	.3	-.6	19.7	163
1962	12.6	12.1	—	—	.5	14.0	13.4	.3	.4	-1.4	18.3	141
1963	15.1	14.5	—	—	.5	14.9	14.2	.3	.4	.1	18.5	123
1964	16.3	15.7	—	—	.6	15.6	14.9	.3	.4	.6	19.1	118
1965	16.6	16.0	—	—	.6	17.5	16.7	.3	.4	-.9	18.2	109
1966	21.3	20.6	$0.1	—	.6	19.0	18.3	.3	.4	2.3	20.6	96
1967	24.0	23.1	.1	—	.8	20.4	19.5	.4	.5	3.7	24.2	101
1968	25.0	23.7	.4	—	.9	23.6	22.6	.5	.4	1.5	25.7	103
1969	29.6	27.9	.4	—	1.2	25.2	24.2	.5	.5	4.4	30.1	102
1970	32.2	30.3	.4	—	1.5	29.8	28.8	.5	.6	2.4	32.5	101
1971	35.9	33.7	.5	—	1.7	34.5	33.4	.5	.6	1.3	33.8	94
1972	40.1	37.8	.5	—	1.8	38.5	37.1	.7	.7	1.5	35.3	88
1973	48.3	46.0	.4	—	1.9	47.2	45.7	.6	.8	1.2	36.5	75
1974	54.7	52.1	.4	—	2.2	53.4	51.6	.9	.9	1.3	37.8	68
1975	59.6	56.8	.4	—	2.4	60.4	58.5	.9	1.0	-.8	37.0	63
1976	66.3	63.4	.6	—	2.3	67.9	65.7	1.0	1.2	-1.6	35.4	54
1977	72.4	69.6	.6	—	2.2	75.3	73.1	1.0	1.2	-2.9	32.5	47
1978	78.1	75.5	.6	—	2.0	83.1	80.4	1.1	1.6	-5.0	27.5	39
1979	90.3	87.9	.6	—	1.8	93.1	90.6	1.1	1.4	-2.9	24.7	30
1980	105.8	103.5	.5	—	1.8	107.7	105.1	1.2	1.4	-1.8	22.8	23
1981	125.4	122.6	.7	—	2.1	126.7	123.8	1.3	1.6	-1.3	21.5	18
1982	125.2	123.7	.7	—	.8	142.1	138.8	1.5	1.8	[h] .6	22.1	15
1983	150.6	138.3	5.5	—	6.7	153.0	149.2	1.5	2.3	-2.4	19.7	14
1984	169.3	159.5	4.7	$2.8	2.3	161.9	157.8	1.6	2.4	7.4	27.1	[i]20
1985	184.2	175.1	4.0	3.2	1.9	171.2	167.2	1.6	2.3	[h]8.7	35.8	[i]24
1986	197.4	189.1	1.8	3.4	3.1	181.0	176.8	1.6	2.6	[h]3.2	39.1	[i]28
1987	210.7	201.1	1.7	3.3	4.7	187.7	183.6	1.5	2.6	23.1	62.1	[i]30
1988	240.8	227.7	2.1	3.4	7.6	200.0	195.5	1.8	2.8	40.7	102.9	[i]41
1989	264.7	248.1	2.1	2.4	12.0	212.5	208.0	1.7	2.8	52.2	155.1	[i]59
1990	286.7	266.1	-.7	4.8	16.4	227.5	223.0	1.6	3.0	59.1	214.2	[i]78
1991	299.3	272.5	.1	5.9	20.8	245.6	240.5	1.8	3.4	53.7	267.8	87
1992	311.2	281.1	-.1	5.9	24.3	259.9	254.9	1.8	3.1	51.3	319.1	103
1993	323.3	290.9	[g]	5.3	27.0	273.1	267.8	2.0	3.4	50.2	369.3	117
1994	328.3	293.3	[g]	5.0	29.9	284.1	279.1	1.6	3.4	44.1	413.5	130

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Table VI.A1.— Operations of the OASI Trust Fund, Calendar Years 1937-2018 (Cont.)
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[a d]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
1995 . .	$342.8	$304.7	-$0.2	$5.5	$32.8	$297.8	$291.6	$2.1	$4.1	$45.0	$458.5	139
1996 . .	363.7	321.6	[g]	6.5	35.7	308.2	302.9	1.8	3.6	55.5	514.0	149
1997 . .	397.2	349.9	[g]	7.4	39.8	322.1	316.3	2.1	3.7	75.1	589.1	160
1998 . .	424.8	371.2	[g]	9.1	44.5	332.3	326.8	1.9	3.7	92.5	681.6	177
1999 . .	457.0	396.4	[g]	10.9	49.8	339.9	334.4	1.8	3.7	117.2	798.8	201
2000 . .	490.5	421.4	[g]	11.6	57.5	358.3	352.7	2.1	3.5	132.2	931.0	223
2001 . .	518.1	441.5	[g]	11.9	64.7	377.5	372.3	2.0	3.3	140.6	1,071.5	247
2002 . .	539.7	455.2	.4	12.9	71.2	393.7	388.1	2.1	3.5	146.0	1,217.5	272
2003 . .	543.8	456.1	[g]	12.5	75.2	406.0	399.8	2.6	3.6	137.8	1,355.3	300
2004 . .	566.3	472.8	[g]	14.6	79.0	421.0	415.0	2.4	3.6	145.3	1,500.6	322
2005 . .	604.3	506.9	-.3	13.8	84.0	441.9	435.4	3.0	3.6	162.4	1,663.0	340
2006 . .	642.2	534.8	[g]	15.6	91.8	461.0	454.5	3.0	3.5	181.3	1,844.3	361
2007 . .	675.0	560.9	[g]	17.2	97.0	495.7	489.1	3.1	3.6	179.3	2,023.6	372
2008 . .	695.5	574.6	[g]	15.6	105.3	516.2	509.3	3.2	3.6	179.3	2,202.9	392
2009 . .	698.2	570.4	[g]	19.9	107.9	564.3	557.2	3.4	3.7	133.9	2,336.8	390
2010 . .	677.1	544.8	2.0	22.1	108.2	584.9	577.4	3.5	3.9	92.2	2,429.0	400
2011 . .	698.8	482.4	87.8	22.2	106.5	603.8	596.2	3.5	4.1	95.0	2,524.1	402
2012 . .	731.1	503.9	97.7	26.7	102.8	645.5	637.9	3.4	4.1	85.6	2,609.7	391
2013 . .	743.8	620.8	4.2	20.7	98.1	679.5	672.1	3.4	3.9	64.3	2,674.0	384
2014 . .	769.4	646.2	.4	28.0	94.8	714.2	706.8	3.1	4.3	55.2	2,729.2	374
2015 . .	801.6	679.5	.3	30.6	91.2	750.5	742.9	3.4	4.3	51.0	2,780.3	364
2016 . .	797.5	678.8	.1	31.6	87.0	776.4	768.6	3.5	4.3	21.1	2,801.3	358
2017 . .	825.6	706.5	[g]	35.9	83.2	806.7	798.7	3.7	4.3	19.0	2,820.3	347
2018 . .	831.0	715.9	[g]	34.5	80.7	853.5	844.9	3.8	4.8	-22.4	2,797.9	330

[a] Beginning in 1979, benefit payments scheduled to be paid on January 3 of a given year were paid on December 31 of the preceding year as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Such advance payments have occurred about every 7 years, first for benefits scheduled for January 3, 1982. For comparability with other historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment in each year without regard to the accelerated payments described above.

[b] Includes net reimbursements from the General Fund of the Treasury to the OASI Trust Fund for: (1) the cost of noncontributory wage credits for military service before 1957; (2) the cost in 1971-82 of deemed wage credits for military service performed after 1956; (3) the cost of benefits to certain uninsured persons who attained age 72 before 1968; (4) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (5) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (6) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[c] Net interest includes net profits or losses on marketable investments. Beginning in 1967, the trust fund pays administrative expenses on an estimated basis, with a final adjustment including interest made in the following fiscal year. Net interest includes the amounts of these interest adjustments. The 1970 report describes the accounting for administrative expenses for years prior to 1967. Beginning in October 1973, figures include relatively small amounts of gifts to the fund. Net interest for 1983-86 reflects payments for interest on amounts owed under the interfund borrowing provisions. During 1983-90, net interest reflects interest reimbursements paid from the trust fund to the General Fund on advance tax transfers.

[d] Beginning in 1966, includes payments for vocational rehabilitation services furnished to disabled persons receiving benefits because of their disabilities. Beginning in 1983, net benefit amounts include reimbursements paid from the General Fund to the trust fund for unnegotiated benefit checks. Excluding the portion attributable to vocational rehabilitation services and unnegotiated benefit checks, amounts are the same as benefits scheduled under law at that time for all historical years.

[e] The "Trust fund ratio" column represents asset reserves at the beginning of a year as a percentage of cost during the year. The table shows no ratio for 1937 because no reserves existed at the beginning of the year.

[f] Operations prior to 1940 are for the Old-Age Reserve Account established by the original Social Security Act. The 1939 Amendments transferred the asset reserves of the Account to the OASI Trust Fund effective January 1, 1940.

[g] Between -$50 million and $50 million.

[h] Reflects interfund borrowing and subsequent repayment of loans. The OASI Trust Fund borrowed $17.5 billion from the DI and HI Trust Funds in 1982 and repaid the loans in 1985 ($4.4 billion) and 1986 ($13.2 billion).

[i] Reserves used for the trust fund ratio calculation include January advance tax transfers.

Note: Totals do not necessarily equal the sums of rounded components.

Table VI.A2.— Operations of the DI Trust Fund, Calendar Years 1957-2017
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[a d]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
1957. . .	$0.7	$0.7	—	—	[f]	$0.1	$0.1	[f]	—	$0.6	$0.6	—
1958. . .	1.0	1.0	—	—	[f]	.3	.2	[f]	—	.7	1.4	249
1959. . .	.9	.9	—	—	[f]	.5	.5	[f]	[f]	.4	1.8	284
1960. . .	1.1	1.0	—	—	$0.1	.6	.6	[f]	[f]	.5	2.3	304
1961. . .	1.1	1.0	—	—	.1	1.0	.9	$0.1	[f]	.1	2.4	239
1962. . .	1.1	1.0	—	—	.1	1.2	1.1	.1	[f]	-.1	2.4	206
1963. . .	1.2	1.1	—	—	.1	1.3	1.2	.1	[f]	-.1	2.2	183
1964. . .	1.2	1.2	—	—	.1	1.4	1.3	.1	[f]	-.2	2.0	159
1965. . .	1.2	1.2	—	—	.1	1.7	1.6	.1	[f]	-.4	1.6	121
1966. . .	2.1	2.0	[f]	—	.1	1.9	1.8	.1	[f]	.1	1.7	82
1967. . .	2.4	2.3	[f]	—	.1	2.1	1.9	.1	[f]	.3	2.0	83
1968. . .	3.5	3.3	[f]	—	.1	2.5	2.3	.1	[f]	1.0	3.0	83
1969. . .	3.8	3.6	[f]	—	.2	2.7	2.6	.1	[f]	1.1	4.1	111
1970. . .	4.8	4.5	[f]	—	.3	3.3	3.1	.2	[f]	1.5	5.6	126
1971. . .	5.0	4.6	$0.1	—	.4	4.0	3.8	.2	[f]	1.0	6.6	140
1972. . .	5.6	5.1	.1	—	.4	4.8	4.5	.2	[f]	.8	7.5	140
1973. . .	6.4	5.9	.1	—	.5	6.0	5.8	.2	[f]	.5	7.9	125
1974. . .	7.4	6.8	.1	—	.5	7.2	7.0	.2	[f]	.2	8.1	110
1975. . .	8.0	7.4	.1	—	.5	8.8	8.5	.3	[f]	-.8	7.4	92
1976. . .	8.8	8.2	.1	—	.4	10.4	10.1	.3	[f]	-1.6	5.7	71
1977. . .	9.6	9.1	.1	—	.3	11.9	11.5	.4	[f]	-2.4	3.4	48
1978. . .	13.8	13.4	.1	—	.3	13.0	12.6	.3	[f]	.9	4.2	26
1979. . .	15.6	15.1	.1	—	.4	14.2	13.8	.4	[f]	1.4	5.6	30
1980. . .	13.9	13.3	.1	—	.5	15.9	15.5	.4	[f]	-2.0	3.6	35
1981. . .	17.1	16.7	.2	—	.2	17.7	17.2	.4	[f]	-.6	3.0	21
1982. . .	22.7	22.0	.2	—	.5	18.0	17.4	.6	[f]	[g] -.4	2.7	17
1983. . .	20.7	18.0	1.1	—	1.6	18.2	17.5	.6	[f]	2.5	5.2	15
1984. . .	17.3	15.5	.4	$0.2	1.2	18.5	17.9	.6	[f]	-1.2	4.0	[h]35
1985. . .	19.3	17.0	1.2	.2	.9	19.5	18.8	.6	[f]	[g]2.4	6.3	[h]27
1986. . .	19.4	18.2	.2	.2	.8	20.5	19.9	.6	$0.1	[g]1.5	7.8	[h]38
1987. . .	20.3	19.5	.2	[f]	.6	21.4	20.5	.8	.1	-1.1	6.7	[h]44
1988. . .	22.7	21.8	.2	.1	.6	22.5	21.7	.7	.1	.2	6.9	[h]38
1989. . .	24.8	23.8	.2	.1	.7	23.8	22.9	.8	.1	1.0	7.9	[h]38
1990. . .	28.8	28.4	-.6	.1	.9	25.6	24.8	.7	.1	3.2	11.1	[h]40
1991. . .	30.4	29.1	[f]	.2	1.1	28.6	27.7	.8	.1	1.8	12.9	39
1992. . .	31.4	30.1	[f]	.2	1.1	32.0	31.1	.8	.1	-.6	12.3	40
1993. . .	32.3	31.2	[f]	.3	.8	35.7	34.6	1.0	.1	-3.4	9.0	35
1994. . .	52.8	51.4	[f]	.3	1.2	38.9	37.7	1.0	.1	14.0	22.9	23
1995. . .	56.7	54.4	-.2	.3	2.2	42.1	40.9	1.1	.1	14.6	37.6	55
1996. . .	60.7	57.3	[f]	.4	3.0	45.4	44.2	1.2	[f]	15.4	52.9	83
1997. . .	60.5	56.0	[f]	.5	4.0	47.0	45.7	1.3	.1	13.5	66.4	113
1998. . .	64.4	59.0	[f]	.6	4.8	49.9	48.2	1.6	.2	14.4	80.8	133
1999. . .	69.5	63.2	[f]	.7	5.7	53.0	51.4	1.5	.1	16.5	97.3	152
2000. . .	77.9	71.1	-.8	.7	6.9	56.8	55.0	1.6	.2	21.1	118.5	171
2001. . .	83.9	74.9	[f]	.8	8.2	61.4	59.6	1.7	[f]	22.5	141.0	193
2002. . .	87.4	77.3	[f]	.9	9.2	67.9	65.7	2.0	.2	19.5	160.5	208
2003. . .	88.1	77.4	[f]	.9	9.7	73.1	70.9	2.0	.2	15.0	175.4	219
2004. . .	91.4	80.3	[f]	1.1	10.0	80.6	78.2	2.2	.2	10.8	186.2	218
2005. . .	97.4	86.1	[f]	1.1	10.3	88.0	85.4	2.3	.3	9.4	195.6	212
2006. . .	102.6	90.8	[f]	1.2	10.6	94.5	91.7	2.3	.4	8.2	203.8	207
2007. . .	109.9	95.2	[f]	1.4	13.2	98.8	95.9	2.5	.4	11.1	214.9	206
2008. . .	109.8	97.6	[f]	1.3	11.0	109.0	106.0	2.5	.4	.9	215.8	197
2009. . .	109.3	96.9	[f]	2.0	10.5	121.5	118.3	2.7	.4	-12.2	203.5	178

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Table VI.A2.— Operations of the DI Trust Fund, Calendar Years 1957-2017 (Cont.)
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[a d]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
2010 . .	$104.0	$92.5	$0.4	$1.9	$9.3	$127.7	$124.2	$3.0	$0.5	-$23.6	$179.9	159
2011 . .	106.3	81.9	14.9	1.6	7.9	132.3	128.9	2.9	.5	-26.1	153.9	136
2012 . .	109.1	85.6	16.5	.6	6.4	140.3	136.9	2.9	.5	-31.2	122.7	110
2013 . .	111.2	105.4	.7	.4	4.7	143.4	140.1	2.8	.6	-32.2	90.4	86
2014 . .	114.9	109.7	.1	1.7	3.4	145.1	141.7	2.9	.4	-30.2	60.2	62
2015 . .	118.6	115.4	[f]	1.1	2.1	146.6	143.4	2.8	.4	-28.0	32.3	41
2016 . .	160.0	157.4	[f]	1.2	1.4	145.9	142.8	2.8	.4	14.1	46.3	22
2017 . .	171.0	167.1	[f]	2.0	1.9	145.8	142.8	2.8	.2	25.1	71.5	32
2018 . .	172.3	169.2	[f]	.5	2.6	146.8	143.7	2.9	.2	25.6	97.1	49

[a] Beginning in 1979, benefit payments scheduled to be paid on January 3 of a given year were paid on December 31 of the preceding year as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Such advance payments have occurred about every 7 years, first for benefits scheduled for January 3, 1982. For comparability with other historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment in each year without regard to the accelerated payments described above.

[b] Includes net reimbursements from the General Fund of the Treasury to the DI Trust Fund for: (1) the cost of noncontributory wage credits for military service before 1957; (2) the cost in 1971-82 of deemed wage credits for military service performed after 1956; (3) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (4) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (5) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[c] Net interest includes net profits or losses on marketable investments. Beginning in 1967, the trust fund pays administrative expenses on an estimated basis, with a final adjustment including interest made in the following fiscal year. Net interest includes the amounts of these interest adjustments. The 1970 report describes the accounting for administrative expenses for years prior to 1967. Beginning in July 1974, figures include relatively small amounts of gifts to the fund. Net interest for 1983-86 reflects payments for interest on amounts owed under the interfund borrowing provisions. During 1983-90, net interest reflects interest reimbursements paid from the trust fund to the General Fund on advance tax transfers.

[d] Beginning in 1966, includes payments for vocational rehabilitation services furnished to disabled persons receiving benefits because of their disabilities. Beginning in 1983, net benefit amounts include reimbursements paid from the General Fund to the trust fund for unnegotiated benefit checks. Excluding the portion attributable to vocational rehabilitation services and unnegotiated benefit checks, amounts are the same as benefits scheduled under law at that time for all historical years.

[e] The "Trust fund ratio" column represents asset reserves at the beginning of a year as a percentage of cost during the year. The table shows no ratio for 1957 because no reserves existed at the beginning of the year.

[f] Between -$50 million and $50 million.

[g] Reflects interfund borrowing and subsequent repayment of loans. The DI Trust Fund loaned $5.1 billion to the OASI Trust Fund in 1982. The OASI Trust Fund repaid the loan in 1985 ($2.5 billion) and 1986 ($2.5 billion).

[h] Reserves used for the trust fund ratio calculation include January advance tax transfers.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.A3.— Operations of the Combined OASI and DI Trust Funds, Calendar Years 1957-2018
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[a,d]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
1957	$8.1	$7.5	—	—	$0.6	$7.6	$7.4	$0.2	[f]	$0.5	$23.0	298
1958	9.1	8.5	—	—	.6	8.9	8.6	.2	$0.1	.2	23.2	259
1959	9.5	8.9	—	—	.6	10.8	10.3	.2	.3	-1.3	22.0	215
1960	12.4	11.9	—	—	.6	11.8	11.2	.2	.3	.6	22.6	186
1961	12.9	12.3	—	—	.6	13.4	12.7	.3	.3	-.5	22.2	169
1962	13.7	13.1	—	—	.6	15.2	14.5	.3	.4	-1.5	20.7	146
1963	16.2	15.6	—	—	.6	16.2	15.4	.3	.4	[f]	20.7	128
1964	17.5	16.8	—	—	.6	17.0	16.2	.4	.4	.5	21.2	122
1965	17.9	17.2	—	—	.7	19.2	18.3	.4	.5	-1.3	19.8	110
1966	23.4	22.6	$0.1	—	.7	20.9	20.1	.4	.5	2.5	22.3	95
1967	26.4	25.4	.1	—	.9	22.5	21.4	.5	.5	3.9	26.3	99
1968	28.5	27.0	.4	—	1.0	26.0	25.0	.6	.5	2.5	28.7	101
1969	33.3	31.5	.5	—	1.3	27.9	26.8	.6	.5	5.5	34.2	103
1970	37.0	34.7	.5	—	1.8	33.1	31.9	.6	.6	3.9	38.1	103
1971	40.9	38.3	.5	—	2.0	38.5	37.2	.7	.6	2.4	40.4	99
1972	45.6	42.9	.5	—	2.2	43.3	41.6	.9	.7	2.3	42.8	93
1973	54.8	51.9	.5	—	2.4	53.1	51.5	.8	.8	1.6	44.4	80
1974	62.1	58.9	.5	—	2.7	60.6	58.6	1.1	.9	1.5	45.9	73
1975	67.6	64.3	.5	—	2.9	69.2	67.0	1.2	1.0	-1.5	44.3	66
1976	75.0	71.6	.7	—	2.7	78.2	75.8	1.2	1.2	-3.2	41.1	57
1977	82.0	78.7	.7	—	2.5	87.3	84.7	1.4	1.2	-5.3	35.9	47
1978	91.9	88.9	.8	—	2.3	96.0	93.0	1.4	1.6	-4.1	31.7	37
1979	105.9	103.0	.7	—	2.2	107.3	104.4	1.5	1.5	-1.5	30.3	30
1980	119.7	116.7	.7	—	2.3	123.5	120.6	1.5	1.4	-3.8	26.5	25
1981	142.4	139.4	.8	—	2.2	144.4	141.0	1.7	1.6	-1.9	24.5	18
1982	147.9	145.7	.9	—	1.4	160.1	156.2	2.1	1.8	[g] .2	24.8	15
1983	171.3	156.3	6.7	—	8.3	171.2	166.7	2.2	2.3	.1	24.9	14
1984	186.6	175.0	5.2	$3.0	3.4	180.4	175.7	2.3	2.4	6.2	31.1	[h]21
1985	203.5	192.1	5.2	3.4	2.7	190.6	186.1	2.2	2.4	[g]11.1	42.2	[h]24
1986	216.8	207.4	1.9	3.7	3.9	201.5	196.7	2.2	2.7	[g] 4.7	46.9	[h]29
1987	231.0	220.6	1.9	3.2	5.3	209.1	204.1	2.4	2.6	21.9	68.8	[h]31
1988	263.5	249.5	2.3	3.4	8.2	222.5	217.1	2.5	2.9	41.0	109.8	[h]41
1989	289.4	271.9	2.3	2.5	12.7	236.2	230.9	2.4	2.9	53.2	163.0	[h]57
1990	315.4	294.5	-1.3	5.0	17.2	253.1	247.8	2.3	3.0	62.3	225.3	[h]75
1991	329.7	301.6	.1	6.1	21.9	274.2	268.2	2.6	3.5	55.5	280.7	82
1992	342.6	311.3	-.1	6.1	25.4	291.9	286.0	2.7	3.2	50.7	331.5	96
1993	355.6	322.0	.1	5.6	27.9	308.8	302.4	3.0	3.4	46.8	378.3	107
1994	381.1	344.7	[f]	5.3	31.1	323.0	316.8	2.7	3.5	58.1	436.4	117
1995	399.5	359.1	-.4	5.8	35.0	339.8	332.6	3.1	4.1	59.7	496.1	128
1996	424.5	378.9	[f]	6.8	38.7	353.6	347.0	3.0	3.6	70.9	567.0	140
1997	457.7	406.0	[f]	7.9	43.8	369.1	362.0	3.4	3.7	88.6	655.5	154
1998	489.2	430.2	[f]	9.7	49.3	382.3	375.0	3.5	3.8	106.9	762.5	171
1999	526.6	459.6	[f]	11.6	55.5	392.9	385.8	3.3	3.8	133.7	896.1	194
2000	568.4	492.5	-.8	12.3	64.5	415.1	407.6	3.8	3.7	153.3	1,049.4	216
2001	602.0	516.4	[f]	12.7	72.9	438.9	431.9	3.7	3.3	163.1	1,212.5	239
2002	627.1	532.5	.4	13.8	80.4	461.7	453.8	4.2	3.6	165.4	1,378.0	263
2003	631.9	533.5	[f]	13.4	84.9	479.1	470.8	4.6	3.7	152.8	1,530.8	288
2004	657.7	553.0	[f]	15.7	89.0	501.6	493.3	4.5	3.8	156.1	1,686.8	305

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Table VI.A3.— Operations of the Combined OASI and DI Trust Funds, Calendar Years 1957-2018 (Cont.)
[Dollar amounts in billions]

Calendar year	Income					Cost				Asset Reserves[a]		
	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits	Net interest[c]	Total[a]	Benefit payments[a,d]	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[e]
2005 . .	$701.8	$592.9	-$0.3	$14.9	$94.3	$529.9	$520.7	$5.3	$3.9	$171.8	$1,858.7	318
2006 . .	744.9	625.6	[f]	16.9	102.4	555.4	546.2	5.3	3.8	189.5	2,048.1	335
2007 . .	784.9	656.1	[f]	18.6	110.2	594.5	584.9	5.5	4.0	190.4	2,238.5	345
2008 . .	805.3	672.1	[f]	16.9	116.3	625.1	615.3	5.7	4.0	180.2	2,418.7	358
2009 . .	807.5	667.3	[f]	21.9	118.3	685.8	675.5	6.2	4.1	121.7	2,540.3	353
2010 . .	781.1	637.3	2.4	23.9	117.5	712.5	701.6	6.5	4.4	68.6	2,609.0	357
2011 . .	805.1	564.2	102.7	23.8	114.4	736.1	725.1	6.4	4.6	69.0	2,677.9	354
2012 . .	840.2	589.5	114.3	27.3	109.1	785.8	774.8	6.3	4.7	54.4	2,732.3	341
2013 . .	855.0	726.2	4.9	21.1	102.8	822.9	812.3	6.2	4.5	32.1	2,764.4	332
2014 . .	884.3	756.0	.5	29.6	98.2	859.2	848.5	6.1	4.7	25.0	2,789.5	322
2015 . .	920.2	794.9	.3	31.6	93.3	897.1	886.3	6.2	4.7	23.0	2,812.5	311
2016 . .	957.5	836.2	.1	32.8	88.4	922.3	911.4	6.2	4.7	35.2	2,847.7	305
2017 . .	996.6	873.6	[f]	37.9	85.1	952.5	941.5	6.5	4.5	44.1	2,891.8	299
2018 . .	1,003.4	885.1	[f]	35.0	83.3	1,000.2	988.6	6.7	4.9	3.1	2,894.9	289

[a] Beginning in 1979, benefit payments scheduled to be paid on January 3 of a given year were paid on December 31 of the preceding year as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Such advance payments have occurred about every 7 years, first for benefits scheduled for January 3, 1982. For comparability with other historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment in each year without regard to the accelerated payments described above.

[b] Includes net reimbursements from the General Fund of the Treasury to the OASI and DI Trust Funds for: (1) the cost of noncontributory wage credits for military service before 1957; (2) the cost in 1971-82 of deemed wage credits for military service performed after 1956; (3) the cost of benefits to certain uninsured persons who attained age 72 before 1968; (4) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (5) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (6) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

[c] Net interest includes net profits or losses on marketable investments. Beginning in 1967, the trust funds pay administrative expenses on an estimated basis, with a final adjustment including interest made in the following fiscal year. Net interest includes the amounts of these interest adjustments. The 1970 report describes the accounting for administrative expenses for years prior to 1967. Beginning in October 1973, figures include relatively small amounts of gifts to the funds. Net interest for 1983-86 reflects payments for interest on amounts owed under the interfund borrowing provisions. During 1983-90, net interest reflects interest reimbursements paid from the trust funds to the General Fund on advance tax transfers.

[d] Beginning in 1966, includes payments for vocational rehabilitation services furnished to disabled persons receiving benefits because of their disabilities. Beginning in 1983, net benefit amounts include reimbursements paid from the General Fund to the trust funds for unnegotiated benefit checks. Excluding the portion attributable to vocational rehabilitation services and unnegotiated benefit checks, amounts are the same as benefits scheduled under law at that time for all historical years.

[e] The "Trust fund ratio" column represents asset reserves at the beginning of a year as a percentage of cost during the year.

[f] Between -$50 million and $50 million.

[g] Reflects interfund borrowing and subsequent repayment of loans. The OASI Trust Fund borrowed $12.4 billion from the HI Trust Fund in 1982 and repaid the loan in 1985 ($1.8 billion) and 1986 ($10.6 billion).

[h] Reserves used for the trust fund ratio calculation include January advance tax transfers.

Note: Totals do not necessarily equal the sums of rounded components.

Tables VI.A4 and VI.A5 show the total asset reserves of the OASI Trust Fund and the DI Trust Fund, respectively, at the end of calendar years 2017 and 2018. The tables show the invested asset reserves by interest rate and year of maturity. Bonds issued to the trust funds in 2018 had an interest rate of 2.875 percent, compared with an interest rate of 2.250 percent for bonds issued in 2017.

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Table VI.A4.—OASI Trust Fund Asset Reserves, End of Calendar Years 2017 and 2018
[In thousands]

	December 31, 2017	December 31, 2018
Obligations sold only to the trust funds (special issue securities):		
Certificates of indebtedness:		
2.375 percent, 2018	$48,361,532	—
3.000 percent, 2019	—	$52,867,020
Bonds:		
1.375 percent, 2019	6,693,020	—
1.375 percent, 2020-25	40,158,120	40,158,120
1.375 percent, 2026	6,693,019	6,693,019
1.375 percent, 2027	173,240,401	173,240,401
1.750 percent, 2019	4,908,185	—
1.750 percent, 2020-25	29,449,110	29,449,110
1.750 percent, 2026-27	9,816,372	9,816,372
1.750 percent, 2028	178,148,587	178,148,587
1.875 percent, 2019	2,320,955	—
1.875 percent, 2020-27	18,567,648	18,567,648
1.875 percent, 2028-30	6,962,865	6,962,865
1.875 percent, 2031	188,111,583	188,111,583
2.000 percent, 2019	3,655,629	—
2.000 percent, 2020-25	21,933,768	21,933,768
2.000 percent, 2026-29	14,622,516	14,622,516
2.000 percent, 2030	185,790,628	185,790,628
2.250 percent, 2019	5,582,927	—
2.250 percent, 2020-25	33,497,562	33,497,562
2.250 percent, 2026-27	11,165,852	11,165,852
2.250 percent, 2028	5,582,927	5,582,927
2.250 percent, 2029	183,731,514	183,731,514
2.250 percent, 2030-31	3,193,030	3,193,030
2.250 percent, 2032	189,708,097	189,708,097
2.500 percent, 2019	5,971,787	—
2.500 percent, 2020-25	35,830,722	35,830,722
2.500 percent, 2026	166,547,382	166,547,382
2.875 percent, 2019	7,264,432	—
2.875 percent, 2020-24	36,322,160	36,322,160
2.875 percent, 2025	160,575,595	160,575,595
2.875 percent, 2032	—	1
2.875 percent, 2033	—	176,889,560
3.250 percent, 2019	10,628,270	—
3.250 percent, 2020-23	42,513,080	42,513,080
3.250 percent, 2024	153,311,163	153,311,163
3.500 percent, 2018	60,311,343	—
4.000 percent, 2018	12,075,192	—
4.000 percent, 2019	12,075,192	—
4.000 percent, 2020-22	36,225,576	36,225,576
4.000 percent, 2023	142,682,893	142,682,893
4.125 percent, 2018	10,516,946	—
4.125 percent, 2019	10,516,946	—
4.125 percent, 2020	106,585,700	106,585,700
4.625 percent, 2018	9,167,663	—

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Table VI.A4.—OASI Trust Fund Asset Reserves, End of Calendar Years 2017 and 2018 (Cont.)
[In thousands]

	December 31, 2017	December 31, 2018
4.625 percent, 2019	96,068,657	77,990,001
5.000 percent, 2018	12,454,232	—
5.000 percent, 2019-21	37,362,696	37,362,696
5.000 percent, 2022	130,607,701	130,607,701
5.125 percent, 2018	11,567,866	—
5.125 percent, 2019	11,567,866	11,567,866
5.125 percent, 2020	11,567,769	11,567,769
5.125 percent, 2021	118,153,469	118,153,469
Total investments	2,820,368,145	2,797,973,953
Undisbursed balances[a]	-58,948	-102,175
Total asset reserves	2,820,309,197	2,797,871,778

[a] A negative amount for a given year represents a situation where actual program cost exceeded the amount of invested securities of the OASI Trust Fund that were redeemed to cover such cost. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Amounts of special issue securities are at par value. The trust fund purchases and redeems special issue securities at par value. The table groups equal amounts that mature in two or more years at a given interest rate.

Table VI.A5.—DI Trust Fund Asset Reserves, End of Calendar Years 2017 and 2018
[In thousands]

	December 31, 2017	December 31, 2018
Obligations sold only to the trust funds (special issue securities):		
Certificates of indebtedness:		
2.375 percent, 2018	$14,830,708	—
3.000 percent, 2019	—	$9,771,433
3.125 percent, 2019	—	7,340,572
Bonds:		
1.875 percent, 2019	3,011,390	—
1.875 percent, 2020-22	9,034,170	9,034,170
2.250 percent, 2019	6,309,802	—
2.250 percent, 2020	6,309,802	6,309,802
2.250 percent, 2021	6,309,801	6,309,801
2.875 percent, 2024-25	—	7,248,238
2.875 percent, 2026-32	—	25,368,826
4.000 percent, 2023	14,675,554	14,675,554
5.000 percent, 2022	11,142,596	11,142,596
Total investments	71,623,823	97,200,992
Undisbursed balances[a]	-143,810	-143,908
Total asset reserves	71,480,013	97,057,084

[a] A negative amount for a given year represents a situation where actual program cost exceeded the amount of invested securities of the DI Trust Fund that were redeemed to cover such cost. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Amounts of special issue securities are at par value. The trust fund purchases and redeems special issue securities at par value. The table groups equal amounts that mature in two or more years at a given interest rate.

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B. HISTORY OF ACTUARIAL STATUS ESTIMATES

This appendix chronicles the history of the OASDI actuarial balance and the year of combined OASI and DI Trust Fund reserve depletion since 1982 under the intermediate assumptions. The actuarial balance is the principal summary measure of actuarial status for the long-range period as a whole. The year of trust fund reserve depletion is also critical, as it indicates the year by which legislative action would be needed in order to maintain timely payment of scheduled benefits.

The 1983 report was the last report for which the actuarial balance was positive. The two basic components of actuarial balance are the summarized income rate and the summarized cost rate, both of which are expressed as percentages of taxable payroll over the period. Section IV.B.4 defines the summarized income rate, summarized cost rate, and actuarial balance in detail. For any given period, the actuarial balance includes the difference between the present value of non-interest income for the period and the present value of the cost for the period, each divided by the present value of taxable payroll for all years in the period. The computation of the actuarial balance also includes:

- In the reports for 1988 and later, the amount of the trust fund asset reserves on hand at the beginning of the valuation period; and
- In the reports for 1991 and later, the present value of a target trust fund asset reserve equal to 100 percent of the annual cost to be reached and maintained at the end of the valuation period.

Reports of 1973-87 used the average-cost method, a simpler method which approximates the results of the present-value approach for computing the actuarial balance. Under the average-cost method, the sum of the annual cost rates over the 75-year projection period was divided by the total number of years, 75, to obtain the average cost rate per year. A similar computation produced the average income rate. The actuarial balance was the difference between the average income rate and the average cost rate.

When the 1973 report introduced the average-cost method, the financing of the program was more nearly on a pay-as-you-go basis over the long-range. Also, the long-range demographic and economic assumptions in that report produced an annual rate of growth in total taxable payroll which was about the same as the annual rate at which the trust funds earned interest. In either circumstance (i.e., pay-as-you-go financing, where the annual income rate is the same as the annual cost rate, or an annual rate of growth in total taxable payroll equal to the annual interest rate), the average-cost method produces

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the same result as the present-value method. However, by 1988, neither of these circumstances still existed.

After the 1977 and 1983 Social Security Amendments, projections indicated substantial increases in the trust fund reserves continuing well into the 21st century. These laws changed the program's financing from essentially pay-as-you-go to partial advance funding through the 75-year period. Also, for the reports from 1973 through 1987, long-range fertility rates and average real-wage growth assumptions were gradually reduced, resulting in an annual rate of growth in taxable payroll that was significantly lower than the assumed interest rate by 1987. As a result of the difference between this rate of growth and the assumed interest rate, the results of the average-cost method and the present-value method began to diverge in the reports for 1973 through 1987, and by 1988 they were quite different. While the average-cost method reflected most of the effects of assumed interest rates, it no longer reflected all interest effects. The present-value method, by contrast, accurately reflects the implications of assumed interest rates. As a result, the 1988 report reintroduced the present-value method of calculating the actuarial balance.

A positive actuarial balance indicates that estimated income (plus starting reserves, beginning with the 1988 report) is more than sufficient to meet estimated trust fund obligations (plus the ending target fund, beginning with the 1991 report) for the period as a whole. Even with a positive actuarial balance, it is possible for reserves to become temporarily depleted within the long-range period. An actuarial balance of zero indicates that the estimated income (plus starting reserves, beginning with the 1988 report) exactly matches estimated trust fund obligations (plus the ending target fund, beginning with the 1991 report) for the period as a whole. A negative actuarial balance indicates that estimated income (plus starting reserves, beginning with the 1988 report) is insufficient to meet estimated trust fund obligations (plus the ending target fund, beginning with the 1991 report) for the entire period.

Table VI.B1 contains the estimated OASDI actuarial balances, summarized income rates, and summarized cost rates for the 1982 report through the current report. The reports presented these values on the basis of the intermediate assumptions, which recent reports refer to as alternative II and reports from 1982 to 1990 referred to as alternative II-B.

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Table VI.B1.—Long-Range OASDI Actuarial Balances and Trust Fund Reserve Depletion Dates as Shown in the Trustees Reports for 1982-2019 under Intermediate Assumptions[a]

[As a percentage of taxable payroll]

Year of report	Summarized income rate	Summarized cost rate	Actuarial balance[b]	Change from previous year[c]	Year of combined trust fund reserve depletion
1982	12.27	14.09	-1.82	[d]	1983
1983	12.87	12.84	+.02	+1.84	solvent
1984	12.90	12.95	-.06	-.08	solvent
1985	12.94	13.35	-.41	-.35	2049
1986	12.96	13.40	-.44	-.03	2051
1987	12.89	13.51	-.62	-.18	2051
1988	12.94	13.52	-.58	+.04	2048
1989	13.02	13.72	-.70	-.13	2046
1990	13.04	13.95	-.91	-.21	2043
1991	13.11	14.19	-1.08	-.17	2041
1992	13.16	14.63	-1.46	-.38	2036
1993	13.21	14.67	-1.46	[d]	2036
1994	13.24	15.37	-2.13	-.66	2029
1995	13.27	15.44	-2.17	-.04	2030
1996	13.33	15.52	-2.19	-.02	2029
1997	13.37	15.60	-2.23	-.03	2029
1998	13.45	15.64	-2.19	+.04	2032
1999	13.49	15.56	-2.07	+.12	2034
2000	13.51	15.40	-1.89	+.17	2037
2001	13.58	15.44	-1.86	+.03	2038
2002	13.72	15.59	-1.87	-.01	2041
2003	13.78	15.70	-1.92	-.04	2042
2004	13.84	15.73	-1.89	+.03	2042
2005	13.87	15.79	-1.92	-.04	2041
2006	13.88	15.90	-2.02	-.09	2040
2007	13.92	15.87	-1.95	+.06	2041
2008	13.94	15.63	-1.70	+.26	2041
2009	14.02	16.02	-2.00	-.30	2037
2010	14.01	15.93	-1.92	+.08	2037
2011	14.02	16.25	-2.22	-.30	2036
2012	14.02	16.69	-2.67	-.44	2033
2013	13.88	16.60	-2.72	-.05	2033
2014	13.89	16.77	-2.88	-.16	2033
2015	13.86	16.55	-2.68	+.20	2034
2016	13.84	16.50	-2.66	+.02	2034
2017	13.84	16.67	-2.83	-.17	2034
2018	13.84	16.69	-2.84	-.02	2034
2019	13.81	16.60	-2.78	+.06	2035

[a] This table shows the actuarial balance and year of trust fund reserve depletion based on the intermediate assumptions, which the 1982-90 reports referred to as alternative II-B and the 1991 and later reports refer to as alternative II.

[b] The definition and method of calculating the actuarial balance were changed in 1988 and 1991. See text for details.

[c] A detailed year-by-year breakdown of the reasons for the changes in the actuarial balance since the 1983 Trustees Report may be found in Actuarial Note 2019.8 at www.ssa.gov/OACT/NOTES/ran8/.

[d] Between -0.005 and 0.005 percent of taxable payroll.

Note: Totals do not necessarily equal the sums of rounded components.

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For several of the years included in the table, significant legislative changes or definitional changes affected the estimated actuarial balance. The Social Security Amendments of 1983 account for the largest single change shown in the table: the actuarial balance of -1.82 for the 1982 report improved to +0.02 for the 1983 report. In 1985, the estimated actuarial balance changed largely because of an adjustment made to the method for estimating the age distribution of immigrants.

Rebenchmarking of the National Income and Product Accounts and changes in demographic assumptions contributed to the change in the actuarial balance for 1987. Various changes in assumptions and methods for the 1988 report had roughly offsetting effects on the actuarial balance. In 1989 and 1990, changes in economic assumptions accounted for most of the changes in the estimated actuarial balance.

In 1991, the effect of legislation, changes in economic assumptions, and the introduction of the cost of reaching and maintaining an ending target trust fund level combined to produce the change in the actuarial balance. In 1992, changes in disability assumptions and the method for projecting average benefit levels accounted for most of the change in the actuarial balance. In 1993, numerous small changes in assumptions and methods had offsetting effects on the actuarial balance. In 1994, changes in the real-wage assumptions, disability rates, and the earnings sample used for projecting average benefit levels accounted for most of the change in the actuarial balance. In 1995, numerous small changes had largely offsetting effects on the actuarial balance, including a substantial reallocation of the payroll tax rate, which reduced the OASI actuarial balance, but increased the DI actuarial balance.

In 1996, a change in the method of projecting dually-entitled beneficiaries produced a large increase in the actuarial balance, which almost totally offset decreases produced by changes in the valuation period and in the demographic and economic assumptions. Various changes in assumptions and methods for the 1997 report had roughly offsetting effects on the actuarial balance. In 1998, increases caused by changes in the economic assumptions, although partially offset by decreases produced by changes in the valuation period and in the demographic assumptions, accounted for most of the changes in the estimated actuarial balance. In 1999, increases caused by changes in the economic assumptions (related to improvements in the CPI by the Bureau of Labor Statistics) accounted for most of the changes in the estimated actuarial balance. For the 2000 report, changes in economic assumptions and methodology caused increases in the actuarial balance, although reductions in the balance caused by the change in valuation period and changes in demographic assumptions partially offset these increases.

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For the 2001 report, increases caused by changes in the demographic starting values, although partially offset by a decrease produced by the change in the valuation period, accounted for most of the changes in the estimated actuarial balance. For the 2002 report, changes in the valuation period and the demographic assumptions—both decreases in the actuarial balance—were offset by changes in the economic assumptions, while an increase due to disability assumptions was slightly more than offset by a decrease due to changes in the projection methods and data. For the 2003 report, an increase due to the change in program assumptions was more than offset by decreases due to the change in valuation period and changes in demographic assumptions. In the 2004 report, increases due to changing the method of projecting benefit levels for higher earners more than offset decreases in the actuarial balance arising from the change in the valuation period and the net effect of other changes in programmatic data and methods. For the 2005 report, an increase due to changing the method of projecting future average benefit levels was more than offset by decreases due to changes in the valuation period, updated starting values for the economic assumptions, and other methodological changes.

In 2006, decreases in the actuarial balance due to the change in the valuation period, a reduction in the ultimate annual real interest rate, and improvements in calculating mortality for disabled workers, were greater in aggregate than increases in the actuarial balance due to changes in demographic starting values and the ultimate total fertility rate, as well as other programmatic data and method changes. For the 2007 report, increases in the actuarial balance arising from revised disability incidence rate assumptions, improvements in average benefit level projections, and changes in near-term economic projections, more than offset decreases in the balance due to the valuation period change and updated historical mortality data. For the 2008 report, the large increase in the actuarial balance was primarily due to changes in immigration projection methods and assumptions. These changes more than offset the decreases in the actuarial balance due to the change in the valuation period and the lower starting and ultimate mortality rates. In 2009, changes in starting values and near-term economic assumptions due to the economic recession, faster ultimate rates of decline in death rates for ages 65-84, and the change in the valuation period accounted for most of the large decrease in the actuarial balance. Legislative changes, in particular the estimated effects of the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act of 2010, were the main reason for the increase in the actuarial balance for the 2010 report. The change in the valuation period partially offset this increase; there were also changes in

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several assumptions, methods, and recent data which had largely offsetting effects.

For the 2011 report, changes in mortality projections, due to new starting values and revised methods, were the most significant of several factors contributing to the increase in the deficit. In 2012, changes in economic assumptions and starting values accounted for about half of the decrease in actuarial balance. Other factors worsening the actuarial balance were the change in valuation period, changes to starting demographic values, changes to ultimate disability incidence assumptions, and methodology changes and data updates. For the 2013 report, the change in valuation period accounted for the entire net change in the actuarial balance. The effects of substantially lower death rates for 2009 than previously projected and the American Taxpayer Relief Act of 2012 (which lowered the Federal marginal income tax rates) were offset by updates of program-specific data and methodology improvements. In 2014, changes in economic data and assumptions accounted for the majority of the net change in the actuarial balance. Other factors worsening the actuarial balance were the change in the valuation period and various methodology improvements and data updates. For the 2015 report, methodological improvements and updates of programmatic data accounted for the majority of the net increase in the actuarial balance. Also increasing the actuarial balance were a lower assumed ultimate average wage differential and changes in near-term economic assumptions. These increases were offset somewhat by the change in the valuation period and updates to historical and near-term projected birth rates.

For the 2016 report, the actuarial balance increased primarily due to the effects of the Bipartisan Budget Act of 2015 and improvements made to immigration methods. The most notable immigration change was a revision to the method for projecting emigration of the never-authorized population to reflect lower rates of emigration for those who have resided here longer. These increases in the actuarial balance were largely offset by the effects of changes in ultimate economic assumptions, including a lower real interest rate and a lower annual increase in the rate of price inflation. In 2017, the change in the valuation period and various methodology improvements accounted for most of the net reduction in the actuarial balance. Other economic factors also contributed to worsening the actuarial balance, including a lower real-wage differential assumption and an assumed weaker recovery from the recent recession. These reductions were offset somewhat by lower estimated disability incidence rates over the short-range period.

For the 2018 report, incorporating the effects of lower-than-expected birth rates, lower near-term fertility assumptions, and the change in the valuation

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period decreased the actuarial balance. Offsetting these factors to a large degree were the effects of higher-than-expected death rates and several methods improvements, most notably an update to the sample used to project average benefit levels for newly-entitled worker beneficiaries.

Section IV.B.6 describes changes affecting the actuarial balance shown for the 2019 report.

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C. FISCAL YEAR HISTORICAL AND PROJECTED TRUST FUND OPERATIONS THROUGH 2028

Tables VI.C1, VI.C2, and VI.C3 contain details of the fiscal year 2018 operations of the OASI, DI, and the combined OASI and DI Trust Funds, respectively. The fiscal year for the U.S. Government is the 12-month period ending September 30. Fiscal year 2018 is the most recent fiscal year for which complete information is available. The descriptions of the values in these tables are similar to the corresponding descriptions and values in the calendar year operations tables in section III.A. Please see that section for a description of the various items of income and cost.

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Table VI.C1.—Operations of the OASI Trust Fund, Fiscal Year 2018
[In millions]

Total asset reserves, September 30, 2017		$2,820,101
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$708,547	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-2,420	
Net payroll tax contributions[a]		706,127
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L.s 111-312, 112-78, and 112-96[a]	11	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		11
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	214	
All other, not subject to withholding[a]	34,504	
Total income from taxation of benefits[a]		34,718
Investment income and interest adjustments:		
Interest on investments	81,583	
Interest adjustments[c]	[b]	
Total investment income and interest adjustments		81,583
Gifts		[b]
Total income		822,440
Cost:		
Benefit payments:		
Monthly benefits and lump-sum death payments[d]	833,063	
Reimbursement from the General Fund for unnegotiated checks	-37	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	8	
Net benefit payments[d]		833,034
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		4,769
Administrative expenses:		
Costs incurred by:		
Social Security Administration	3,167	
Department of the Treasury	512	
Offsetting miscellaneous receipts	-2	
Miscellaneous reimbursements from the General Fund [e]	-6	
Net administrative expenses		3,672
Total cost		841,474
Net increase in asset reserves		-19,034
Total invested assets	2,801,254	
Undisbursed balances[f]	-188	
Total asset reserves, September 30, 2018		2,801,066

[a] Includes adjustments for prior years
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust fund and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust fund.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI program.
[f] A negative balance represents a situation where the actual program cash payments exceeded the amount of invested securities of the OASI Trust Fund that were redeemed to make such payments. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.C2.—Operations of the DI Trust Fund, Fiscal Year 2018
[In millions]

Total asset reserves, September 30, 2017		$69,444
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$167,627	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-583	
Net payroll tax contributions[a]		167,043
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L.s 111-312, 112-78, and 112-96[a]	2	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		2
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	4	
All other, not subject to withholding[a]	996	
Total income from taxation of benefits[a]		1,000
Investment income and interest adjustments:		
Interest on investments	2,225	
Interest adjustments[c]	3	
Total investment income and interest adjustments		2,227
Gifts		—
Total income		170,272
Cost:		
Benefit payments:		
Monthly benefits[d]	143,550	
Reimbursement from the General Fund for unnegotiated checks	-20	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	112	
Net benefit payments[d]		143,642
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		174
Administrative expenses:		
Costs incurred by:		
Social Security Administration	2,651	
Department of the Treasury	93	
Demonstration projects	18	
Miscellaneous reimbursements from the General Fund[e]	-3	
Net administrative expenses		2,759
Total cost		146,575
Net increase in asset reserves		23,698
Total invested assets	93,401	
Undisbursed balances[f]	-259	
Total asset reserves, September 30, 2018		93,141

[a] Includes adjustments for prior years.
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust fund and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust fund.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing certain legislatively mandated activities not directly related to administering the DI program.
[f] A negative balance represents a situation where the actual program cash payments exceeded the amount of invested securities of the DI Trust Fund that were redeemed to make such payments. In this situation, future redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.C3.—Operations of the Combined OASI and DI Trust Funds, Fiscal Year 2018
[In millions]

Total asset reserves, September 30, 2017		$2,889,545
Income:		
Net payroll tax contributions:		
Payroll tax contributions[a]	$876,174	
Payments from the General Fund of the Treasury for payroll tax contributions subject to refund[a]	-3,003	
Net payroll tax contributions[a]		873,171
Reimbursements from the General Fund:		
Reduction in payroll tax contributions due to P.L.s 111-312, 112-78, and 112-96[a]	13	
Payroll tax credits due to P.L. 98-21[a]	[b]	
Net General Fund reimbursements[a]		13
Income based on taxation of benefit payments:		
Withheld from benefit payments to nonresident aliens	218	
All other, not subject to withholding[a]	35,500	
Total income from taxation of benefits[a]		35,718
Investment income and interest adjustments:		
Interest on investments	83,808	
Interest adjustments[c]	3	
Total investment income and interest adjustments		83,811
Gifts		[b]
Total income		992,712
Cost:		
Benefit payments:		
Monthly benefits and lump-sum death payments[d]	976,613	
Reimbursement from the General Fund for unnegotiated checks	-56	
Payment for costs of vocational rehabilitation services for disabled beneficiaries	119	
Net benefit payments[d]		976,676
Financial interchange with the Railroad Retirement "Social Security Equivalent Benefit Account"		4,942
Administrative expenses:		
Costs incurred by:		
Social Security Administration	5,818	
Department of the Treasury	606	
Offsetting miscellaneous receipts	-2	
Demonstration projects	18	
Miscellaneous reimbursements from the General Fund[e]	-10	
Net administrative expenses		6,430
Total cost		988,049
Net increase in asset reserves		4,663
Total invested assets	2,894,654	
Undisbursed balances[f]	-447	
Total asset reserves, September 30, 2018		2,894,208

[a] Includes adjustments for prior years.
[b] Between -$0.5 and $0.5 million.
[c] Includes: (1) interest on adjustments in the allocation of administrative expenses between the trust funds and the General Fund account for the Supplemental Security Income program, (2) interest arising from the revised allocation of administrative expenses among the trust funds, and (3) interest on certain reimbursements to the trust funds.
[d] Includes net reductions for the recovery of overpayments.
[e] Reimbursements for costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI and DI programs.
[f] A negative net balance represents a situation where the actual combined program cash payments exceeded the amount of invested securities of the OASI and DI Trust Funds that were redeemed to make such payments. In this situation, future net redemption of additional invested securities will be required to pay for this shortfall.

Note: Totals do not necessarily equal the sums of rounded components.

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Tables VI.C4, VI.C5, and VI.C6 show estimates of the operations and status of the OASI, DI, and the hypothetical combined OASI and DI Trust Funds, respectively, during fiscal years 2014 through 2028.

Table VI.C4.—Operations of the OASI Trust Fund, Fiscal Years 2014-2028
[Dollar amounts in billions]

	Income					Cost				Asset Reserves		
Fiscal year	Total	Net payroll tax contributions	GF reimbursements[a]	Taxation of benefits[b]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[c]
Historical data:												
2014	$763.3	$642.3	$0.1	$24.6	$96.3	$705.6	$698.2	$3.2	$4.3	$57.6	$2,712.7	376
2015	795.3	672.2	.2	29.6	93.2	741.5	733.7	3.5	4.3	53.9	2,766.6	366
2016	799.9	679.6	.1	31.1	89.1	769.8	762.1	3.4	4.3	30.1	2,796.6	359
2017	822.4	702.1	[d]	35.4	84.9	799.0	791.1	3.6	4.3	23.5	2,820.1	350
2018	822.4	706.1	[d]	34.7	81.6	841.5	833.0	3.7	4.8	-19.0	2,801.1	335
Intermediate:												
2019	898.6	783.8	[d]	35.0	79.7	896.0	887.2	3.9	4.9	2.6	2,803.6	313
2020	948.6	832.5	[d]	37.7	78.5	949.4	940.5	3.9	4.9	-0.8	2,802.9	295
2021	997.3	878.2	[d]	41.4	77.8	1,009.7	1,000.8	4.0	4.9	-12.4	2,790.5	278
2022	1,045.6	923.5	[d]	45.2	76.9	1,076.0	1,066.6	4.1	5.2	-30.4	2,760.1	259
2023	1,089.4	965.7	[d]	49.2	74.5	1,146.3	1,136.7	4.3	5.3	-56.9	2,703.2	241
2024	1,141.6	1,013.2	[d]	53.6	74.8	1,221.3	1,211.4	4.4	5.4	-79.7	2,623.6	221
2025	1,192.9	1,059.5	[d]	58.5	75.0	1,299.2	1,289.3	4.5	5.5	-106.3	2,517.2	202
2026	1,257.0	1,111.1	[d]	71.3	74.6	1,381.1	1,370.8	4.7	5.6	-124.1	2,393.1	182
2027	1,315.1	1,159.4	[d]	80.0	75.6	1,467.3	1,456.8	4.8	5.6	-152.2	2,240.9	163
2028	1,379.8	1,218.7	[d]	87.0	74.1	1,560.9	1,550.2	5.0	5.7	-181.1	2,059.9	144
Low-cost:												
2019	903.4	787.7	[d]	35.0	80.7	895.8	887.0	3.9	4.9	7.6	2,808.7	313
2020	976.1	857.1	[d]	37.9	81.1	954.2	945.4	3.9	4.9	21.8	2,830.5	294
2021	1,047.5	921.7	[d]	41.8	84.0	1,020.0	1,011.1	4.0	4.9	27.5	2,858.0	278
2022	1,118.4	985.6	[d]	45.9	86.9	1,092.1	1,082.7	4.2	5.2	26.3	2,884.4	262
2023	1,187.9	1,047.6	[d]	50.2	90.1	1,169.3	1,159.6	4.4	5.3	18.6	2,903.0	247
2024	1,267.9	1,116.9	[d]	55.0	96.0	1,252.0	1,242.0	4.6	5.4	15.8	2,918.8	232
2025	1,349.9	1,187.0	[d]	60.2	102.7	1,338.7	1,328.5	4.8	5.5	11.2	2,930.1	218
2026	1,448.6	1,264.4	[d]	73.8	110.3	1,430.6	1,419.9	5.0	5.6	18.0	2,948.0	205
2027	1,542.7	1,338.9	[d]	83.4	120.5	1,528.5	1,517.6	5.3	5.7	14.2	2,962.3	193
2028	1,649.3	1,428.3	[d]	91.2	129.8	1,635.7	1,624.4	5.5	5.7	13.6	2,975.9	181
High-cost:												
2019	894.9	780.3	[d]	35.1	79.5	896.4	887.6	3.9	4.9	-1.5	2,799.5	312
2020	915.0	801.4	[d]	37.6	76.0	946.9	938.0	3.9	5.0	-31.9	2,767.6	296
2021	930.4	818.6	[d]	41.1	70.7	1,003.2	994.2	4.0	5.0	-72.8	2,694.8	276
2022	958.8	848.5	[d]	44.7	65.7	1,064.9	1,055.5	4.1	5.3	-106.1	2,588.8	253
2023	983.1	873.5	[d]	48.5	61.1	1,130.1	1,120.5	4.2	5.4	-147.0	2,441.8	229
2024	1,013.1	904.2	[d]	52.6	56.2	1,199.0	1,189.3	4.2	5.5	-185.9	2,255.8	204
2025	1,043.9	934.8	[d]	57.2	51.9	1,270.1	1,260.3	4.3	5.5	-226.2	2,029.7	178
2026	1,086.7	970.7	[d]	69.3	46.7	1,344.1	1,334.1	4.4	5.6	-257.4	1,772.3	151
2027	1,122.2	1,002.2	[d]	77.5	42.5	1,421.3	1,411.2	4.5	5.6	-299.2	1,473.1	125
2028	1,160.4	1,041.0	[d]	83.9	35.6	1,504.6	1,494.3	4.6	5.6	-344.1	1,129.0	98

[a] Includes reimbursements from the General Fund of the Treasury to the OASI Trust Fund for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.
[b] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.
[c] The "Trust fund ratio" column represents asset reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.
[d] Between -$50 million and $50 million.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.C5.—Operations of the DI Trust Fund, Fiscal Years 2014-2028[a]
[Dollar amounts in billions]

	Income					Cost				Asset Reserves		
Fiscal year	Total	Net payroll tax contributions	GF reimbursements[b]	Taxation of benefits[c]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[d]
Historical data:												
2014	$114.1	$109.1	[e]	$1.0	$4.0	$144.7	$141.3	$2.9	$0.4	-$30.6	$69.9	69
2015	118.0	114.2	[e]	1.0	2.7	146.2	142.9	2.9	.4	-28.3	41.7	48
2016	150.3	147.6	[e]	1.2	1.5	146.2	143.1	2.8	.4	4.1	45.7	28
2017	169.5	165.9	[e]	2.0	1.6	145.8	142.9	2.7	.2	23.7	69.4	31
2018	170.3	167.0	[e]	1.0	2.2	146.6	143.6	2.8	.2	23.7	93.1	47
Intermediate:												
2019	150.5	146.3	[e]	1.2	2.9	148.6	145.6	2.9	.1	1.9	95.0	63
2020	146.0	141.4	[e]	1.7	3.0	150.6	147.6	2.9	.1	-4.6	90.4	63
2021	153.9	149.1	[e]	1.8	3.0	153.6	150.5	3.0	.1	.3	90.8	59
2022	161.7	156.8	[e]	1.9	3.0	157.9	154.6	3.3	.1	3.7	94.5	57
2023	169.1	164.0	[e]	2.0	3.1	163.0	159.5	3.5	.1	6.1	100.6	58
2024	177.8	172.1	[e]	2.2	3.6	169.4	165.6	3.8	[e]	8.3	108.9	59
2025	186.3	179.9	[e]	2.3	4.0	177.3	173.2	4.1	[e]	9.0	117.9	61
2026	196.1	188.7	[e]	2.9	4.6	185.7	181.3	4.3	[e]	10.5	128.4	64
2027	205.3	196.9	[e]	3.2	5.2	194.5	189.9	4.6	[e]	10.8	139.2	66
2028	216.3	206.9	[e]	3.5	5.9	202.1	197.2	4.9	[e]	14.2	153.4	69
Low-cost:												
2019	151.2	147.0	[e]	1.2	3.0	147.2	144.2	2.9	.1	4.0	97.2	63
2020	150.6	145.5	[e]	1.6	3.4	148.2	145.2	2.9	.1	2.4	99.6	66
2021	162.1	156.5	[e]	1.7	3.8	150.2	147.1	3.0	.1	11.9	111.5	66
2022	173.8	167.4	[e]	1.8	4.6	153.5	150.1	3.3	.1	20.3	131.8	73
2023	185.7	177.9	[e]	1.9	5.8	157.6	154.0	3.6	[e]	28.0	159.9	84
2024	199.4	189.7	[e]	2.1	7.7	163.0	159.0	3.9	[e]	36.5	196.4	98
2025	213.8	201.6	[e]	2.2	10.0	169.8	165.6	4.2	[e]	44.0	240.3	116
2026	230.4	214.7	[e]	2.7	13.0	177.4	172.8	4.6	[e]	53.0	293.4	135
2027	246.9	227.4	[e]	3.1	16.5	185.5	180.6	4.9	[e]	61.4	354.8	158
2028	266.5	242.5	[e]	3.3	20.6	192.7	187.4	5.3	[e]	73.8	428.6	184
High-cost:												
2019	149.8	145.7	[e]	1.2	2.9	150.2	147.3	2.9	.1	-.4	92.8	62
2020	140.5	136.1	[e]	1.7	2.7	154.4	151.3	2.9	.1	-13.9	78.9	60
2021	143.1	139.0	[e]	1.8	2.3	158.9	155.7	3.0	.1	-15.7	63.1	50
2022	147.6	144.1	[e]	2.0	1.6	163.8	160.4	3.3	.1	-16.2	46.9	39
2023	151.5	148.3	[e]	2.1	1.1	168.9	165.3	3.5	.1	-17.4	29.6	28
2024	156.4	153.6	[e]	2.2	.6	175.4	171.6	3.7	.1	-19.0	10.6	17
2025	[f]	158.7	[e]	2.4	[f]	183.5	179.6	3.9	.1	[f]	[f]	6
2026	[f]	164.8	[e]	3.0	[f]	192.2	188.0	4.1	.1	[f]	[f]	[f]
2027	[f]	170.2	[e]	3.3	[f]	201.2	196.8	4.4	[e]	[f]	[f]	[f]
2028	[f]	176.8	[e]	3.6	[f]	208.9	204.2	4.6	.1	[f]	[f]	[f]

[a] The DI Trust Fund becomes depleted in fiscal year 2025 under the high-cost assumptions. For any period during which reserves would be depleted, scheduled benefits could not be paid in full on a timely basis, income from taxing benefits would be less than would apply to scheduled benefits, and interest on trust fund reserves would be negligible.
[b] Includes reimbursements from the General Fund of the Treasury to the DI Trust Fund for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.
[c] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.
[d] The "Trust fund ratio" column represents asset reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.
[e] Between -$50 million and $50 million.
[f] While the fund is depleted, values under current law would reflect permissible expenditures only, which are inconsistent with the cost of scheduled benefits shown in this table.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.C6.—Operations of the Combined OASI and DI Trust Funds, Fiscal Years 2014-2028
[Dollar amounts in billions]

Fiscal year	Income					Cost				Asset Reserves		
	Total	Net payroll tax contributions	GF reimbursements[a]	Taxation of benefits[b]	Net interest	Total	Scheduled benefits	Administrative costs	RRB interchange	Net increase during year	Amount at end of year	Trust fund ratio[c]
Historical data:												
2014. .	$877.4	$751.3	$0.2	$25.7	$100.3	$850.3	$839.6	$6.0	$4.7	$27.1	$2,782.6	324
2015. .	913.3	786.4	.3	30.7	96.0	887.7	876.6	6.4	4.7	25.6	2,808.2	313
2016. .	950.2	827.1	.2	32.3	90.6	916.0	905.2	6.2	4.7	34.1	2,842.4	307
2017. .	991.9	868.0	[d]	37.4	86.5	944.7	934.0	6.2	4.5	47.2	2,889.5	301
2018. .	992.7	873.2	[d]	35.7	83.8	988.0	976.7	6.4	4.9	4.7	2,894.2	292
Intermediate:												
2019. .	1,049.1	930.2	[d]	36.3	82.6	1,044.6	1,032.9	6.7	5.0	4.5	2,898.7	277
2020. .	1,094.7	973.8	[d]	39.3	81.5	1,100.0	1,088.1	6.9	5.0	-5.4	2,893.3	264
2021. .	1,151.2	1,027.3	[d]	43.1	80.8	1,163.3	1,151.3	7.0	5.0	-12.1	2,881.3	249
2022. .	1,207.3	1,080.3	[d]	47.1	79.9	1,233.9	1,221.2	7.4	5.3	-26.6	2,854.6	234
2023. .	1,258.5	1,129.6	[d]	51.2	77.6	1,309.3	1,296.1	7.8	5.4	-50.9	2,803.8	218
2024. .	1,319.4	1,185.2	[d]	55.8	78.4	1,390.7	1,377.0	8.2	5.5	-71.3	2,732.5	202
2025. .	1,379.2	1,239.4	[d]	60.8	79.0	1,476.5	1,462.4	8.6	5.5	-97.3	2,635.2	185
2026. .	1,453.1	1,299.8	[d]	74.1	79.2	1,566.8	1,552.1	9.0	5.6	-113.6	2,521.5	168
2027. .	1,520.4	1,356.3	[d]	83.2	80.9	1,661.8	1,646.7	9.4	5.6	-141.4	2,380.1	152
2028. .	1,596.2	1,425.7	[d]	90.5	80.0	1,763.0	1,747.5	9.8	5.7	-166.9	2,213.3	135
Low-cost:												
2019. .	1,054.6	934.7	[d]	36.2	83.7	1,042.9	1,031.2	6.7	5.0	11.7	2,905.9	278
2020. .	1,126.6	1,002.7	[d]	39.5	84.4	1,102.4	1,090.6	6.9	5.0	24.2	2,930.1	264
2021. .	1,209.6	1,078.3	[d]	43.5	87.8	1,170.1	1,158.1	7.0	4.9	39.4	2,969.5	250
2022. .	1,292.2	1,153.0	[d]	47.7	91.5	1,245.6	1,232.8	7.5	5.2	46.7	3,016.2	238
2023. .	1,373.5	1,225.5	[d]	52.1	95.9	1,326.9	1,313.5	8.0	5.3	46.7	3,062.9	227
2024. .	1,467.3	1,306.6	[d]	57.0	103.7	1,415.0	1,401.0	8.5	5.4	52.3	3,115.2	216
2025. .	1,563.8	1,388.5	[d]	62.5	112.8	1,508.6	1,494.1	9.0	5.5	55.2	3,170.4	206
2026. .	1,679.0	1,479.1	[d]	76.5	123.3	1,608.0	1,592.8	9.6	5.6	71.0	3,241.4	197
2027. .	1,789.6	1,566.2	[d]	86.4	137.0	1,714.0	1,698.2	10.2	5.7	75.6	3,317.1	189
2028. .	1,915.7	1,670.8	[d]	94.5	150.4	1,828.3	1,811.8	10.7	5.7	87.4	3,404.5	181
High-cost:												
2019. .	1,044.7	926.0	[d]	36.3	82.4	1,046.6	1,034.9	6.7	5.0	-1.9	2,892.3	277
2020. .	1,055.5	937.5	[d]	39.3	78.7	1,101.3	1,089.4	6.9	5.1	-45.8	2,846.5	263
2021. .	1,073.6	957.6	[d]	42.9	73.0	1,162.1	1,149.9	7.0	5.1	-88.5	2,758.0	245
2022. .	1,106.5	992.5	[d]	46.7	67.2	1,228.7	1,216.0	7.3	5.4	-122.3	2,635.7	224
2023. .	1,134.6	1,021.9	[d]	50.6	62.2	1,299.0	1,285.9	7.7	5.5	-164.3	2,471.4	203
2024. .	1,169.5	1,057.8	[d]	54.9	56.9	1,374.4	1,361.0	8.0	5.5	-204.9	2,266.4	180
2025. .	1,205.0	1,093.6	[d]	59.6	51.9	1,453.6	1,439.8	8.3	5.5	-248.6	2,017.8	156
2026. .	1,253.7	1,135.5	[d]	72.3	45.9	1,536.3	1,522.1	8.6	5.6	-282.6	1,735.2	131
2027. .	1,293.7	1,172.3	[d]	80.9	40.5	1,622.5	1,608.0	8.9	5.6	-328.8	1,406.4	107
2028. .	1,337.7	1,217.8	[d]	87.5	32.4	1,713.4	1,698.6	9.2	5.7	-375.8	1,030.6	82

[a] Includes reimbursements from the General Fund of the Treasury to the OASI and DI Trust Funds for: (1) the cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21; (2) the cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246; and (3) payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.
[b] Revenue from taxation of benefits is the amount that would be assessed on benefit amounts scheduled in the law.
[c] The "Trust fund ratio" column represents asset reserves at the beginning of a year (which are identical to reserves at the end of the prior year shown in the "Amount at end of year" column) as a percentage of cost for the year.
[d] Between -$50 million and $50 million.

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D. LONG-RANGE SENSITIVITY ANALYSIS

This appendix presents estimates that illustrate the sensitivity of the long-range actuarial status of the OASDI program to changes in selected individual assumptions. The estimates based on the three alternative sets of assumptions, which were presented earlier in this report, illustrate the effects of varying all of the principal assumptions simultaneously, in order to portray a significantly more optimistic or pessimistic future. For each sensitivity analysis presented in this appendix, the intermediate alternative II projection is the reference point, and one assumption is varied within that alternative. The variation used for each individual assumption is the same as the level used for that assumption in the low-cost alternative I and high-cost alternative III projections.

Each table in this section shows the effects of changing a particular assumption on the OASDI summarized income rates, summarized cost rates, and actuarial balances for 25-year, 50-year, and 75-year valuation periods. Following each table is a discussion of the estimated changes in cost rates. The change in each of the actuarial balances is approximately equal to the change in the corresponding cost rate, but in the opposite direction. This appendix does not discuss income rates following each table because income rates vary only slightly with changes in assumptions that affect revenue from taxation of benefits.

1. Total Fertility Rate

Table VI.D1 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions about the ultimate total fertility rate. The Trustees assume that total fertility will ultimately be 1.8, 2.0, and 2.2 children per woman under alternatives III, II, and I, respectively. The total fertility rate reaches ultimate values in 2024, 2027, and 2027 under alternatives III, II, and I, respectively.

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Table VI.D1.—Sensitivity of OASDI Measures to Fertility Assumptions
[As a percentage of taxable payroll]

Valuation period	Ultimate total fertility rate[a] [b] 1.8	2.0	2.2
Summarized income rate:			
25-year: 2019-43	14.55	14.55	14.55
50-year: 2019-68	13.99	13.97	13.96
75-year: 2019-93	13.86	13.81	13.77
Summarized cost rate:			
25-year: 2019-43	16.26	16.28	16.29
50-year: 2019-68	16.55	16.36	16.17
75-year: 2019-93	17.07	16.60	16.14
Actuarial balance:			
25-year: 2019-43	-1.71	-1.73	-1.74
50-year: 2019-68	-2.55	-2.38	-2.22
75-year: 2019-93	-3.22	-2.78	-2.37
Annual balance for 2093	-5.63	-4.11	-2.82
Year of combined trust fund reserve depletion	2035	2035	2035

[a] The total fertility rate for any year is the average number of children that would be born to a woman if she were to experience, at each age of her life, the birth rate observed in, or assumed for, the selected year, and if she were to survive the entire childbearing period. The ultimate total fertility rate is reached in 2024, 2027, and 2027 under alternatives III, II, and I, respectively.
[b] Ultimate total fertility rates used for this analysis are: 1.8 from the alternative III assumptions, 2.0 from the alternative II assumptions, and 2.2 from the alternative I assumptions. All other assumptions used for this analysis are from alternative II.

For the 25-year period, the cost rate for the three fertility assumptions varies by only about 0.03 percent of taxable payroll. In contrast, the 75-year cost rate varies over a wide range, decreasing from 17.07 to 16.14 percent, as the assumed ultimate total fertility rate increases from 1.8 to 2.2. Similarly, while the 25-year actuarial balance varies by only 0.03 percent of taxable payroll, the 75-year actuarial balance varies over a much wider range, from -3.22 to -2.37 percent.

During the 25-year period, the very slight increases in the working population resulting from higher fertility (than that experienced in an alternative scenario) are more than offset by decreases in the female labor force and increases in the number of child beneficiaries. Therefore, program cost increases slightly with higher fertility. For the 75-year long-range period, however, changes in fertility have a relatively greater effect on the labor force than on the beneficiary population. As a result, an increase in fertility significantly reduces the cost rate. Each increase of 0.1 in the ultimate total fertility rate increases the long-range actuarial balance by about 0.21 percent of taxable payroll.

2. Death Rates

Table VI.D2 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions about future

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reductions in death rates for the period from 2018 to 2093. These assumptions are described in section V.A.2. The Trustees assume that the age-sex-adjusted death rates will decline at average annual rates of 0.41 percent, 0.77 percent, and 1.16 percent for alternatives I, II, and III, respectively.

Table VI.D2.—Sensitivity of OASDI Measures to Death-Rate Assumptions
[As a percentage of taxable payroll]

Valuation period	Average annual death-rate reduction[a] [b]		
	0.41 percent	0.77 percent	1.16 percent
Summarized income rate:			
25-year: 2019-43	14.55	14.55	14.55
50-year: 2019-68	13.96	13.97	13.99
75-year: 2019-93	13.79	13.81	13.83
Summarized cost rate:			
25-year: 2019-43	16.14	16.28	16.43
50-year: 2019-68	16.02	16.36	16.73
75-year: 2019-93	16.10	16.60	17.13
Actuarial balance:			
25-year: 2019-43	-1.59	-1.73	-1.89
50-year: 2019-68	-2.06	-2.38	-2.74
75-year: 2019-93	-2.31	-2.78	-3.29
Annual balance for 2093	-3.12	-4.11	-5.11
Year of combined trust fund reserve depletion	2035	2035	2035

[a] The average annual death-rate reduction is the average annual geometric rate of decline in the age-sex-adjusted death rate between 2018 and 2093. The overall age-sex-adjusted death rate decreases from 2018 to 2093 by 26 percent, 44 percent, and 58 percent for alternatives I, II, and III, respectively.
[b] The average annual death-rate reductions used for this analysis are: 0.41 percent from the alternative I assumptions, 0.77 percent from the alternative II assumptions, and 1.16 percent from the alternative III assumptions. All other assumptions used for this analysis are from alternative II.

The variation in cost for the 25-year period is less pronounced than the variation for the 75-year period because decreases in death rates have cumulative effects. The 25-year cost rate increases from 16.14 percent (for an average annual death-rate reduction of 0.41 percent over the entire long-range period) to 16.43 percent (for an average annual death-rate reduction of 1.16 percent over the entire long-range period). The 75-year cost rate increases from 16.10 to 17.13 percent. The actuarial balance decreases from -1.59 to -1.89 percent for the 25-year period, and from -2.31 to -3.29 percent for the 75-year period.

Lower death rates raise both the income (through increased taxable payroll) and the cost of the OASDI program. The relative increase in cost, however, exceeds the relative increase in taxable payroll. For any given year, reductions in the death rates for people who are age 62 and over (ages at which death rates are the highest) increase the number of retired-worker beneficiaries (and, therefore, the amount of retirement benefits paid) without adding significantly to the number of covered workers (and, therefore, to the taxable

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payroll). Reductions for people at age 50 to retirement eligibility age result in significant increases to the taxable payroll. However, those increases are not large enough to offset the sum of the additional retirement benefits mentioned above and the disability benefits paid to additional beneficiaries at these pre-retirement ages, which are ages of high disability incidence. At ages under 50, death rates are so low that even substantial reductions in death rates do not result in significant increases in the numbers of covered workers or beneficiaries. Consequently, if death rates decline by about the same relative amount for all ages, the cost increases faster than the rate of growth in payroll, which results in higher cost rates and lower actuarial balances. Each additional 0.1-percentage-point increase in the average annual rate of decline in the death rate decreases the long-range actuarial balance by about 0.13 percent of taxable payroll.

3. Immigration

Table VI.D3 shows OASDI income rates, cost rates, and actuarial balances under alternative II with three different assumptions about the magnitude of total net immigration (sum of net lawful permanent resident (LPR) immigration and net other-than-LPR immigration). See section V.A.3 for more information on immigration assumptions and methods. The Trustees assume annual levels of immigration and emigration, with total net annual immigration averaging 949,000 persons, 1,265,000 persons, and 1,601,000 persons over the long-range period under alternatives III, II, and I, respectively.

Table VI.D3.—Sensitivity of OASDI Measures to Total Net Immigration Assumptions
[As a percentage of taxable payroll]

Valuation period	Average annual total net immigration[a] [b]		
	949,000	1,265,000	1,601,000
Summarized income rate:			
25-year: 2019-43	14.57	14.55	14.52
50-year: 2019-68	14.01	13.97	13.94
75-year: 2019-93	13.84	13.81	13.78
Summarized cost rate:			
25-year: 2019-43	16.44	16.28	16.11
50-year: 2019-68	16.59	16.36	16.12
75-year: 2019-93	16.87	16.60	16.33
Actuarial balance:			
25-year: 2019-43	-1.87	-1.73	-1.59
50-year: 2019-68	-2.59	-2.38	-2.18
75-year: 2019-93	-3.03	-2.78	-2.55
Annual balance for 2093	-4.56	-4.11	-3.72
Year of combined trust fund reserve depletion	2035	2035	2036

[a] Average annual total net immigration is the annual total net immigration to the Social Security area, including both LPR and other-than-LPR immigration, averaged over the 75-year projection period.
[b] The average annual total net immigration assumptions used for this analysis are: 949,000 from the alternative III assumptions, 1,265,000 from the alternative II assumptions, and 1,601,000 from the alternative I assumptions. All other assumptions used for this analysis are from alternative II.

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For all three periods, when total net immigration increases, the cost rate decreases. For the 25-year period, the cost rate decreases from 16.44 percent of taxable payroll (for an average annual total net immigration of 949,000 persons over the entire long-range period) to 16.11 percent (for an average annual total net immigration of 1,601,000 persons over the entire long-range period). For the 50-year period, it decreases from 16.59 percent to 16.12 percent, and for the 75-year period, it decreases from 16.87 percent to 16.33 percent. The actuarial balance increases from -1.87 to -1.59 percent for the 25-year period, from -2.59 to -2.18 percent for the 50-year period, and from -3.03 to -2.55 percent for the 75-year period.

The cost rate decreases with an increase in total net immigration because immigration occurs at relatively young ages, thereby increasing the numbers of covered workers earlier than the numbers of beneficiaries. Increasing average annual total net immigration by 100,000 persons improves the long-range actuarial balance by about 0.07 percent of taxable payroll.

4. Real-Wage Differential

Table VI.D4 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions about the real-wage differential. The Trustees assume the ultimate real-wage differential will be 0.60 percentage point, 1.21 percentage points, and 1.84 percentage points under alternatives III, II, and I, respectively. In each case, the ultimate annual increase in the CPI is 2.60 percent (consistent with alternative II). Therefore, the ultimate percentage increases in average annual wages in covered employment are 3.20, 3.81, and 4.44 percent.

For the 25-year period, the cost rate decreases from 17.07 percent (for a real-wage differential of 0.60 percentage point) to 15.49 percent (for a differential of 1.84 percentage points). For the 50-year period, it decreases from 17.51 to 15.23 percent, and for the 75-year period it decreases from 17.87 to 15.34 percent. The actuarial balance increases from -2.39 to -1.07 percent for the 25-year period, from -3.37 to -1.41 percent for the 50-year period, and from -3.88 to -1.70 percent for the 75-year period.

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Table VI.D4.—Sensitivity of OASDI Measures to Real-Wage Assumptions
[As a percentage of taxable payroll]

Valuation period	Ultimate percentage increase in wages-CPI[a b] 3.20-2.60	3.81-2.60	4.44-2.60
Summarized income rate:			
25-year: 2019-43	14.67	14.55	14.42
50-year: 2019-68	14.14	13.97	13.82
75-year: 2019-93	13.99	13.81	13.64
Summarized cost rate:			
25-year: 2019-43	17.07	16.28	15.49
50-year: 2019-68	17.51	16.36	15.23
75-year: 2019-93	17.87	16.60	15.34
Actuarial balance:			
25-year: 2019-43	-2.39	-1.73	-1.07
50-year: 2019-68	-3.37	-2.38	-1.41
75-year: 2019-93	-3.88	-2.78	-1.70
Annual balance for 2093	-6.03	-4.11	-2.42
Year of combined trust fund reserve depletion	2033	2035	2038

[a] The first value in each pair is the ultimate annual percentage increase in average wages in covered employment. The second value is the ultimate annual percentage increase in the Consumer Price Index. The difference between the two values is the ultimate real-wage differential.
[b] The ultimate real-wage differentials of 0.60, 1.21, and 1.84 percentage points are the same as in alternatives III, II, and I, respectively. All other assumptions used for this analysis are from alternative II.

The cost rate decreases with increasing real-wage differentials. Higher wages increase taxable payroll immediately, but they increase benefit levels only gradually as new beneficiaries become entitled. In addition, cost-of-living adjustments (COLAs) to benefits depend not on changes in wages, but on changes in prices. Each 0.1-percentage-point increase in the real-wage differential increases the long-range actuarial balance by about 0.18 percent of taxable payroll.

5. Consumer Price Index

Table VI.D5 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions about the rate of increase for the Consumer Price Index (CPI). The Trustees assume the annual increase in the CPI will be 3.20 percent, 2.60 percent, and 2.00 percent under alternatives I, II, and III, respectively.[1] In each case, the ultimate real-wage differential is 1.21 percentage points (consistent with alternative II), yielding ultimate percentage increases in average annual wages in covered employment of 4.41, 3.81, and 3.21 percent.

[1] Prior to the 2014 report, alternative I included a lower ultimate annual change in the CPI and alternative III included a higher ultimate annual change in the CPI than was included for alternative II.

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Table VI.D5.—Sensitivity of OASDI Measures to CPI-Increase Assumptions
[As a percentage of taxable payroll]

Valuation period	Ultimate percentage increase in wages-CPI[a b] 4.41-3.20	3.81-2.60	3.21-2.00
Summarized income rate:			
25-year: 2019-43	14.53	14.55	14.57
50-year: 2019-68	13.96	13.97	13.99
75-year: 2019-93	13.80	13.81	13.83
Summarized cost rate:			
25-year: 2019-43	16.18	16.28	16.38
50-year: 2019-68	16.23	16.36	16.50
75-year: 2019-93	16.46	16.60	16.75
Actuarial balance:			
25-year: 2019-43	-1.65	-1.73	-1.81
50-year: 2019-68	-2.27	-2.38	-2.50
75-year: 2019-93	-2.66	-2.78	-2.92
Annual balance for 2093	-3.95	-4.11	-4.29
Year of combined trust fund reserve depletion	2035	2035	2035

[a] The first value in each pair is the ultimate annual percentage increase in average wages in covered employment. The second value is the ultimate annual percentage increase in the Consumer Price Index. The difference between the two values is the ultimate real-wage differential.
[b] The ultimate CPI increases of 3.20, 2.60, and 2.00 percent are the same as in alternatives I, II, and III, respectively. The ultimate real-wage differential of 1.21 percentage points is the same as in alternative II. All other assumptions used for this analysis are also from alternative II.

For all three periods, the cost rate increases when the assumed rates of increase in the CPI are smaller. For the 25-year period, the cost rate increases from 16.18 (for CPI increases of 3.20 percent) to 16.38 percent (for CPI increases of 2.00 percent). For the 50-year period, it increases from 16.23 to 16.50 percent, and for the 75-year period, it increases from 16.46 to 16.75 percent. The actuarial balance decreases from -1.65 to -1.81 percent for the 25-year period, from -2.27 to -2.50 percent for the 50-year period, and from -2.66 to -2.92 percent for the 75-year period.

The time lag between the effects of the CPI changes on taxable payroll and on scheduled benefits explains these patterns. When the rate of increase in the CPI is greater and the real-wage differential is constant, then: (1) the effect on taxable payroll due to a greater rate of increase in average wages occurs immediately and (2) the effect on benefits due to a larger COLA occurs with a lag of about 1 year. As a result of these effects, the higher taxable payrolls have a stronger effect than the higher benefits, which results in lower cost rates. Each 0.1-percentage-point decrease in the rate of the change in the CPI decreases the long-range actuarial balance by about 0.02 percent of taxable payroll.

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6. Real Interest Rate

Table VI.D6 shows OASDI income rates, cost rates, and actuarial balances under alternative II with three different assumptions about the annual real interest rate (compounded semiannually) for special public-debt obligations issuable to the trust funds. The Trustees assume that the ultimate annual real interest rate will be 2.0 percent, 2.5 percent, and 3.0 percent under alternatives III, II, and I, respectively. In each case, the ultimate annual increase in the CPI is 2.60 percent, which is consistent with alternative II. Therefore, the ultimate annual yields are 4.7, 5.2, and 5.7 percent, respectively.

Table VI.D6.—Sensitivity of OASDI Measures to Real-Interest Assumptions
[As a percentage of taxable payroll]

Valuation period	Ultimate annual real interest rate[a] [b]		
	2.0 percent	2.5 percent	3.0 percent
Summarized income rate:			
25-year: 2019-43	14.50	14.55	14.60
50-year: 2019-68	13.91	13.97	14.04
75-year: 2019-93	13.74	13.81	13.88
Summarized cost rate:			
25-year: 2019-43	16.34	16.28	16.21
50-year: 2019-68	16.44	16.36	16.28
75-year: 2019-93	16.71	16.60	16.48
Actuarial balance:			
25-year: 2019-43	-1.84	-1.73	-1.61
50-year: 2019-68	-2.53	-2.38	-2.24
75-year: 2019-93	-2.97	-2.78	-2.60
Annual balance for 2093	-4.11	-4.11	-4.11
Year of combined trust fund reserve depletion	2035	2035	2035

[a] The ultimate real interest rate is the effective annual yield on asset reserves held by the trust funds divided by the annual rate of growth in the CPI.
[b] The ultimate annual real interest rates used for this analysis are: 2.0 percent from the alternative III assumptions, 2.5 percent from the alternative II assumptions, and 3.0 percent from the alternative I assumptions. All other assumptions used for this analysis are from alternative II.

For the 25-year period, the cost rate decreases with increasing real interest rates from 16.34 percent (for an ultimate real interest rate of 2.0 percent) to 16.21 percent (for an ultimate real interest rate of 3.0 percent). For the 50-year period, it decreases from 16.44 to 16.28 percent and, for the 75-year period, it decreases from 16.71 to 16.48 percent. The actuarial balance increases from -1.84 to -1.61 percent for the 25-year period, from -2.53 to -2.24 percent for the 50-year period, and from -2.97 to -2.60 percent for the 75-year period. Each 0.1-percentage-point increase in the real interest rate increases the long-range actuarial balance by about 0.04 percent of taxable payroll.

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7. Taxable Ratio

Table VI.D7 shows OASDI income rates, cost rates, and actuarial balances under alternative II with three different assumptions about the ratio of taxable payroll to covered earnings (the taxable ratio). Note that covered earnings are the sum of wages and net self-employment earnings covered by Social Security, and taxable payroll is essentially the amount of covered earnings subject to the Social Security payroll tax up to the contribution and benefit base ($132,900 for 2019). The Trustees assume that the ultimate taxable ratio will be 81.0 percent, 82.5 percent, and 84.0 percent under alternatives III, II, and I, respectively.

Table VI.D7.—Sensitivity of OASDI Measures to Taxable Ratio Assumptions
[As a percentage of taxable payroll]

Valuation period	Ultimate taxable ratio[a] [b]		
	81.0 percent	82.5 percent	84.0 percent
Summarized income rate:			
25-year: 2019-43	14.58	14.55	14.52
50-year: 2019-68	14.00	13.97	13.95
75-year: 2019-93	13.83	13.81	13.79
Summarized cost rate:			
25-year: 2019-43	16.51	16.28	16.05
50-year: 2019-68	16.57	16.36	16.15
75-year: 2019-93	16.78	16.60	16.41
Actuarial balance:			
25-year: 2019-43	-1.92	-1.73	-1.54
50-year: 2019-68	-2.57	-2.38	-2.20
75-year: 2019-93	-2.95	-2.78	-2.62
Annual balance for 2093	-4.23	-4.11	-4.00
Year of combined trust fund reserve depletion	2034	2035	2036

[a] The taxable ratio is the ratio of taxable payroll to covered earnings. These concepts are described in further detail in section V.C.6 of this report.
[b] The ultimate taxable ratios used for this analysis are: 81.0 percent from the alternative III assumptions, 82.5 percent from the alternative II assumptions, and 84.0 percent from the alternative I assumptions. All other assumptions used for this analysis are from alternative II.

Because the combined employee-employer tax rate of 12.4 percent is unchanged across all alternatives, the income rate changes a relatively small amount as the taxable ratio increases, due to changes in taxation of benefits and the initial fund as a percentage of taxable payroll.

For the 25-year period, the cost rate decreases with increasing taxable ratios, from 16.51 percent (for an ultimate taxable ratio of 81.0 percent) to 16.05 percent (for an ultimate taxable ratio of 84.0 percent). For the 50-year period, it decreases from 16.57 to 16.15 percent and, for the 75-year period, it decreases from 16.78 to 16.41 percent. The actuarial balance increases from -1.92 to -1.54 percent for the 25-year period, from -2.57 to

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-2.20 percent for the 50-year period, and from -2.95 to -2.62 for the 75-year period.

The cost rate decreases with an increase in taxable payroll because the increase in taxable payroll occurs immediately. The increase in benefit amounts occurs much more gradually as new beneficiaries become entitled. In addition, the change in the taxable ratio does not affect COLAs or AWIs. Each 1.0 percentage-point increase in the ultimate taxable ratio increases (improves) the long-range actuarial balance by about 0.11 percent of taxable payroll.

8. Disability Incidence Rates

Table VI.D8 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions concerning future disability incidence rates. The Trustees assume that the ultimate age-sex-adjusted[1] incidence rates will be 4.2, 5.2, and 6.2 awards per thousand exposed for alternatives I, II, and III, respectively. For all three alternatives, the Trustees assume that incidence rates by age and sex will vary during the early years of the projection period before attaining ultimate levels.

Table VI.D8.—Sensitivity of OASDI Measures to Disability Incidence Assumptions
[As a percentage of taxable payroll]

Valuation period	Disability incidence rates[a] based on alternative— I	II	III
Summarized income rate:			
25-year: 2019-43	14.55	14.55	14.55
50-year: 2019-68	13.97	13.97	13.98
75-year: 2019-93	13.81	13.81	13.81
Summarized cost rate:			
25-year: 2019-43	16.09	16.28	16.46
50-year: 2019-68	16.11	16.36	16.60
75-year: 2019-93	16.34	16.60	16.84
Actuarial balance:			
25-year: 2019-43	-1.54	-1.73	-1.91
50-year: 2019-68	-2.14	-2.38	-2.62
75-year: 2019-93	-2.53	-2.78	-3.03
Annual balance for 2093	-3.82	-4.11	-4.39
Year of combined trust fund reserve depletion	2036	2035	2034

[a] The ultimate age-sex-adjusted incidence rates used for this analysis are: 4.2 awards per thousand exposed for the alternative I assumptions, 5.2 awards per thousand exposed for the alternative II assumptions, and 6.2 awards per thousand exposed for the alternative III assumptions. All other assumptions used for this analysis are from alternative II.

For the 25-year period, the cost rate increases with increasing disability incidence rates, from 16.09 percent (for the relatively low rates assumed for

[1] Age-sex-adjusted to the disability-exposed population as of the year 2000.

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alternative I) to 16.46 percent (for the relatively high rates assumed for alternative III). For the 50-year period, it increases from 16.11 to 16.60 percent, and for the 75-year period, it increases from 16.34 to 16.84 percent. The actuarial balance decreases from -1.54 to -1.91 percent for the 25-year period, from -2.14 to -2.62 percent for the 50-year period, and from -2.53 to -3.03 percent for the 75-year period.

9. Disability Termination Rates

Table VI.D9 shows OASDI income rates, cost rates, and actuarial balances on the basis of alternative II with three different assumptions about future disability termination rates, including deaths and recoveries up to the age at which disabled-worker beneficiaries convert to retired-worker status.

For all three alternatives, the Trustees assume that death rates for disabled-worker beneficiaries will decline throughout the long-range period. The Trustees assume that the age-sex-adjusted[1] death rate of 25.2 deaths per thousand disabled-worker beneficiaries in 2018 will decline to 18.9, 12.0, and 7.1 deaths per thousand in 2093 for alternatives I, II, and III, respectively. These levels are about 25 percent, 52 percent, and 72 percent lower, respectively, than the level in 2018.

For all three alternatives, ultimate recovery rates by age, sex, and duration are attained in the twentieth year of the projection period. The ultimate age-sex-adjusted[1] recovery rates used for this analysis are 12.5 recoveries per thousand disabled-worker beneficiaries for the alternative I assumptions, 10.3 recoveries per thousand disabled-worker beneficiaries for the alternative II assumptions, and 8.2 recoveries per thousand disabled-worker beneficiaries for the alternative III assumptions.

[1] Age-sex-adjusted to the disabled-worker population as of the year 2000.

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Table VI.D9.—Sensitivity of OASDI Measures to Disability Termination Assumptions
[As a percentage of taxable payroll]

Valuation period	Disability termination rates[a] based on alternative— I	II	III
Summarized income rate:			
25-year: 2019-43	14.55	14.55	14.55
50-year: 2019-68	13.98	13.97	13.97
75-year: 2019-93	13.81	13.81	13.81
Summarized cost rate:			
25-year: 2019-43	16.25	16.28	16.30
50-year: 2019-68	16.33	16.36	16.38
75-year: 2019-93	16.57	16.60	16.61
Actuarial balance:			
25-year: 2019-43	-1.70	-1.73	-1.76
50-year: 2019-68	-2.35	-2.38	-2.41
75-year: 2019-93	-2.76	-2.78	-2.80
Annual balance for 2093	-4.11	-4.11	-4.08
Year of combined trust fund reserve depletion	2035	2035	2035

[a] The age-sex-adjusted death rates in 2093 used for this analysis are: 18.9 deaths per thousand disabled-worker beneficiaries for the alternative I assumptions, 12.0 deaths per thousand disabled-worker beneficiaries for the alternative II assumptions, and 7.1 deaths per thousand disabled-worker beneficiaries for the alternative III assumptions. The ultimate age-sex-adjusted recovery rates used for this analysis are: 12.5 recoveries per thousand disabled-worker beneficiaries for the alternative I assumptions, 10.3 recoveries per thousand disabled-worker beneficiaries for the alternative II assumptions, and 8.2 recoveries per thousand disabled-worker beneficiaries for the alternative III assumptions. All other assumptions used for this analysis are from alternative II.

For the 25-year period, the cost rate increases with decreasing disability termination rates, from 16.25 percent (for the relatively high termination rates assumed for alternative I) to 16.30 percent (for the relatively low termination rates assumed for alternative III). For the 50-year period, it increases from 16.33 to 16.38 percent, and for the 75-year period, it increases from 16.57 to 16.61 percent. The actuarial balance decreases from -1.70 to -1.76 percent for the 25-year period, from -2.35 to -2.41 percent for the 50-year period, and from -2.76 to -2.80 percent for the 75-year period.

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E. STOCHASTIC PROJECTIONS AND UNCERTAINTY

Significant uncertainty surrounds the estimates under the intermediate assumptions, especially for a period as long as 75 years. This appendix presents stochastic projections, a way to illustrate the uncertainty of these estimates. The stochastic projections supplement the traditional methods of examining such uncertainty.

1. Background

The Trustees have traditionally shown estimates using the low-cost and high-cost sets of specified assumptions to illustrate the potential implications of uncertainty. These alternative estimates provide a range of possible outcomes for the projections. However, they do not provide an indication of the probability that actual future experience will be inside or outside this range. This appendix presents the results of a model, based on stochastic modeling techniques, that estimates a probability distribution of future outcomes of the financial status of the combined OASI and DI Trust Funds. This model, which was first included in the 2003 report, is in the process of further development for the future, most notably by incorporating parameter uncertainty. This will allow the stochastic model to better reflect the uncertainty in the estimates of the underlying factors for these projections.

2. Stochastic Methodology

Other sections of this report provide estimates of the financial status of the combined OASI and DI Trust Funds using a scenario-based model. For the scenario-based model, the Trustees use three alternative scenarios (low-cost, intermediate, and high-cost) that use specific assumptions about levels of fertility, rates of change in mortality, lawful permanent resident (LPR) and other-than-LPR immigration levels, legal and other-than-LPR emigration levels, changes in the Consumer Price Index, changes in average real wages, unemployment rates, trust fund real yield rates, and disability incidence and recovery rates. In general, the Trustees assume that each of these variables will reach an ultimate value at a specific point during the long-range period, and will maintain that value throughout the remainder of the period. The three alternative scenarios assume separate, specified values for each of these variables. Chapter V contains more details about each of these assumptions.

This appendix presents estimates of the probability that key measures of OASDI solvency will fall in certain ranges, based on 5,000 independent stochastic simulations. Each simulation allows the above variables to vary throughout the long-range period. The fluctuation of each variable over time

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is simulated using historical data and standard time-series techniques. Generally, each variable is modeled using an equation that: (1) captures a relationship between current and prior years' values of the variable, and (2) introduces year-by-year random variation based on variation observed in the historical period. For some variables, the equations also reflect relationships with other variables. The equations contain parameters that are estimated using historical data for periods from 12 years to over 110 years, depending on the nature and quality of the available data. Each time-series equation is designed so that, in the absence of random variation over time, the value of the variable for each year equals its value under the intermediate assumptions.[1]

For each simulation, the stochastic method develops year-by-year random variation for each variable using Monte Carlo techniques. Each simulation produces an estimate of the financial status of the combined OASI and DI Trust Funds. This appendix shows the distribution of results from 5,000 simulations of the model.

Readers should interpret the results from this model with caution and with an understanding of the model's limitations. Results are sensitive to equation specifications, degrees of interdependence among variables, and the historical periods used for estimating model coefficients. For some variables, recent historical variation may not provide a realistic representation of the potential variation for the future. Also, results would differ if additional variables (such as labor force participation rates, retirement rates, marriage rates, and divorce rates) were also allowed to vary randomly. Furthermore, more variability would result if statistical approaches were used to model uncertainty in the central tendencies of the variables. Time-series modeling reflects only what occurred in the historical period. Future uncertainty exists not only for the underlying central tendency but also for the frequency and size of occasional longer-term shifts in the central tendency. Many experts predict, and history suggests, that the future will likely bring substantial shifts that are not fully reflected in the historical period used for the current model. As a result, readers should understand that the true range of uncertainty is larger than indicated in this appendix.

[1] More detail on this model, and stochastic modeling in general, is available at www.ssa.gov/OACT/stochastic/index.html.

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3. Stochastic Results

This section illustrates the results for the stochastic simulations of two fundamental measures of actuarial status: the annual cost rates and the trust fund ratio. The latter measure is highlighted in the Overview of this report. Section 4 follows with a comparison of stochastic results to results from the alternative scenarios for these and other measures, and an analysis of the differences.

Figure VI.E1 displays the probability distribution of the year-by-year OASDI cost rates (that is, cost as a percentage of taxable payroll). The range of the annual cost rates widens as the projections move further into the future, which reflects increasing uncertainty. Because there is relatively little variation in income rates across the 5,000 stochastic simulations, the figure includes the income rate only under the intermediate assumptions. The two outermost lines in this figure indicate the range within which future annual cost rates are projected to occur 95 percent of the time (i.e., a 95-percent confidence interval). In other words, the current model estimates that there is a 2.5 percent probability that the cost rate for a given year will exceed the upper end of this range and a 2.5 percent probability that it will fall below the lower end of this range. Other lines in the figure delineate additional confidence intervals (80-percent, 60-percent, 40-percent, and 20-percent) around future annual cost rates. The median (50th percentile) cost rate for each year is the rate for which half of the simulated outcomes are higher and half are lower for that year. These lines do not represent the results of individual stochastic simulations. Instead, for each given year, they represent the percentile distribution of annual cost rates based on all stochastic simulations for that year.

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Figure VI.E1.—Long-Range OASDI Cost Rates From Stochastic Modeling

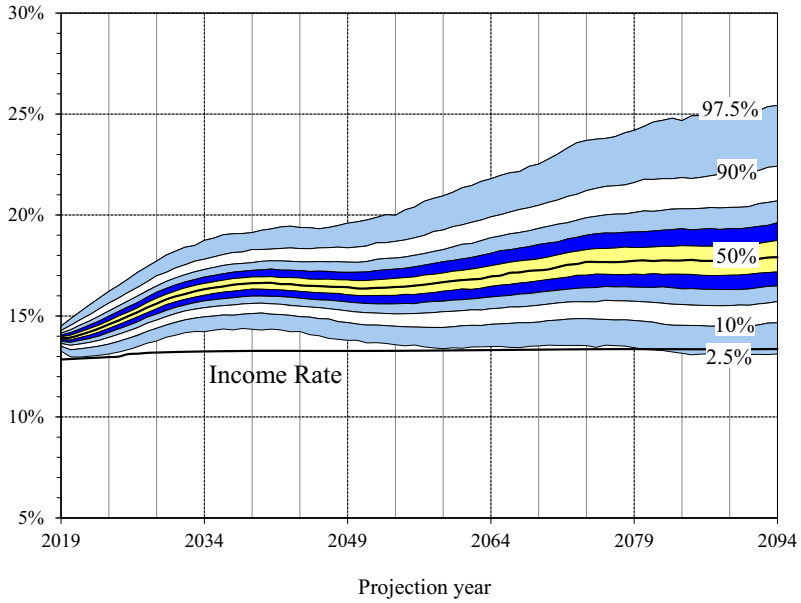

Figure VI.E2 presents the simulated probability distribution of the annual trust fund ratios for the combined OASI and DI Trust Funds. The lines in this figure display the median set (50th percentile) of estimated annual trust fund ratios and delineate the 95-percent, 80-percent, 60-percent, 40-percent, and 20-percent confidence intervals estimated for future annual trust fund ratios. Again, none of these lines represent the path of a single simulation. For each given year, they represent the percentile distribution of trust fund ratios based on all stochastic simulations for that year.

Figure VI.E2 shows that the 95-percent confidence interval for the trust fund depletion year ranges from 2031 to 2044, and that there is a 50-percent probability of trust fund depletion by the end of 2035 (the median depletion year). The median depletion year is the same as the Trustees project under the intermediate assumptions. The figure also shows confidence intervals for the trust fund ratio in each year. For example, the 95-percent confidence interval for the trust fund ratio at the beginning of 2025 ranges from 216 to 145 percent of annual cost.

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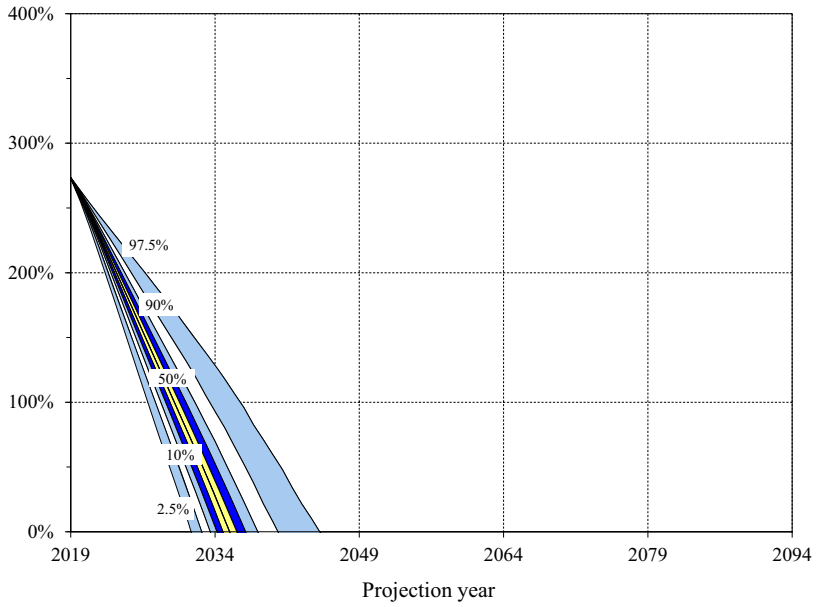
Figure VI.E2.—Long-Range OASDI Trust Fund Ratios From Stochastic Modeling



4. Comparison of Results: Stochastic to Low-Cost, Intermediate, and High-Cost Alternatives

This section compares results from two different approaches for illustrating ranges of uncertainty for trust fund actuarial status. One approach uses results from the low-cost, intermediate, and high-cost alternative scenarios. The other approach uses distributions of results from the stochastic simulations. Each of these approaches provides insights into uncertainty. Comparing the results requires an understanding of fundamental differences in the approaches.

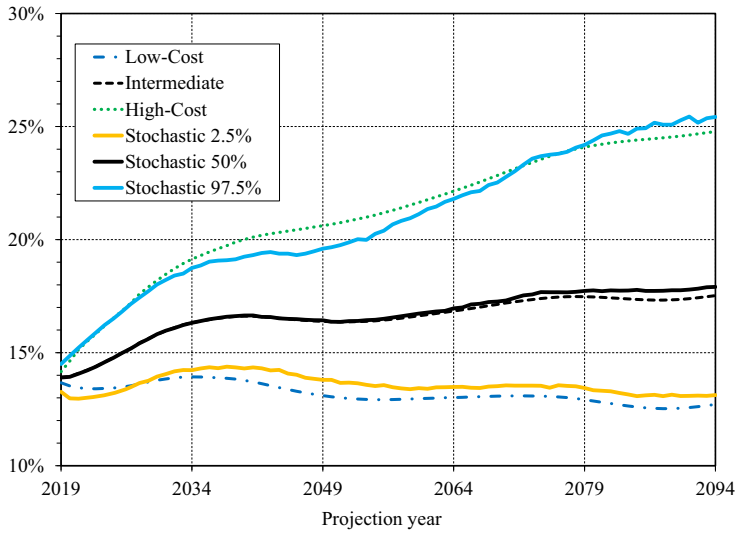
One fundamental difference relates to the presentation of distributional results. Figure VI.E3 shows projected OASDI annual cost rates for the low-cost, intermediate, and high-cost alternatives along with the annual cost rates at the 97.5th percentile, 50th percentile, and 2.5th percentile for the stochastic simulations. While all values on each line for the alternatives are results from a single specified scenario, the values on each stochastic line may be results from different simulations for different years. The one stochastic simulation (from the 5,000 simulations) that yields results closest to a particular

percentile for one projected year may yield results that are distant from that percentile in another projected year.

Because each stochastic simulation shows substantial variability from year to year, the range shown between the 97.5th and 2.5th percentiles is broader than would be seen if simulations followed a smooth trend like in the alternatives. In spite of this effect, the range from high-cost to low-cost annual rates for the stochastic distribution is generally contained slightly within the range for the high-cost and low-cost alternatives. With introduction of parameter uncertainty for the stochastic simulations expected in future reports, the range for the 95-percent confidence interval is expected to expand.

Both the alternatives and the stochastic results suggest that the range of potential cost rates above the central levels (those for the intermediate alternative and for the median, respectively) is larger than the range below these central results. The difference between the central results and the higher cost levels (the high-cost alternative and the upper end of the 95-percent confidence range, respectively) is about 1.5 times as large as the difference between the central and lower cost levels for both models by the end of the projection period.

Figure VI.E3.—OASDI Cost Rates: Comparison of Stochastic to Low-Cost, Intermediate, and High-Cost Alternatives
[As a percentage of taxable payroll]



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Another fundamental difference between the alternatives and the stochastic simulations is the method of assigning values for assumptions. For the alternatives, specific values are assigned for each of the key demographic, economic, and program-specific variables. The high-cost alternative uses parameter values that increase estimated annual cost as a percent of payroll, while the low-cost alternative uses parameter values that decrease annual cost as a percent of payroll. (One parameter, the interest rate, has no effect on annual cost as a percent of payroll for either the alternatives or the stochastic simulations.) In contrast, the stochastic method essentially randomly assigns values for each of the key demographic and economic variables for each year in each of the 5,000 independent stochastic simulations. For each of the stochastic simulations, randomly assigned values for different variables result in varying and often offsetting effects on projected cost as a percent of payroll, with some tending toward higher cost and some tending toward lower cost. This difference tends to reduce the range of cost as a percent of payroll across the 95-percent confidence interval. Again, the future introduction of parameter uncertainty is expected to broaden this range.

It is important to understand that the stochastic model's 95-percent confidence intervals for any summary measure of trust fund finances would tend to be narrower than the range produced for the low-cost and high-cost alternatives, even if the stochastic model's 95-percent confidence interval for annual cost rates were identical to the range defined by the low-cost and high-cost projections. This is true because summary measures of trust fund finances depend on cost rates for many years, and the probability that annual cost rates, on average for individual stochastic simulations, will be at least as low (high) as the 2.5 (97.5) percentile line is significantly lower than 2.5 percent. As a result, the relationship between the ranges presented for annual cost rates and summary measures of trust fund finances is fundamentally different for the stochastic model than it is for the low-cost and high-cost alternatives.

Figure VI.E4 compares the ranges of trust fund (unfunded obligation) ratios for the alternative scenarios to the 95-percent confidence interval of the stochastic simulations. This figure extends figure VI.E2 to show unfunded obligation ratios, expressed as negative values below the zero percent line. An unfunded obligation ratio is the ratio of the unfunded obligation accumulated through the beginning of the year to the cost for that year.

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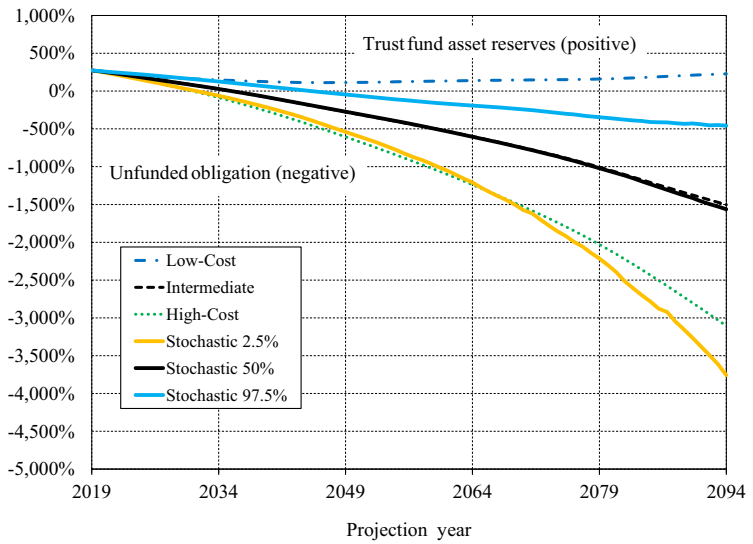
Figure VI.E4.—OASDI Trust Fund (Unfunded Obligation) Ratios: Comparison of Stochastic to Low-Cost, Intermediate, and High-Cost Alternatives[a]
[Asset reserves (unfunded obligation) as a percentage of annual cost]



[a] An unfunded obligation, shown as a negative value in this figure, is equivalent to the amount the trust funds would need to have borrowed to date in order to pay all scheduled benefits (on a timely basis) after trust fund asset reserves are depleted. Note that current law does not permit the trust funds to borrow.

As mentioned above, a summary measure that accumulates annual values tends to smooth the kind of annual fluctuations that occur in stochastic simulations. Therefore, one might expect the range across the stochastic confidence interval for trust fund (unfunded obligation) ratios to be narrower and fall within the range seen across the high-cost and low-cost alternatives, as it does for the actuarial balance measure. But this is not the case, largely due to the way interest rates are assigned.

For the stochastic model, real interest rates for each simulation are assigned essentially randomly, so the rate for compounding of trust fund reserves (unfunded obligations) is essentially uncorrelated with the level of cost as a percent of payroll. On the other hand, real interest rates are assigned to be higher for the low-cost alternative and lower for the high-cost alternative. High interest rates raise the level of the positive trust fund ratio in the low-cost alternative somewhat, but this effect is limited because the magnitude of reserves is small. However, low interest rates substantially reduce the magnitude of the unfunded obligation ratio for the high-cost alternative because the

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magnitude of unfunded obligations is relatively large. As a result, the trust fund (unfunded obligation) ratios are shifted, albeit unevenly, higher (or less negative) for both the high-cost and low-cost alternatives.

This interest rate effect on the alternatives is not as evident for some other summary measures of actuarial status, such as the actuarial balance. Because the actuarial balance reflects the cumulative effects of interest in both its numerator and denominator, the interest rate effect is much less pronounced. In contrast, cumulative interest affects only the numerator of the trust fund (unfunded obligation) ratio. There is also no significant interest rate effect on the trust fund depletion date.

Other factors also contribute, to varying degrees, to the difference in ranges between the results of the alternative scenarios and the stochastic simulations. The contrasts in results and methods do not mean that either approach to illustrating ranges of uncertainty is superior to the other. The ranges are different and explainable.

Table VI.E1 displays long-range actuarial estimates for the combined OASDI program using the two methods of illustrating uncertainty: alternative scenarios and stochastic simulations. The table shows scenario-based estimates for the intermediate, low-cost, and high-cost assumptions. It also shows stochastic estimates for the median (50th percentile) and for the 80-percent and 95-percent confidence intervals. Each individual stochastic estimate in the table is the level at that percentile from the distribution of the 5,000 simulations. For each given percentile, the values in the table for each long-range actuarial measure are generally from different stochastic simulations.

The median stochastic estimates displayed in table VI.E1 are similar to the intermediate scenario-based estimates. The median estimate of the long-range actuarial balance is -2.83 percent of taxable payroll, about 0.05 percentage point lower (more negative) than projected under the intermediate assumptions. The median estimate for the open-group unfunded obligation is $14.2 trillion, about $0.3 trillion larger than the $13.9 trillion estimate under the intermediate assumptions. The median first projected year for which cost exceeds non-interest income (as it did in 2010 through 2018), and remains in excess of non-interest income throughout the remainder of the long-range period, is 2019. This is the same year as projected under the intermediate assumptions. The median projected year in which asset reserves first become depleted is 2035, also the same as projected under the intermediate assumptions. The median estimates of the annual cost rate for the 75th year of the projection period are 17.89 percent of taxable payroll and 6.19 percent of gross domestic product (GDP). The comparable estimates

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under the intermediate assumptions are 17.47 percent of payroll and 6.05 percent of GDP.

For three measures in table VI.E1 (the actuarial balance, the first projected year cost exceeds non-interest income and remains in excess through 2093, and the first year asset reserves become depleted), the 95-percent stochastic confidence interval falls within the range defined by the low-cost and high-cost alternatives. For the remaining three measures (the open-group unfunded obligation, the annual cost in the 75th year as a percent of taxable payroll, and the annual cost in the 75th year as a percent of GDP), one or both of the bounds of the 95-percent stochastic confidence interval fall outside the range defined by the low-cost and high-cost alternatives.

Table VI.E1.—Long-Range Estimates Relating to the Actuarial Status of the Combined OASDI Program
[Comparison of scenario-based and stochastic results]

	Traditional scenario-based model			Stochastic model				
					80-percent confidence interval		95-percent confidence interval	
	Intermediate	Low-cost	High-cost	Median 50th percentile	10th percentile	90th percentile	2.5th percentile	97.5th percentile
Actuarial balance	-2.78	0.19	-6.60	-2.83	-4.27	-1.63	-5.12	-1.00
Open-group unfunded obligation (in trillions)	$13.9	-$2.1	$28.1	$14.2	$7.2	$25.0	$4.3	$33.3
First projected year cost exceeds non-interest income and remains in excess through 2093	2019	[a]	2019	2019	2019	2058	2019	[b]
First year asset reserves become depleted[c]	2035	[d]	2030	2035	2032	2040	2031	2044
Annual cost in 75th year (percent of taxable payroll)	17.47	12.66	24.73	17.89	14.65	22.36	13.09	25.37
Annual cost in 75th year (percent of GDP)	6.05	4.77	7.86	6.19	5.10	7.68	4.57	8.64

[a] The annual balance is projected to be negative for a temporary period, returning to positive levels before the end of the projection period.
[b] For this percentile, cost does not exceed tax income in 2093.
[c] For some stochastic simulations, the first year in which trust fund reserves become depleted does not indicate a permanent depletion of reserves.
[d] Trust fund reserves are not estimated to be depleted within the projection period.

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F. INFINITE HORIZON PROJECTIONS

Another measure of trust fund financial status is the infinite horizon unfunded obligation, which takes account of all past and future annual balances, even those after the next 75 years. The extension of the time period past 75 years assumes that the current law for the OASDI program and the demographic and economic trends used for the 75-year projection continue indefinitely.

Table VI.F1 shows that the OASDI open-group unfunded obligation over the infinite horizon is $43.2 trillion in present value, which is $29.3 trillion larger than for the 75-year period. The $29.3 trillion increment reflects a significant financing gap projected for OASDI for years after 2093 into perpetuity. Of course, the degree of uncertainty associated with estimates increases substantially for years further in the future.

The $43.2 trillion infinite horizon open-group unfunded obligation is equivalent to 4.1 percent of taxable payroll or 1.4 percent of GDP. These relative measures of the unfunded obligation over the infinite horizon express its magnitude in relation to the resources potentially available to finance the shortfall.

The summarized shortfalls for the 75-year period and through the infinite horizon both reflect annual cash-flow shortfalls for all years after trust fund reserve depletion. The annual shortfalls after trust fund reserve depletion rise slowly and reflect increases in life expectancy. The summarized shortfalls over the infinite horizon, as percentages of taxable payroll and GDP, are larger than the shortfalls for the 75-year period.

To illustrate the magnitude of the projected infinite horizon shortfall, consider that it could be eliminated with additional revenue equivalent to an immediate increase in the combined payroll tax rate from 12.4 percent to about 16.7 percent,[1] or with cost reductions equivalent to an immediate and permanent reduction in benefits for all current and future beneficiaries by about 25 percent.

[1] The indicated increase in the payroll tax rate of 4.3 percent is somewhat larger than the 4.1 percent infinite horizon actuarial deficit because the indicated increase reflects a behavioral response to tax rate changes. In particular, the calculation assumes that an increase in payroll taxes results in a small shift of wages and salaries to forms of employee compensation that are not subject to the payroll tax.

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Table VI.F1.—Unfunded OASDI Obligations Through the Infinite Horizon and the 75-Year Projection Period, Based on Intermediate Assumptions
[Present values as of January 1, 2019; dollar amounts in trillions]

	Present value	Expressed as a percentage of future payroll and GDP	
		Taxable payroll	GDP
Unfunded obligation through the infinite horizon[a]	$43.2	4.1	1.4
Unfunded obligation through 2093[b]	13.9	2.6	.9

[a] Present value of future cost less future non-interest income, reduced by the amount of trust fund asset reserves at the beginning of 2019. Expressed as a percentage of payroll and GDP for the period 2019 through the infinite horizon.
[b] Present value of future cost less future non-interest income through 2093, reduced by the amount of trust fund reserves at the beginning of 2019. Expressed as a percentage of payroll and GDP for the period 2019 through 2093.

Notes:
1. The present values of future taxable payroll for 2019-93 and for 2019 through the infinite horizon are $531.2 trillion and $1,050.1 trillion, respectively.
2. The present values of GDP for 2019-93 and for 2019 through the infinite horizon are $1,497.0 trillion and $3,158.3 trillion, respectively. Present values of GDP shown in the Medicare Trustees Report differ slightly due to the use of discount rates that are specific to each program's trust fund holdings.

Last year, the Trustees projected that the infinite horizon unfunded obligation was $34.3 trillion in present value. If the assumptions, methods, and starting values had not changed, moving the valuation date forward by 1 year would have increased the unfunded obligation by about $1.0 trillion, to $35.3 trillion. The net effects of changes in assumptions, methods, law, and starting values increased the infinite horizon unfunded obligation by $7.8 trillion. The major change affecting the infinite horizon unfunded obligation for this report is the reduction in the ultimate real interest rate from 2.7 percent to 2.5 percent, which provides less discounting of annual shortfalls in the future. The same interest rate change also increased the present values of future taxable payroll and GDP for this report.

The infinite horizon unfunded obligation expressed as a share of taxable payroll is higher than in last year's report by 0.1 percentage point. The infinite horizon unfunded obligation expressed as a share of GDP is higher than in last year's report by less than 0.05 percentage point. The infinite horizon unfunded obligation as a share of both taxable payroll and GDP changed relatively little, because the reduction in the ultimate real interest rate increased the present value of taxable payroll and of GDP by almost as much as it increased the present value of the unfunded obligation. See section IV.B.6 for details regarding changes in law, data, methods, and assumptions.

a. Unfunded Obligations for Past, Current, and Future Participants

Table VI.F2 separates the components of the infinite horizon unfunded obligation (with the exception of General Fund reimbursements) among past,

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current, and future participants. The table does not separate past General Fund reimbursements among participants because there is no clear basis for attributing the reimbursements across generations.

Past participants are defined as those no longer alive as of the valuation date. Current participants are those age 15 and older as of 2019. Future participants are those under age 15 or not yet born.

The excess of the present value of cost for past and current participants over the present value of dedicated tax income for past and current participants produces an unfunded obligation for past and current participants of $35.9 trillion. Table VI.F2 also shows an unfunded obligation of $35.2 trillion for past and current participants, including past and future General Fund reimbursements. Future participants are scheduled to pay dedicated taxes of $7.9 trillion less into the system than the cost of their scheduled benefits ($105.2 trillion of dedicated tax income as compared to $113.1 trillion of cost). The unfunded obligation for all participants through the infinite horizon thus equals $43.2 trillion.

Making Social Security solvent over the infinite horizon requires some combination of increased revenue or reduced benefits for current and future participants amounting to $43.2 trillion in present value, 4.1 percent of future taxable payroll, or 1.4 percent of future GDP.

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Table VI.F2.—Present Values Through the Infinite Horizon for Various Categories of Program Participants, Based on Intermediate Assumptions
[Present values as of January 1, 2019; dollar amounts in trillions]

	Present value	Expressed as a percentage of future payroll and GDP: Taxable payroll	GDP
Present value of past cost	$62.8	6.0	2.0
Less present value of past dedicated tax income	65.0	6.2	2.1
Plus present value of future cost for current participants	73.3	7.0	2.3
Less present value of future dedicated tax income for current participants	35.2	3.4	1.1
Equals unfunded obligation for past and current participants excluding General Fund reimbursements	35.9	3.4	1.1
Less present value of past General Fund reimbursements[a]	.7	.1	[b]
Less present value of future General Fund reimbursements through the infinite horizon[a]	[c]	[d]	[b]
Equals unfunded obligation for past and current participants including General Fund reimbursements	35.2	3.4	1.1
Plus present value of cost for future participants through the infinite horizon	113.1	10.8	3.6
Less present value of dedicated tax income for future participants through the infinite horizon	105.2	10.0	3.3
Equals unfunded obligation for all participants through the infinite horizon	43.2	4.1	1.4

[a] Distribution of General Fund reimbursements among past, current, and future participants cannot be determined.
[b] Less than 0.05 percent of GDP.
[c] Less than $50 billion.
[d] Less than 0.05 percent of taxable payroll.

Notes:
1. The present value of future taxable payroll for 2019 through the infinite horizon is $1,050.1 trillion.
2. The present value of GDP for 2019 through the infinite horizon is $3,158.3 trillion.
3. Totals do not necessarily equal the sums of rounded components.

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G. ESTIMATES FOR OASDI AND HI, SEPARATE AND COMBINED

In this appendix, the Trustees present long-range actuarial estimates for the OASDI and Hospital Insurance (HI) programs both separately and on a combined basis. These estimates facilitate analysis of the adequacy of the income and asset reserves of these programs relative to their cost under current law. This appendix does not include estimates for the Supplementary Medical Insurance (SMI) program because adequate financing is guaranteed in the law and because the SMI program is not financed through a payroll tax. For more information on Medicare estimates, please see the 2019 Medicare Trustees Report.

The information in this appendix on combined operations, while significant, should not obscure the analysis of the financial status of the individual trust funds, which are legally separate and cannot be commingled. In addition, the factors which determine the costs of the OASI, DI, and HI programs differ substantially.

1. Estimates as a Percentage of Taxable Payroll

Comparing cost and income rates for the OASDI and HI programs as percentages of taxable payroll requires a note of caution. The taxable payrolls for the HI program are larger than those estimated for the OASDI program because: (1) a larger maximum taxable amount was established for the HI program in 1991, with the maximum eliminated altogether for the HI program in 1994; (2) larger proportions of Federal, State, and local government employees are covered under the HI program; and (3) the earnings of railroad workers are included directly in the HI taxable payroll but are not included in the OASDI taxable payroll. (Railroad worker contributions for the equivalent of OASDI benefits are accounted for in a net interchange that occurs annually between the OASDI and Railroad Retirement programs.) As a result, the HI taxable payroll is about 25 percent larger than the OASDI taxable payroll throughout the long-range period.

As with the OASI and DI Trust Funds, income to the HI Trust Fund comes primarily from contributions paid by employees, employers, and self-employed persons. Table VI.G1 shows the OASDI and HI contribution rates that are authorized in the Federal Insurance Contributions Act.

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Table VI.G1.—Payroll Tax Contribution Rates for the OASDI and HI Programs
[In percent]

Calendar years	Employees and employers, combined[a]		Employees only	Self employed[b]		
	OASDI up to base[c]	HI all earnings[d]	HI over limit[e]	OASDI up to base[c]	HI all earnings[d]	HI over limit[e]
1966	7.70	0.70	—	5.80	0.35	—
1967	7.80	1.00	—	5.90	.50	—
1968	7.60	1.20	—	5.80	.60	—
1969-70	8.40	1.20	—	6.30	.60	—
1971-72	9.20	1.20	—	6.90	.60	—
1973	9.70	2.00	—	7.00	1.00	—
1974-77	9.90	1.80	—	7.00	.90	—
1978	10.10	2.00	—	7.10	1.00	—
1979-80	10.16	2.10	—	7.05	1.05	—
1981	10.70	2.60	—	8.00	1.30	—
1982-83	10.80	2.60	—	8.05	1.30	—
1984[f]	11.40	2.60	—	11.40	2.60	—
1985[f]	11.40	2.70	—	11.40	2.70	—
1986-87[f]	11.40	2.90	—	11.40	2.90	—
1988-89[f]	12.12	2.90	—	12.12	2.90	—
1990-2010[g]	12.40	2.90	—	12.40	2.90	—
2011-2012[h]	10.40	2.90	—	10.40	2.90	—
2013 and later	12.40	2.90	0.90	12.40	2.90	0.90

[a] Except as noted below, the combined employee/employer rate is divided equally between employees and employers.
[b] Beginning in 1990, self-employed persons receive a deduction, for purposes of computing their net earnings, equal to half of the combined OASDI and HI contributions that would be payable without regard to the contribution and benefit base. The OASDI contribution rate then applies to net earnings after this deduction, but subject to the OASDI base.
[c] The payroll tax on earnings for the OASDI program applies to annual earnings up to a contribution and benefit base indexed to the average wage level. The base is $132,900 for 2019.
[d] Prior to 1994, the payroll tax on earnings for the HI program applied to annual earnings up to a contribution base. The HI contribution base was eliminated beginning in 1994.
[e] Starting with Federal personal income tax returns for tax year 2013, earned income exceeding $200,000 for individual filers and $250,000 for married couples filing jointly is subject to an additional HI tax of 0.9 percent. These income limits are not indexed after 2013.
[f] In 1984 only, employees received an immediate credit of 0.3 percent of taxable wages against their OASDI payroll tax contributions. The self-employed received similar credits of 2.7 percent, 2.3 percent, and 2.0 percent against their combined OASDI and Hospital Insurance (HI) contributions on net earnings from self-employment in 1984, 1985, and 1986-89, respectively. The General Fund of the Treasury reimbursed the trust funds for these credits.
[g] Public Law 111-147 exempted most employers from paying the employer share of OASDI payroll tax on wages paid during the period March 19, 2010 through December 31, 2010 to certain qualified individuals hired after February 3, 2010. The General Fund of the Treasury reimbursed the trust funds for the payroll tax revenue forgone under this law.
[h] Public Law 111-312, Public Law 112-78, and Public Law 112-96 reduced the OASDI payroll tax rate for 2011 and 2012 by 2 percentage points for employees and for self-employed workers. The General Fund of the Treasury reimbursed the trust funds for the payroll tax revenue forgone under these laws.

Table VI.G2 shows the Trustees' estimates of annual income rates and cost rates for the OASDI program and the HI program under the low-cost, intermediate, and high-cost sets of assumptions described earlier in this report. The income rates reflect the payroll tax rates shown in table VI.G1, revenue from taxation of scheduled OASDI benefits for both the OASDI and HI

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Trust Funds, and any reimbursements from the General Fund of the Treasury. For the HI program, the income rates also reflect: (1) the additional 0.9-percent tax on employees for relatively high earnings and the portion of total payroll to which the 0.9-percent rate applies; (2) premium revenues; and (3) monies from fraud and abuse control activities. Annual income and cost rates indicate the cash-flow operation of the programs. Therefore, income rates exclude interest earned on trust fund asset reserves. Table VI.G2 also shows annual balances, which are the differences between annual income rates and cost rates.

The Trustees project that the OASDI and HI cost rates will rise generally above current levels under the intermediate and high-cost sets of assumptions. The greatest increase occurs from 2019 to 2038 under both sets of assumptions for OASDI and under the intermediate assumptions for HI. Under the intermediate assumptions, the OASDI cost rate increases by 26 percent from its current level by 2093, while under the high-cost assumptions, the cost rate increases by 75 percent by 2093. For HI, cost rates increase by 53 percent and 218 percent from 2019 to 2093 under the intermediate and high-cost assumptions, respectively. Under the low-cost assumptions, the OASDI and HI cost rates decrease from 2019 to 2093 by 7 percent and 26 percent, respectively.

The Trustees project annual deficits for every year of the projection period under the intermediate and high-cost assumptions for both the OASDI and HI programs. Under the low-cost assumptions, OASDI annual balances are negative through 2049, and are positive thereafter, increasing to 0.17 percent of payroll for 2056, declining to 0.02 percent for 2071, and then generally increasing through the remainder of the 75-year projection period. After a 0.01 deficit in 2019, HI annual balances as a percent of payroll are positive for 2020 through the remainder of the projection period under the low-cost assumptions.

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Table VI.G2.—OASDI and HI Annual Income Rates, Cost Rates, and Balances, Calendar Years 2019-2095
[As a percentage of taxable payroll[a]]

	OASDI			HI		
Calendar year	Income rate	Cost rate[b]	Balance[b]	Income rate	Cost rate	Balance
Intermediate:						
2019	12.85	13.91	-1.06	3.35	3.47	-0.12
2020	12.87	13.94	-1.07	3.37	3.52	-.15
2021	12.90	14.09	-1.19	3.39	3.58	-.19
2022	12.92	14.23	-1.31	3.40	3.66	-.26
2023	12.94	14.40	-1.46	3.42	3.75	-.32
2024	12.97	14.59	-1.62	3.44	3.82	-.38
2025	12.99	14.79	-1.80	3.46	3.90	-.43
2026	13.11	14.99	-1.88	3.55	3.97	-.43
2027	13.13	15.19	-2.06	3.57	4.03	-.46
2028	13.17	15.43	-2.26	3.60	4.21	-.61
2030	13.20	15.81	-2.60	3.64	4.37	-.73
2035	13.25	16.40	-3.15	3.73	4.70	-.96
2040	13.27	16.62	-3.34	3.81	4.90	-1.09
2045	13.27	16.49	-3.22	3.86	4.99	-1.13
2050	13.27	16.37	-3.10	3.92	5.02	-1.10
2055	13.28	16.41	-3.13	3.99	5.02	-1.03
2060	13.30	16.63	-3.33	4.06	5.03	-.97
2065	13.32	16.90	-3.58	4.14	5.09	-.96
2070	13.34	17.20	-3.86	4.21	5.19	-.98
2075	13.36	17.43	-4.07	4.27	5.28	-1.01
2080	13.36	17.46	-4.10	4.32	5.33	-1.01
2085	13.35	17.36	-4.00	4.35	5.33	-.98
2090	13.35	17.36	-4.00	4.39	5.32	-.93
2095	13.37	17.58	-4.21	4.43	5.33	-.89
Low-cost:						
2019	12.77	13.67	-.90	3.34	3.36	-.01
2020	12.85	13.53	-.68	3.36	3.31	.05
2021	12.86	13.45	-.58	3.37	3.30	.07
2022	12.88	13.41	-.53	3.39	3.31	.08
2023	12.89	13.40	-.51	3.40	3.32	.08
2024	12.92	13.42	-.50	3.42	3.32	.10
2025	12.92	13.44	-.52	3.44	3.32	.11
2026	13.03	13.48	-.45	3.51	3.32	.19
2027	13.05	13.53	-.49	3.53	3.30	.23
2028	13.08	13.62	-.54	3.56	3.39	.17
2030	13.10	13.78	-.68	3.60	3.38	.22
2035	13.12	13.92	-.80	3.70	3.30	.40
2040	13.13	13.78	-.65	3.78	3.12	.66
2045	13.11	13.37	-.26	3.84	2.87	.97
2050	13.10	13.05	.05	3.91	2.66	1.25
2055	13.09	12.92	.17	3.98	2.49	1.49
2060	13.10	12.96	.14	4.05	2.40	1.66
2065	13.11	13.03	.08	4.12	2.38	1.74
2070	13.11	13.08	.03	4.18	2.41	1.76
2075	13.11	13.06	.05	4.22	2.46	1.77
2080	13.10	12.86	.24	4.26	2.48	1.78
2085	13.09	12.60	.49	4.28	2.48	1.80
2090	13.08	12.54	.54	4.31	2.48	1.84
2095	13.10	12.77	.33	4.36	2.50	1.86

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Table VI.G2.—OASDI and HI Annual Income Rates, Cost Rates, and Balances, Calendar Years 2019-2095 (Cont.)
[As a percentage of taxable payroll[a]]

	OASDI			HI		
Calendar year	Income rate	Cost rate[b]	Balance[b]	Income rate	Cost rate	Balance
High-cost:						
2019	12.93	14.16	-1.23	3.35	3.58	-0.22
2020	12.91	14.62	-1.72	3.38	3.75	-.37
2021	12.94	15.14	-2.20	3.41	3.90	-.49
2022	12.98	15.50	-2.52	3.43	4.05	-.63
2023	13.00	15.84	-2.84	3.45	4.23	-.78
2024	13.04	16.19	-3.16	3.48	4.39	-.92
2025	13.06	16.52	-3.46	3.50	4.57	-1.07
2026	13.20	16.85	-3.64	3.59	4.74	-1.15
2027	13.23	17.19	-3.96	3.62	4.91	-1.29
2028	13.29	17.60	-4.31	3.66	5.23	-1.57
2030	13.33	18.20	-4.87	3.70	5.64	-1.94
2035	13.40	19.30	-5.90	3.80	6.68	-2.88
2040	13.44	20.01	-6.56	3.88	7.67	-3.80
2045	13.47	20.38	-6.91	3.94	8.62	-4.68
2050	13.49	20.68	-7.19	4.00	9.43	-5.43
2055	13.52	21.09	-7.57	4.06	10.03	-5.97
2060	13.56	21.64	-8.08	4.13	10.49	-6.36
2065	13.60	22.27	-8.67	4.21	10.85	-6.64
2070	13.65	22.99	-9.34	4.28	11.08	-6.80
2075	13.70	23.68	-9.99	4.36	11.28	-6.92
2080	13.73	24.16	-10.43	4.42	11.38	-6.96
2085	13.75	24.40	-10.65	4.47	11.39	-6.92
2090	13.76	24.58	-10.82	4.52	11.37	-6.85
2095	13.78	24.84	-11.06	4.57	11.37	-6.80

[a] The taxable payroll for HI is significantly larger than the taxable payroll for OASDI because the HI taxable maximum amount was eliminated beginning in 1994, and because HI covers all Federal civilian employees, all State and local government employees hired after April 1, 1986, and railroad employees.
[b] OASDI benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

Notes:
1. The income rate excludes interest income.
2. The Trustees show income and cost estimates generally on a cash basis for the OASDI program and on an incurred basis for the HI program.
3. Totals do not necessarily equal the sums of rounded components.

Table VI.G3 shows summarized values over the 25-year, 50-year, and 75-year valuation periods. For each of those periods, the summarized income rates include beginning trust fund asset reserves, and the summarized cost rates include the cost of accumulating an ending fund reserve equal to 100 percent of annual cost at the end of the period.

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Table VI.G3.—Summarized OASDI and HI Income Rates and Cost Rates for Valuation Periods,[a] Calendar Years 2019-2093
[As a percentage of taxable payroll[b]]

Valuation period	OASDI			HI		
	Income rate	Cost rate[c]	Actuarial balance	Income rate	Cost rate	Actuarial balance
Intermediate:						
25-year:						
2019-43	14.55	16.28	-1.73	3.71	4.51	-0.80
50-year:						
2019-68	13.97	16.36	-2.38	3.84	4.73	-.89
75-year:						
2019-93	13.81	16.60	-2.78	3.97	4.88	-.91
Low-cost:						
25-year:						
2019-43	14.31	14.23	.08	3.67	3.38	.29
50-year:						
2019-68	13.74	13.63	.11	3.83	2.97	.86
75-year:						
2019-93	13.55	13.36	.19	3.96	2.81	1.14
High-cost:						
25-year:						
2019-43	14.83	18.71	-3.88	3.76	6.07	-2.31
50-year:						
2019-68	14.26	19.76	-5.50	3.90	7.74	-3.84
75-year:						
2019-93	14.13	20.73	-6.60	4.02	8.58	-4.55

[a] Income rates include beginning trust fund asset reserves and cost rates include the cost of reaching an ending target trust fund equal to 100 percent of annual cost at the end of the period.
[b] The taxable payroll for HI is significantly larger than the taxable payroll for OASDI because the HI taxable maximum amount was eliminated beginning 1994, and because HI covers all Federal civilian employees, all State and local government employees hired after April 1, 1986, and railroad employees.
[c] OASDI benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

Note: Totals do not necessarily equal the sums of rounded components.

The Trustees project that the OASDI and HI programs will each experience large actuarial deficits for the 25-year, 50-year, and 75-year valuation periods under the high-cost assumptions. Actuarial deficits under the intermediate assumptions are smaller than those for the high-cost assumptions for all three valuation periods. Under the low-cost assumptions, the OASDI and HI programs have positive actuarial balances for all three valuation periods.

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2. Estimates as a Percentage of Gross Domestic Product

This section presents long-range projections of the operations of the combined Old-Age and Survivors Insurance and Disability Insurance (OASI and DI) Trust Funds and of the Hospital Insurance (HI) Trust Fund, expressed as a percentage of gross domestic product (GDP). While expressing fund operations as a percentage of taxable payroll is a very useful approach for assessing the financial status of the programs (see section IV.B.1), expressing them as a percentage of the total value of goods and services produced in the United States provides an additional perspective.

Table VI.G4 shows non-interest income, total cost, and the resulting balance of the combined OASI and DI Trust Funds, of the HI Trust Fund, and of the combined OASI, DI, and HI Trust Funds, expressed as percentages of GDP on the basis of each of the three alternative sets of assumptions. Table VI.G4 also contains estimates of GDP. For OASDI, non-interest income consists of payroll tax contributions, proceeds from taxation of scheduled OASDI benefits, and any reimbursements from the General Fund of the Treasury. Cost consists of scheduled benefits, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. For HI, non-interest income consists of payroll tax contributions (including contributions from railroad employment), up to an additional 0.9 percent tax on earned income for relatively high earners, proceeds from taxation of scheduled OASDI benefits, premium revenues, monies from fraud and abuse control activities, and any reimbursements from the General Fund of the Treasury. Cost consists of outlays (benefits and administrative expenses) for beneficiaries. The Trustees show income and cost estimates generally on a cash basis for the OASDI program[1] and on an incurred basis for the HI program.

The Trustees project the OASDI annual balance (non-interest income less cost) as a percentage of GDP to be negative throughout the projection period under the intermediate and high-cost assumptions. Under the low-cost assumptions, the OASDI annual deficit as a percentage of GDP generally decreases through 2026. After 2026, deficits increase to a peak in 2034 and then decrease through 2049. The deficit decreases in 2026 in part because of a one-time upward shift in taxation of benefits income due to the expiration of the personal income tax provisions in Public Law 115-97, the Tax Cuts

[1] OASDI benefits paid for entitlement for a particular month are generally paid in the succeeding month. There are two primary exceptions to this general rule. First, payments can occur with a greater delay when a benefit award is made after the month of initial benefit entitlement. At the time of benefit award, benefits owed for months of prior entitlement are then also paid to the beneficiary. For the projections in this report, such retroactive payments are included in the period where they are paid (at time of award). Second, when benefit payments scheduled for January 3 are paid on the prior December 31, because January 3 falls on a Sunday, such payments are shown in this report for the period they were scheduled to be paid.

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and Jobs Act. The annual balances are then positive for 2050 through the remainder of the projection period. The positive annual balances increase through 2056, decline through 2071, and then generally increase through 2093. Under the intermediate assumptions, the annual deficits increase through 2040, decrease through 2051, and then generally increase thereafter. Under the high-cost assumptions, annual deficits increase throughout the projection period.

The Trustees project that the HI annual balance as a percentage of GDP will be negative in 2019, and then positive throughout the rest of the projection period, under the low-cost assumptions. Under the intermediate and the high-cost assumptions, the HI annual balance is negative for all years of the projection period. Under the intermediate assumptions, annual deficits generally increase through 2046, and then generally decline thereafter. Under the high-cost assumptions, annual deficits reach a peak in 2076 and decline slowly thereafter.

The combined OASDI and HI annual balance as a percentage of GDP is negative throughout the projection period under both the intermediate and high-cost assumptions. Under the low-cost assumptions, the combined OASDI and HI annual balance is negative through 2038, and then positive and mostly rising thereafter. Under the intermediate assumptions, the combined OASDI and HI annual deficits increase from 2019 through 2041, decrease through 2054, increase through 2078, and then generally decline thereafter, reaching 1.82 percent of GDP by 2093. Under the high-cost assumptions, combined annual deficits rise to a peak of 6.31 percent in 2082 and mostly decrease thereafter.

By 2093, the combined OASDI and HI annual balances as percentages of GDP range from a positive annual balance of 1.03 percent for the low-cost assumptions to an annual deficit of 6.27 percent for the high-cost assumptions. Annual balances differ by a much smaller amount for the tenth projection year, 2028, ranging from an annual deficit of 0.12 percent for the low-cost assumptions to an annual deficit of 2.24 percent for the high-cost assumptions.

The summarized long-range (75-year) actuarial balance as a percentage of GDP for the combined OASDI and HI programs varies among the three alternatives by a relatively large amount, from a positive actuarial balance of 0.59 percent under the low-cost assumptions to an actuarial deficit of 4.23 percent under the high-cost assumptions. The 25-year summarized actuarial balance varies by a smaller amount, from a positive actuarial balance of 0.16 percent to an actuarial deficit of 2.40 percent. Summarized rates are calculated on a present-value basis. They include the trust fund reserve balances on January 1, 2019 and the cost of reaching a target trust fund level equal to

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100 percent of the following year's annual cost at the end of the period. (See section IV.B.4 for further explanation.)

Table VI.G4.—OASDI and HI Annual and Summarized Income, Cost, and Balance as a Percentage of GDP, Calendar Years 2019-2095

	Percentage of GDP									GDP in dollars (billions)
	OASDI			HI			Combined			
Calendar year	Income[a]	Cost[b]	Balance[b]	Income[a]	Cost	Balance	Income[a]	Cost[b]	Balance[b]	
Intermediate:										
2019	4.56	4.93	-0.38	1.49	1.54	-0.05	6.04	6.47	-0.43	$21,485
2020	4.57	4.94	-.38	1.50	1.57	-.07	6.07	6.51	-.45	22,523
2021	4.59	5.01	-.42	1.52	1.60	-.09	6.10	6.61	-.51	23,558
2022	4.62	5.09	-.47	1.53	1.65	-.12	6.15	6.73	-.58	24,616
2023	4.64	5.16	-.52	1.54	1.69	-.15	6.18	6.85	-.67	25,735
2024	4.66	5.25	-.58	1.55	1.73	-.17	6.22	6.97	-.75	26,907
2025	4.68	5.33	-.65	1.57	1.76	-.20	6.25	7.10	-.85	28,109
2026	4.74	5.42	-.68	1.61	1.80	-.19	6.35	7.22	-.87	29,349
2027	4.76	5.50	-.75	1.62	1.83	-.21	6.38	7.34	-.95	30,637
2028	4.78	5.59	-.82	1.64	1.92	-.28	6.41	7.51	-1.10	31,972
2030	4.78	5.72	-.94	1.65	1.98	-.33	6.43	7.70	-1.27	34,800
2035	4.76	5.89	-1.13	1.68	2.12	-.43	6.44	8.01	-1.56	42,963
2040	4.74	5.93	-1.19	1.71	2.19	-.49	6.44	8.12	-1.68	52,965
2045	4.72	5.86	-1.14	1.72	2.23	-.50	6.44	8.09	-1.65	65,548
2050	4.71	5.81	-1.10	1.75	2.24	-.49	6.45	8.04	-1.59	81,297
2055	4.71	5.82	-1.11	1.77	2.23	-.46	6.48	8.05	-1.57	100,694
2060	4.71	5.89	-1.18	1.81	2.23	-.43	6.51	8.12	-1.61	124,381
2065	4.70	5.97	-1.26	1.83	2.26	-.42	6.54	8.22	-1.69	153,328
2070	4.70	6.05	-1.36	1.86	2.29	-.43	6.56	8.35	-1.79	189,023
2075	4.69	6.12	-1.43	1.88	2.33	-.45	6.57	8.44	-1.88	233,480
2080	4.67	6.10	-1.43	1.89	2.34	-.44	6.56	8.44	-1.88	289,008
2085	4.65	6.04	-1.39	1.90	2.33	-.43	6.55	8.37	-1.82	357,936
2090	4.63	6.02	-1.39	1.91	2.32	-.41	6.54	8.34	-1.79	442,655
2095	4.62	6.07	-1.45	1.92	2.31	-.39	6.54	8.38	-1.84	546,331
Summarized rates: [c]										
25-year:										
2019-43 . .	5.22	5.84	-.62	1.67	2.03	-.36	6.89	7.87	-.98	
50-year:										
2019-68 . .	4.99	5.84	-.85	1.72	2.12	-.40	6.71	7.96	-1.25	
75-year:										
2019-93 . .	4.90	5.89	-.99	1.77	2.17	-.40	6.67	8.06	-1.39	
Low-cost:										
2019	4.53	4.85	-.32	1.49	1.49	-.01	6.01	6.34	-.33	21,807
2020	4.56	4.80	-.24	1.50	1.48	.02	6.06	6.28	-.22	23,282
2021	4.59	4.80	-.21	1.51	1.48	.03	6.10	6.28	-.17	24,774
2022	4.63	4.82	-.19	1.53	1.49	.03	6.16	6.31	-.16	26,239
2023	4.66	4.85	-.18	1.54	1.50	.04	6.20	6.35	-.15	27,796
2024	4.70	4.88	-.18	1.55	1.50	.04	6.25	6.39	-.14	29,448
2025	4.73	4.91	-.19	1.56	1.51	.05	6.28	6.42	-.14	31,188
2026	4.79	4.95	-.16	1.60	1.51	.09	6.38	6.46	-.08	32,986
2027	4.82	5.00	-.18	1.61	1.51	.10	6.43	6.50	-.08	34,852
2028	4.85	5.05	-.20	1.62	1.55	.08	6.47	6.59	-.12	36,806
2030	4.85	5.10	-.25	1.64	1.54	.10	6.49	6.64	-.15	41,032
2035	4.84	5.14	-.29	1.68	1.50	.18	6.52	6.64	-.11	53,775
2040	4.83	5.07	-.24	1.71	1.41	.30	6.54	6.49	.06	70,485
2045	4.83	4.92	-.10	1.74	1.30	.44	6.57	6.23	.34	93,041
2050	4.83	4.82	.02	1.78	1.21	.57	6.61	6.03	.59	123,297
2055	4.85	4.79	.06	1.82	1.14	.68	6.67	5.92	.74	163,160
2060	4.87	4.82	.05	1.86	1.10	.76	6.73	5.92	.81	215,224
2065	4.89	4.86	.03	1.89	1.09	.80	6.78	5.95	.83	283,386
2070	4.90	4.89	.01	1.92	1.11	.81	6.82	6.00	.82	373,605
2075	4.92	4.90	.02	1.95	1.13	.81	6.86	6.03	.83	494,275
2080	4.92	4.83	.09	1.97	1.14	.82	6.88	5.97	.91	655,836
2085	4.92	4.74	.18	1.98	1.15	.83	6.90	5.88	1.02	870,185
2090	4.93	4.72	.20	2.00	1.15	.85	6.92	5.87	1.05	1,151,359
2095	4.94	4.82	.12	2.02	1.16	.86	6.96	5.98	.98	1,518,880

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Table VI.G4.—OASDI and HI Annual and Summarized Income, Cost, and Balance as a Percentage of GDP, Calendar Years 2019-2095 (Cont.)

	Percentage of GDP									GDP in dollars (billions)
	OASDI			HI			Combined			
Calendar year	Income[a]	Cost[b]	Balance[b]	Income[a]	Cost	Balance	Income[a]	Cost[b]	Balance[b]	
Low-cost (Cont.):										
Summarized rates: [c]										
25-year:										
2019-43 . .	5.25	5.22	0.03	1.67	1.53	0.13	6.91	6.75	0.16	
50-year:										
2019-68 . .	5.07	5.02	.04	1.74	1.35	.39	6.81	6.37	.43	
75-year:										
2019-93 . .	5.02	4.95	.07	1.81	1.29	.52	6.83	6.24	.59	
High-cost:										
2019	4.59	5.03	-.44	1.49	1.59	-.10	6.08	6.61	-.54	21,152
2020	4.59	5.20	-.61	1.50	1.66	-.17	6.08	6.86	-.78	21,450
2021	4.58	5.36	-.78	1.51	1.73	-.22	6.09	7.09	-1.00	21,982
2022	4.59	5.48	-.89	1.53	1.81	-.28	6.11	7.29	-1.17	22,731
2023	4.60	5.60	-1.00	1.54	1.89	-.35	6.14	7.49	-1.35	23,507
2024	4.62	5.74	-1.12	1.56	1.97	-.41	6.18	7.71	-1.53	24,300
2025	4.63	5.86	-1.23	1.58	2.06	-.48	6.21	7.92	-1.71	25,146
2026	4.69	5.98	-1.29	1.62	2.15	-.52	6.31	8.13	-1.82	26,027
2027	4.70	6.11	-1.41	1.64	2.23	-.58	6.35	8.34	-1.99	26,919
2028	4.71	6.24	-1.53	1.66	2.37	-.71	6.37	8.61	-2.24	27,813
2030	4.71	6.43	-1.72	1.67	2.55	-.88	6.38	8.98	-2.60	29,560
2035	4.69	6.75	-2.06	1.70	2.99	-1.29	6.39	9.74	-3.35	34,391
2040	4.66	6.93	-2.27	1.72	3.40	-1.68	6.37	10.33	-3.95	39,884
2045	4.63	7.00	-2.37	1.73	3.79	-2.06	6.36	10.79	-4.43	46,244
2050	4.60	7.06	-2.45	1.75	4.12	-2.37	6.35	11.17	-4.82	53,611
2055	4.59	7.15	-2.57	1.76	4.35	-2.59	6.35	11.51	-5.16	62,053
2060	4.57	7.30	-2.73	1.78	4.53	-2.74	6.36	11.83	-5.47	71,647
2065	4.55	7.46	-2.90	1.80	4.65	-2.85	6.35	12.10	-5.75	82,537
2070	4.53	7.63	-3.10	1.82	4.71	-2.89	6.35	12.34	-5.99	94,955
2075	4.51	7.79	-3.29	1.84	4.75	-2.92	6.34	12.55	-6.20	109,251
2080	4.47	7.87	-3.40	1.85	4.75	-2.91	6.32	12.63	-6.31	125,836
2085	4.44	7.87	-3.44	1.85	4.71	-2.86	6.29	12.58	-6.30	145,048
2090	4.40	7.86	-3.46	1.85	4.66	-2.81	6.25	12.52	-6.27	167,148
2095	4.37	7.87	-3.50	1.86	4.62	-2.76	6.22	12.49	-6.27	192,458
Summarized rates: [c]										
25-year:										
2019-43 . .	5.21	6.58	-1.36	1.68	2.71	-1.03	6.90	9.29	-2.40	
50-year:										
2019-68 . .	4.93	6.83	-1.90	1.72	3.42	-1.70	6.65	10.25	-3.60	
75-year:										
2019-93 . .	4.82	7.06	-2.25	1.75	3.73	-1.98	6.57	10.80	-4.23	

[a] Income for individual years excludes interest on the trust funds. Interest is implicit in all summarized values.

[b] OASDI benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

[c] Summarized rates are calculated on a present-value basis. They include the value of the trust funds on January 1, 2019 and the cost of reaching a target trust fund level equal to 100 percent of annual cost at the end of the period.

Notes:
1. The Trustees show income and cost estimates generally on a cash basis for the OASDI program and on an incurred basis for the HI program.

2. Totals do not necessarily equal the sums of rounded components.

Table VI.G5 displays annual ratios of OASDI taxable payroll to GDP. These ratios facilitate comparisons of trust fund operations expressed as percent-

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ages of taxable payroll and those expressed as percentages of GDP. HI taxable payroll is about 25 percent larger than the OASDI taxable payroll throughout the long-range period; see section 1 of this appendix for a detailed description of the difference. For each year, the cost as a percentage of GDP is equal to the cost as a percentage of taxable payroll multiplied by the ratio of taxable payroll to GDP.

Table VI.G5.—Ratio of OASDI Taxable Payroll to GDP, Calendar Years 2019-2095

Calendar year	Intermediate	Low-cost	High-cost
2019	0.355	0.355	0.355
2020	.355	.355	.355
2021	.356	.357	.354
2022	.357	.360	.353
2023	.359	.362	.354
2024	.360	.364	.354
2025	.361	.366	.355
2026	.361	.367	.355
2027	.362	.369	.355
2028	.363	.371	.355
2030	.362	.370	.353
2035	.359	.369	.350
2040	.357	.368	.346
2045	.355	.368	.343
2050	.355	.369	.341
2055	.354	.371	.339
2060	.354	.372	.337
2065	.353	.373	.335
2070	.352	.374	.332
2075	.351	.375	.329
2080	.350	.375	.326
2085	.348	.376	.323
2090	.347	.377	.320
2095	.346	.377	.317

Projections of GDP reflect projected increases in U.S. employment, labor productivity, average hours worked, and the GDP price index (GDP deflator). Projections of taxable payroll reflect the components of growth in GDP along with assumed changes in the ratio of total labor compensation to GDP, the ratio of earnings to total labor compensation, the ratio of OASDI covered earnings to total earnings, and the ratio of taxable to total covered earnings.

Over the long-range period, the ratio of OASDI taxable payroll to GDP is projected to decline mostly due to a projected decline in the ratio of wages and salaries to employee compensation. Over the last five complete economic cycles, the ratio of wages and salaries to employee compensation declined at an average annual rate of 0.23 percent. Over the 65-year period ending in 2093, the ratio of wages and salaries to employee compensation is projected to decline at an average annual rate of 0.06 and 0.16 percent for the intermediate and high-cost assumptions, respectively, and to increase at an average annual rate of 0.04 percent for the low-cost assumptions.

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3. Estimates in Dollars

This section presents long-range projections, in dollars, of the operations of the combined OASI and DI Trust Funds and in some cases the HI Trust Fund. Comparing current dollar values over long periods of time is difficult because of the effect of inflation. In order to compare dollar values in a meaningful way, table VI.G6 provides several economic series or indices which can be used to adjust current dollars for changes in prices, wages, or other aspects of economic growth during the projection period. Any series of values can be adjusted by dividing the value for each year by the corresponding index value for the year.

One of the most common forms of standardization is price indexing, which uses some measure of change in the prices of consumer goods. The Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W, hereafter referred to as CPI), published by the Bureau of Labor Statistics, Department of Labor, is one such price index. Consistent with the law, the Social Security Administration (SSA) uses this index to determine the annual cost-of-living increases for OASDI monthly benefits. The ultimate annual rate of increase in the CPI is assumed to be 3.2, 2.6, and 2.0 percent for the low-cost, intermediate, and high-cost sets of assumptions, respectively. Table VI.G7 provides CPI-indexed dollar values (those adjusted using the CPI in table VI.G6), which indicate the relative purchasing power of the values over time.

Wage indexing is another type of standardization. It combines the effects of price inflation and real-wage growth. The wage index presented here is the national average wage index, as defined in section 209(k)(1) of the Social Security Act. SSA uses this index to annually adjust the contribution and benefit base and other earnings-related program amounts. The average wage is assumed to grow by an average rate of 5.0, 3.8, and 2.6 percent under the low-cost, intermediate, and high-cost assumptions, respectively, between 2028 and 2093. Wage-indexed values indicate the level of a series of values relative to the changing standard of living of workers over time.

The taxable payroll series is used as an index to adjust for the effects of changes in the number of workers and changes in the proportion of earnings that are taxable, as well as for the effects of price inflation and real-wage growth. The OASDI taxable payroll consists of all earnings subject to OASDI taxation, with an adjustment for the lower effective tax rate on multiple-employer excess wages. A series of values, divided by the taxable payroll, indicates the percentage of payroll that each value represents, and thus

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the extent to which the series of values increases or decreases as a percent of payroll over time.

The GDP series is used as an index to adjust for the growth in the aggregate amount of goods and services produced in the United States. Values adjusted by GDP (see section 2 of this appendix) indicate their relative share of the total output of the economy. No direct assumption is made about growth in taxable payroll or GDP. These series reflect the basic demographic and economic assumptions, as discussed in sections V.A and V.B, respectively.

Discounting at the rate of interest is another way of standardizing current dollars. The compound new-issue interest factor shown in table VI.G6 increases each year by the assumed effective annual nominal yield for special public-debt obligations issuable to the trust funds in the 12 months of the prior year. The compound effective trust-fund interest factor shown in table VI.G6 uses the effective annual yield on all currently-held securities in the combined OASI and DI Trust Funds. The reciprocal of the compound effective trust-fund interest factor approximates the cumulative discount factor used to convert nominal dollar values to present values as of the start of the valuation period in order to create summarized values for this report.

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Table VI.G6.—Selected Economic Variables, Calendar Years 2018-2095
[GDP and taxable payroll in billions]

Calendar year	Adjusted CPI[a]	Average wage index	Taxable payroll[b]	Gross domestic product	Compound new-issue interest factor[c]	Compound effective trust-fund interest factor[d]
Intermediate:						
2018	98.21	$51,794.15	$7,262	$20,502	0.9720	0.9857
2019	100.00	53,863.71	7,620	21,485	1.0000	1.0143
2020	102.63	56,396.34	7,989	22,523	1.0331	1.0431
2021	105.30	58,914.00	8,379	23,558	1.0692	1.0724
2022	108.04	61,399.77	8,799	24,616	1.1092	1.1021
2023	110.85	63,918.72	9,229	25,735	1.1543	1.1327
2024	113.73	66,573.32	9,677	26,907	1.2049	1.1648
2025	116.68	69,374.02	10,135	28,109	1.2607	1.1991
2026	119.72	72,318.20	10,608	29,349	1.3220	1.2360
2027	122.83	75,397.14	11,101	30,637	1.3882	1.2764
2028	126.02	78,425.26	11,591	31,972	1.4591	1.3204
2030	132.66	84,662.22	12,587	34,800	1.6137	1.4248
2035	150.83	102,489.49	15,436	42,963	2.0758	1.8085
2040	171.48	123,733.59	18,906	52,965	2.6702	2.3263
2045	194.97	149,026.69	23,302	65,548	3.4348	2.9924
2050	221.67	179,849.99	28,843	81,297	4.4184	3.8493
2055	252.02	217,333.50	35,685	100,694	5.6835	4.9515
2060	286.53	262,623.84	44,025	124,381	7.3109	6.3693
2065	325.77	316,963.19	54,150	153,328	9.4044	8.1931
2070	370.38	381,935.36	66,559	189,023	12.0972	10.5391
2075	421.10	459,748.85	81,944	233,480	15.5611	13.5569
2080	478.76	552,934.51	101,017	289,008	20.0169	17.4388
2085	544.32	664,737.33	124,578	357,936	25.7486	22.4323
2090	618.86	799,309.08	153,496	442,655	33.1215	28.8556
2095	703.60	961,385.84	188,790	546,331	42.6055	37.1181
Low-cost:						
2018	97.66	51,842.68	7,268	20,517	.9720	.9857
2019	100.00	54,589.52	7,736	21,807	1.0000	1.0145
2020	103.23	58,130.23	8,260	23,282	1.0420	1.0444
2021	106.54	61,621.98	8,835	24,774	1.0907	1.0758
2022	109.95	65,003.71	9,433	26,239	1.1438	1.1089
2023	113.47	68,429.04	10,057	27,796	1.2023	1.1445
2024	117.10	72,040.30	10,713	29,448	1.2676	1.1835
2025	120.84	75,890.46	11,403	31,188	1.3402	1.2267
2026	124.71	79,999.01	12,118	32,986	1.4200	1.2748
2027	128.70	84,362.57	12,868	34,852	1.5070	1.3288
2028	132.82	88,796.52	13,639	36,806	1.6008	1.3893
2030	141.46	98,170.95	15,192	41,032	1.8083	1.5330
2035	165.59	126,117.08	19,849	53,775	2.4538	2.0540
2040	193.83	161,366.55	25,949	70,485	3.3299	2.7873
2045	226.89	205,782.68	34,259	93,041	4.5187	3.7824
2050	265.59	263,208.08	45,520	123,297	6.1320	5.1328
2055	310.90	337,375.59	60,464	163,160	8.3212	6.9653
2060	363.93	432,505.17	80,058	215,224	11.2920	9.4520
2065	426.00	553,676.86	105,722	283,386	15.3234	12.8265
2070	498.67	707,474.36	139,719	373,605	20.7941	17.4058
2075	583.73	902,928.45	185,267	494,275	28.2179	23.6199
2080	683.29	1,151,407.63	246,211	655,836	38.2921	32.0525
2085	799.85	1,467,816.54	327,140	870,185	51.9630	43.4957
2090	936.28	1,871,567.68	433,656	1,151,359	70.5145	59.0244
2095	1095.98	2,386,543.23	573,141	1,518,880	95.6893	80.0969

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Table VI.G6.—Selected Economic Variables, Calendar Years 2018-2095 (Cont.)
[GDP and taxable payroll in billions]

Calendar year	Adjusted CPI[a]	Average wage index	Taxable payroll[b]	Gross domestic product	Compound new-issue interest factor[c]	Compound effective trust-fund interest factor[d]
High-cost:						
2018	98.74	$51,774.91	$7,259	$20,485	0.9720	0.9857
2019	100.00	53,181.27	7,507	21,152	1.0000	1.0141
2020	102.02	53,756.15	7,622	21,450	1.0236	1.0419
2021	104.06	55,258.23	7,785	21,982	1.0376	1.0691
2022	106.14	57,220.89	8,035	22,731	1.0627	1.0956
2023	108.27	59,231.07	8,313	23,507	1.0971	1.1219
2024	110.43	61,293.18	8,606	24,300	1.1357	1.1486
2025	112.64	63,356.81	8,920	25,146	1.1782	1.1758
2026	114.89	65,432.29	9,243	26,027	1.2242	1.2040
2027	117.19	67,555.34	9,567	26,919	1.2731	1.2333
2028	119.53	69,521.87	9,865	27,813	1.3245	1.2635
2030	124.36	73,276.90	10,448	29,560	1.4337	1.3288
2035	137.31	83,566.28	12,031	34,391	1.7477	1.6025
2040	151.60	95,162.62	13,811	39,884	2.1304	1.9534
2045	167.38	108,223.12	15,882	46,244	2.5970	2.3812
2050	184.80	123,189.65	18,293	53,611	3.1657	2.9027
2055	204.03	140,293.38	21,051	62,053	3.8590	3.5384
2060	225.27	159,734.03	24,157	71,647	4.7041	4.3133
2065	248.71	181,663.13	27,627	82,537	5.7343	5.2579
2070	274.60	206,322.83	31,523	94,955	6.9900	6.4093
2075	303.18	234,124.79	35,952	109,251	8.5208	7.8129
2080	334.74	265,463.17	41,007	125,836	10.3868	9.5239
2085	369.58	300,872.52	46,800	145,048	12.6615	11.6096
2090	408.04	341,102.29	53,429	167,148	15.4343	14.1520
2095	450.51	386,879.11	60,976	192,458	18.8143	17.2512

[a] CPI-W indexed to calendar year 2019.
[b] Total earnings subject to OASDI contribution rates, adjusted to reflect the lower effective contribution rates (compared to the combined employee-employer rate) that apply to multiple-employer "excess wages."
[c] For each alternative, incorporates the average of the assumed annual yield for special public-debt obligations issuable to the trust funds in the 12 months of the prior year.
[d] For each alternative, incorporates the annual effective yield for all outstanding special public-debt obligations held by the trust fund, with a half-year's interest effect in each row. The effective yield for a period equals total interest earned during the period divided by the total exposure to interest on asset reserves and all income and cost items during the period. The reciprocals of the factors approximate the discounting/accumulation factors that are used to calculate summarized rates and balances in this report.

Table VI.G7 shows the operations of the combined OASI and DI Trust Funds in CPI-indexed 2019 dollars—that is, adjusted by the CPI indexing series as discussed above. The following items are presented in the table: (1) non-interest income, (2) interest income, (3) total income, (4) cost, and (5) asset reserves at the end of the year. Non-interest income consists of payroll tax contributions, income from taxation of scheduled OASDI benefits, and any reimbursements from the General Fund of the Treasury. Cost consists of scheduled benefits, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. Table VI.G7 shows trust fund operations under the low-cost, intermediate, and high-cost sets of assumptions.

Table VI.G7.—Operations of the Combined OASI and DI Trust Funds, in CPI-indexed 2019 Dollars,[a] Calendar Years 2019-2095
[In billions]

Calendar year	Non-interest income	Interest income	Total income	Cost[b]	Asset reserves at end of year[b]
Intermediate:					
2019	$979.0	$82.0	$1,061.0	$1,060.0	$2,895.9
2020	1,001.9	79.1	1,081.0	1,085.2	2,817.4
2021	1,026.2	75.8	1,102.0	1,120.9	2,727.1
2022	1,052.3	72.4	1,124.7	1,158.9	2,623.8
2023	1,077.3	70.3	1,147.6	1,198.7	2,506.2
2024	1,103.5	69.2	1,172.7	1,241.2	2,374.3
2025	1,127.8	67.8	1,195.6	1,284.1	2,225.6
2026	1,161.8	66.9	1,228.7	1,328.0	2,069.9
2027	1,186.9	65.6	1,252.4	1,373.0	1,896.9
2028	1,211.6	62.9	1,274.5	1,419.3	1,704.0
2030[c]	1,252.8	57.5	1,310.2	1,499.5	1,267.2
Low-cost:					
2019	987.8	83.7	1,071.4	1,057.6	2,908.8
2020	1,028.0	83.7	1,111.7	1,082.7	2,846.6
2021	1,066.8	83.6	1,150.4	1,115.1	2,793.6
2022	1,105.2	84.6	1,189.8	1,150.6	2,746.2
2023	1,142.7	87.8	1,230.5	1,187.8	2,703.7
2024	1,181.6	92.3	1,273.9	1,227.7	2,666.1
2025	1,219.5	97.5	1,317.0	1,268.2	2,632.3
2026	1,266.5	104.3	1,370.8	1,309.9	2,611.6
2027	1,304.4	111.5	1,415.8	1,353.2	2,593.2
2028	1,342.8	118.4	1,461.3	1,398.4	2,575.6
2030	1,406.7	133.0	1,539.8	1,479.7	2,537.9
2035	1,573.2	149.7	1,722.9	1,669.0	2,438.8
2040	1,757.3	143.3	1,900.6	1,844.3	2,331.0
2045	1,979.3	145.3	2,124.6	2,018.8	2,384.1
2050	2,244.3	164.5	2,408.8	2,236.2	2,724.5
2055	2,546.3	199.3	2,745.5	2,512.9	3,316.9
2060	2,881.8	243.2	3,125.0	2,852.0	4,048.8
2065	3,252.7	291.5	3,544.3	3,233.0	4,849.8
2070	3,673.8	344.1	4,017.9	3,666.1	5,720.8
2075	4,161.8	403.7	4,565.6	4,146.1	6,718.6
2080	4,721.0	484.3	5,205.3	4,635.5	8,099.6
2085	5,351.9	610.1	5,961.9	5,152.8	10,265.5
2090	6,058.7	786.9	6,845.5	5,809.1	13,258.1
2095	6,848.2	987.4	7,835.7	6,676.7	16,584.7
High-cost:					
2019	970.4	80.7	1,051.2	1,063.0	2,883.1
2020	964.1	74.4	1,038.5	1,092.5	2,771.9
2021	968.0	67.2	1,035.3	1,132.3	2,620.5
2022	982.7	60.7	1,043.4	1,173.5	2,439.0
2023	998.4	54.8	1,053.2	1,216.4	2,228.0
2024	1,016.1	49.4	1,065.6	1,262.1	1,987.7
2025	1,034.2	43.6	1,077.8	1,308.4	1,718.2
2026	1,062.3	37.7	1,100.0	1,355.5	1,428.9
2027	1,080.4	31.2	1,111.6	1,403.5	1,109.0
2028[c]	1,096.7	22.8	1,119.5	1,452.6	754.1

[a] CPI-indexed 2019 dollars equal current dollars adjusted by the CPI indexing series in table VI.G6.
[b] Benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.
[c] The combined OASI and DI Trust Funds become depleted in 2035 under the intermediate assumptions and in 2030 under the high-cost assumptions, so estimates for later years are not shown.

Note: Totals do not necessarily equal the sums of rounded components.

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Figure VI.G1 compares annual cost with annual total income and annual non-interest income. The figure shows only the OASDI program under intermediate assumptions, and presents values in CPI-indexed 2019 dollars, consistent with table VI.G7. The difference between the income values for each year is equal to the trust fund interest earnings. The figure illustrates that, under intermediate assumptions, annual cost exceeds both total income and non-interest income for 2020 through the end of the projection period. In 2019, total income slightly exceeds annual cost. For 2020 through 2034 (the year preceding the year of trust fund reserve depletion), annual cost is covered by drawing down combined trust fund reserves.

Figure VI.G1.—Estimated OASDI Income and Cost in CPI-indexed 2019 Dollars, Based on Intermediate Assumptions
[In billions]

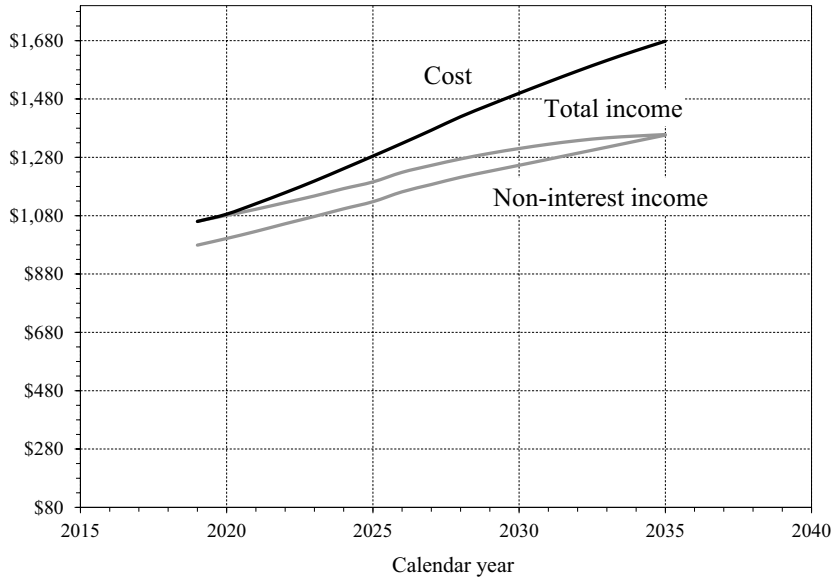

Table VI.G8 presents the operations of the combined OASI and DI Trust Funds in current, or nominal, dollars—that is, in dollars unadjusted for inflation. The following items are presented in the table: (1) non-interest income, (2) interest income, (3) total income, (4) cost, and (5) asset reserves at the end of the year. These estimates are presented using the low-cost, intermediate, and high-cost sets of demographic and economic assumptions to facilitate independent analysis.

Table VI.G8.—Operations of the Combined OASI and DI Trust Funds, in Current Dollars, Calendar Years 2019-2095
[In billions]

Calendar year	Non-interest income	Interest income	Total income	Cost[a]	Asset reserves at end of year[a]
Intermediate:					
2019	$979.0	$82.0	$1,061.0	$1,060.0	$2,895.9
2020	1,028.2	81.2	1,109.4	1,113.7	2,891.6
2021	1,080.5	79.8	1,160.4	1,180.3	2,871.6
2022	1,136.8	78.2	1,215.1	1,252.0	2,834.7
2023	1,194.1	77.9	1,272.0	1,328.7	2,778.0
2024	1,255.0	78.7	1,333.7	1,411.5	2,700.2
2025	1,316.0	79.1	1,395.1	1,498.4	2,596.9
2026	1,390.8	80.1	1,470.9	1,589.9	2,478.0
2027	1,457.8	80.6	1,538.4	1,686.4	2,330.0
2028	1,526.9	79.2	1,606.2	1,788.6	2,147.5
2030[b]	1,662.0	76.2	1,738.2	1,989.3	1,681.2
Low-cost:					
2019	987.8	83.7	1,071.4	1,057.6	2,908.8
2020	1,061.3	86.4	1,147.7	1,117.8	2,938.7
2021	1,136.5	89.0	1,225.6	1,188.1	2,976.2
2022	1,215.1	93.1	1,308.2	1,265.0	3,019.4
2023	1,296.6	99.6	1,396.2	1,347.8	3,067.8
2024	1,383.7	108.1	1,491.7	1,437.6	3,122.0
2025	1,473.7	117.8	1,591.5	1,532.5	3,181.0
2026	1,579.5	130.0	1,709.5	1,633.5	3,256.9
2027	1,678.7	143.4	1,822.2	1,741.6	3,337.5
2028	1,783.6	157.3	1,940.9	1,857.4	3,421.0
2030	1,989.9	188.2	2,178.1	2,093.1	3,590.1
2035	2,605.0	247.8	2,852.9	2,763.6	4,038.3
2040	3,406.1	277.8	3,683.8	3,574.8	4,518.1
2045	4,490.8	329.8	4,820.6	4,580.5	5,409.2
2050	5,960.8	436.8	6,397.7	5,939.3	7,236.2
2055	7,916.2	619.5	8,535.7	7,812.6	10,312.1
2060	10,487.5	885.2	11,372.7	10,379.0	14,734.5
2065	13,856.7	1,242.0	15,098.7	13,772.6	20,660.3
2070	18,320.0	1,716.1	20,036.1	18,281.8	28,527.7
2075	24,293.8	2,356.8	26,650.5	24,202.1	39,217.9
2080	32,258.1	3,309.1	35,567.2	31,673.9	55,343.8
2085	42,806.5	4,879.8	47,686.3	41,214.1	82,108.2
2090	56,725.8	7,367.2	64,093.1	54,389.4	124,132.6
2095	75,055.4	10,822.2	85,877.6	73,175.3	181,765.0
High-cost:					
2019	970.4	80.7	1,051.2	1,063.0	2,883.1
2020	983.6	75.9	1,059.5	1,114.6	2,828.0
2021	1,007.4	70.0	1,077.3	1,178.3	2,727.0
2022	1,043.1	64.4	1,107.5	1,245.6	2,588.8
2023	1,081.0	59.3	1,140.3	1,316.9	2,412.1
2024	1,122.1	54.6	1,176.7	1,393.8	2,195.1
2025	1,164.9	49.1	1,214.0	1,473.8	1,935.3
2026	1,220.5	43.3	1,263.8	1,557.4	1,641.8
2027	1,266.1	36.6	1,302.7	1,644.8	1,299.6
2028[b]	1,310.9	27.2	1,338.1	1,736.3	901.4

[a] Benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

[b] The combined OASI and DI Trust Funds become depleted in 2035 under the intermediate assumptions and in 2030 under the high-cost assumptions, so estimates for later years are not shown.

Note: Totals do not necessarily equal the sums of rounded components.

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Table VI.G9 presents values in CPI-indexed 2019 dollars—that is, adjusted by the CPI indexing series discussed at the beginning of this section. This table contains the annual non-interest income and cost of the combined OASI and DI Trust Funds, of the HI Trust Fund, and of the combined OASI, DI, and HI Trust Funds, based on the low-cost, intermediate, and high-cost sets of assumptions. For OASDI, non-interest income consists of payroll tax contributions, proceeds from taxation of scheduled OASDI benefits, and any reimbursements from the General Fund of the Treasury. Cost consists of scheduled benefits, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries. For HI, non-interest income consists of payroll tax contributions (including contributions from railroad employment), up to an additional 0.9 percent tax on earned income for relatively high earners, proceeds from the taxation of scheduled OASDI benefits, premium revenues, monies from fraud and abuse control activities, and any reimbursements from the General Fund of the Treasury. Total cost consists of scheduled benefits and administrative expenses. The Trustees show income and cost estimates generally on a cash basis for the OASDI program[1] and on an incurred basis for the HI program. Table VI.G9 also shows the annual balance, which equals the difference between non-interest income and cost.

[1] OASDI benefits paid for entitlement for a particular month are generally paid in the succeeding month. There are two primary exceptions to this general rule. First, payments can occur with a greater delay when a benefit award is made after the month of initial benefit entitlement. At the time of benefit award, benefits owed for months of prior entitlement are then also paid to the beneficiary. For the projections in this report, such retroactive payments are included in the period where they are paid (at time of award). Second, when benefit payments scheduled for January 3 are paid on the prior December 31, because January 3 falls on a Sunday, such payments are shown in this report for the period they were scheduled to be paid.

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Table VI.G9.—OASDI and HI Annual Non-interest Income, Cost, and Balance in CPI-Indexed 2019 Dollars,[a] Calendar Years 2019-2095
[In billions]

Calendar year	OASDI			HI			Combined		
	Non-interest income	Cost[b]	Balance[b]	Non-interest income	Cost	Balance	Non-interest income	Cost[b]	Balance[b]
Intermediate:									
2019	$979	$1,060	-$81	$319	$331	-$12	$1,298	$1,391	-$93
2020	1,002	1,085	-83	329	344	-15	1,331	1,429	-98
2021	1,026	1,121	-95	339	358	-19	1,365	1,479	-114
2022	1,052	1,159	-107	349	375	-27	1,401	1,534	-133
2023	1,077	1,199	-121	358	392	-34	1,435	1,591	-155
2024	1,103	1,241	-138	368	408	-40	1,471	1,649	-178
2025	1,128	1,284	-156	378	425	-47	1,506	1,709	-204
2026	1,162	1,328	-166	394	442	-47	1,556	1,770	-214
2027	1,187	1,373	-186	405	457	-52	1,592	1,830	-238
2028	1,212	1,419	-208	415	486	-71	1,627	1,905	-278
2030	1,253	1,500	-247	434	520	-86	1,687	2,020	-333
2035	1,356	1,678	-322	480	603	-123	1,836	2,281	-445
2040	1,463	1,832	-368	527	677	-151	1,990	2,509	-519
2045	1,586	1,971	-384	580	748	-169	2,166	2,719	-553
2050	1,727	2,130	-403	641	820	-179	2,367	2,950	-582
2055	1,880	2,324	-443	709	891	-182	2,589	3,215	-626
2060	2,043	2,555	-512	784	970	-186	2,827	3,525	-698
2065	2,214	2,809	-595	863	1,062	-199	3,077	3,871	-795
2070	2,397	3,090	-693	949	1,170	-221	3,346	4,260	-915
2075	2,599	3,392	-793	1,043	1,290	-247	3,642	4,682	-1,040
2080	2,819	3,685	-866	1,144	1,412	-268	3,963	5,096	-1,133
2085	3,056	3,972	-916	1,251	1,532	-281	4,308	5,504	-1,197
2090	3,312	4,305	-993	1,367	1,658	-290	4,680	5,963	-1,283
2095	3,587	4,717	-1,130	1,494	1,794	-300	5,081	6,511	-1,430
Low-cost:									
2019	988	1,058	-70	324	325	-1	1,312	1,383	-71
2020	1,028	1,083	-55	338	333	5	1,366	1,416	-49
2021	1,067	1,115	-48	352	344	8	1,419	1,459	-41
2022	1,105	1,151	-45	364	356	8	1,469	1,507	-37
2023	1,143	1,188	-45	376	367	9	1,519	1,555	-36
2024	1,182	1,228	-46	389	378	11	1,571	1,606	-35
2025	1,220	1,268	-49	402	389	13	1,622	1,657	-35
2026	1,267	1,310	-43	422	399	23	1,689	1,709	-20
2027	1,304	1,353	-49	436	408	28	1,740	1,761	-21
2028	1,343	1,398	-56	450	428	21	1,792	1,827	-34
2030	1,407	1,480	-73	476	447	29	1,883	1,927	-44
2035	1,573	1,669	-96	546	487	59	2,119	2,156	-37
2040	1,757	1,844	-87	623	514	109	2,380	2,358	22
2045	1,979	2,019	-40	714	534	180	2,694	2,553	140
2050	2,244	2,236	8	825	561	264	3,069	2,797	272
2055	2,546	2,513	33	953	596	357	3,500	3,109	390
2060	2,882	2,852	30	1,098	649	449	3,979	3,501	479
2065	3,253	3,233	20	1,258	725	532	4,511	3,958	552
2070	3,674	3,666	8	1,439	832	608	5,113	4,498	615
2075	4,162	4,146	16	1,649	959	690	5,810	5,105	706
2080	4,721	4,635	85	1,886	1,098	788	6,607	5,734	873
2085	5,352	5,153	199	2,154	1,247	906	7,505	6,400	1,105
2090	6,059	5,809	250	2,457	1,410	1,047	8,516	7,219	1,296
2095	6,848	6,677	172	2,803	1,610	1,193	9,652	8,287	1,365

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Table VI.G9.—OASDI and HI Annual Non-interest Income, Cost, and Balance in CPI-Indexed 2019 Dollars,[a] Calendar Years 2019-2095 (Cont.)
[In billions]

Calendar year	OASDI			HI			Combined		
	Non-interest income	Cost[b]	Balance[b]	Non-interest income	Cost	Balance	Non-interest income	Cost[b]	Balance[b]
High-cost:									
2019	$970	$1,063	-$93	$315	$336	-$21	$1,285	$1,399	-$114
2020	964	1,093	-128	315	350	-35	1,279	1,442	-163
2021	968	1,132	-164	319	365	-46	1,287	1,497	-211
2022	983	1,174	-191	327	387	-60	1,310	1,560	-251
2023	998	1,216	-218	335	410	-75	1,333	1,627	-293
2024	1,016	1,262	-246	343	434	-91	1,359	1,696	-337
2025	1,034	1,308	-274	352	460	-107	1,386	1,768	-382
2026	1,062	1,356	-293	368	486	-118	1,430	1,842	-411
2027	1,080	1,404	-323	377	511	-134	1,458	1,915	-457
2028	1,097	1,453	-356	386	552	-166	1,483	2,004	-522
2030	1,120	1,529	-409	398	606	-208	1,517	2,135	-617
2035	1,174	1,691	-517	426	748	-323	1,600	2,439	-840
2040	1,225	1,823	-598	452	894	-442	1,677	2,717	-1,040
2045	1,278	1,934	-656	478	1,047	-568	1,756	2,981	-1,224
2050	1,335	2,047	-711	506	1,195	-688	1,842	3,241	-1,400
2055	1,395	2,176	-781	536	1,324	-788	1,931	3,500	-1,569
2060	1,454	2,321	-867	567	1,440	-873	2,021	3,761	-1,740
2065	1,511	2,474	-963	598	1,542	-944	2,109	4,016	-1,907
2070	1,567	2,639	-1,072	629	1,629	-1,000	2,196	4,268	-2,072
2075	1,624	2,808	-1,184	662	1,713	-1,051	2,286	4,521	-2,235
2080	1,682	2,960	-1,278	694	1,787	-1,093	2,376	4,746	-2,370
2085	1,741	3,090	-1,349	726	1,848	-1,122	2,467	4,938	-2,471
2090	1,802	3,218	-1,417	759	1,909	-1,150	2,560	5,127	-2,567
2095	1,865	3,362	-1,497	793	1,974	-1,180	2,658	5,335	-2,677

[a] CPI-indexed 2019 dollars equal current dollars adjusted by the CPI indexing series in table VI.G6.
[b] OASDI benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

Note: Totals do not necessarily equal the sums of rounded components.

Table VI.G10 shows values in current, or nominal, dollars—that is, in dollars unadjusted for inflation. This table presents the annual non-interest income, cost, and balance of the combined OASI and DI Trust Funds, of the HI Trust Fund, and of the combined OASI, DI, and HI Trust Funds, based on the low-cost, intermediate, and high-cost sets of assumptions.

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Table VI.G10.—OASDI and HI Annual Non-interest Income, Cost, and Balance in Current Dollars, Calendar Years 2019-2095
[In billions]

Calendar year	OASDI			HI			Combined		
	Non-interest income	Cost[a]	Balance[a]	Non-interest income	Cost	Balance	Non-interest income	Cost[a]	Balance[a]
Intermediate:									
2019	$979	$1,060	-$81	$319	$331	-$12	$1,298	$1,391	-$93
2020	1,028	1,114	-86	338	353	-15	1,366	1,467	-101
2021	1,081	1,180	-100	357	377	-20	1,438	1,558	-120
2022	1,137	1,252	-115	377	405	-29	1,513	1,657	-144
2023	1,194	1,329	-135	397	434	-38	1,591	1,763	-172
2024	1,255	1,412	-157	418	464	-46	1,673	1,876	-203
2025	1,316	1,498	-182	441	496	-55	1,757	1,994	-238
2026	1,391	1,590	-199	472	529	-57	1,863	2,119	-256
2027	1,458	1,686	-229	498	562	-64	1,955	2,248	-293
2028	1,527	1,789	-262	523	612	-89	2,050	2,401	-351
2030	1,662	1,989	-327	575	690	-115	2,237	2,679	-442
2035	2,045	2,531	-486	723	909	-186	2,769	3,441	-672
2040	2,509	3,141	-632	903	1,161	-258	3,413	4,303	-890
2045	3,092	3,842	-750	1,130	1,459	-329	4,222	5,301	-1,079
2050	3,827	4,721	-893	1,420	1,817	-397	5,248	6,538	-1,291
2055	4,738	5,856	-1,118	1,787	2,246	-459	6,525	8,102	-1,577
2060	5,854	7,320	-1,467	2,245	2,780	-534	8,099	10,100	-2,001
2065	7,211	9,150	-1,938	2,811	3,461	-650	10,022	12,611	-2,588
2070	8,878	11,445	-2,567	3,514	4,334	-820	12,392	15,779	-3,387
2075	10,944	14,283	-3,339	4,391	5,431	-1,040	15,336	19,714	-4,378
2080	13,496	17,641	-4,144	5,475	6,758	-1,282	18,972	24,398	-5,427
2085	16,637	21,621	-4,985	6,810	8,339	-1,528	23,447	29,960	-6,513
2090	20,498	26,642	-6,144	8,462	10,259	-1,797	28,960	36,901	-7,941
2095	25,239	33,187	-7,948	10,512	12,623	-2,111	35,751	45,809	-10,059
Low-cost:									
2019	988	1,058	-70	324	325	-1	1,312	1,383	-71
2020	1,061	1,118	-56	349	344	5	1,410	1,461	-51
2021	1,137	1,188	-52	375	367	8	1,511	1,555	-43
2022	1,215	1,265	-50	400	391	9	1,616	1,656	-41
2023	1,297	1,348	-51	427	417	10	1,724	1,765	-41
2024	1,384	1,438	-54	456	443	13	1,839	1,880	-41
2025	1,474	1,533	-59	486	470	16	1,960	2,003	-43
2026	1,579	1,634	-54	527	498	29	2,106	2,131	-25
2027	1,679	1,742	-63	561	525	36	2,240	2,267	-27
2028	1,784	1,857	-74	597	569	28	2,381	2,426	-46
2030	1,990	2,093	-103	674	632	41	2,663	2,725	-62
2035	2,605	2,764	-159	903	806	97	3,508	3,569	-61
2040	3,406	3,575	-169	1,207	996	210	4,613	4,571	42
2045	4,491	4,581	-90	1,621	1,212	408	6,112	5,793	318
2050	5,961	5,939	22	2,191	1,489	702	8,152	7,429	723
2055	7,916	7,813	104	2,964	1,854	1,109	10,880	9,667	1,213
2060	10,488	10,379	108	3,995	2,361	1,634	14,482	12,740	1,742
2065	13,857	13,773	84	5,358	3,090	2,268	19,215	16,863	2,352
2070	18,320	18,282	38	7,178	4,147	3,031	25,498	22,429	3,069
2075	24,294	24,202	92	9,623	5,596	4,027	33,917	29,798	4,119
2080	32,258	31,674	584	12,887	7,505	5,382	45,145	39,179	5,967
2085	42,807	41,214	1,592	17,225	9,976	7,249	60,031	51,190	8,841
2090	56,726	54,389	2,336	23,003	13,202	9,801	79,729	67,591	12,138
2095	75,055	73,175	1,880	30,724	17,645	13,079	105,779	90,820	14,959

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Table VI.G10.—OASDI and HI Annual Non-interest Income, Cost, and Balance in Current Dollars, Calendar Years 2019-2095 (Cont.)
[In billions]

Calendar year	OASDI			HI			Combined		
	Non-interest income	Cost[a]	Balance[a]	Non-interest income	Cost	Balance	Non-interest income	Cost[a]	Balance[a]
High-cost:									
2019	$970	$1,063	-$93	$315	$336	-$21	$1,285	$1,399	-$114
2020	984	1,115	-131	321	357	-36	1,305	1,472	-167
2021	1,007	1,178	-171	332	380	-48	1,339	1,558	-219
2022	1,043	1,246	-203	347	410	-63	1,390	1,656	-266
2023	1,081	1,317	-236	363	444	-81	1,444	1,761	-317
2024	1,122	1,394	-272	379	479	-100	1,501	1,873	-372
2025	1,165	1,474	-309	397	518	-121	1,562	1,991	-430
2026	1,221	1,557	-337	423	558	-136	1,643	2,116	-472
2027	1,266	1,645	-379	442	599	-157	1,708	2,244	-536
2028	1,311	1,736	-425	461	660	-198	1,772	2,396	-624
2030	1,392	1,901	-509	495	753	-259	1,887	2,655	-768
2035	1,612	2,322	-710	584	1,027	-443	2,196	3,350	-1,153
2040	1,857	2,763	-907	685	1,355	-671	2,542	4,119	-1,577
2045	2,139	3,237	-1,098	801	1,752	-952	2,940	4,989	-2,049
2050	2,468	3,782	-1,315	936	2,208	-1,272	3,404	5,990	-2,586
2055	2,846	4,439	-1,593	1,094	2,702	-1,608	3,940	7,141	-3,201
2060	3,276	5,229	-1,953	1,278	3,244	-1,966	4,553	8,473	-3,919
2065	3,758	6,153	-2,395	1,487	3,836	-2,348	5,245	9,989	-4,744
2070	4,303	7,247	-2,944	1,728	4,473	-2,745	6,031	11,720	-5,689
2075	4,924	8,515	-3,590	2,006	5,193	-3,187	6,930	13,708	-6,778
2080	5,631	9,907	-4,277	2,323	5,980	-3,657	7,953	15,888	-7,934
2085	6,434	11,420	-4,986	2,683	6,831	-4,148	9,117	18,251	-9,134
2090	7,352	13,133	-5,781	3,096	7,788	-4,692	10,448	20,921	-10,473
2095	8,401	15,144	-6,743	3,573	8,891	-5,318	11,974	24,035	-12,061

[a] OASDI benefit payments which were scheduled to be paid on January 3 for some past and future years were actually paid on December 31 as required by the statutory provision for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. For comparability with the values for historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment each year.

Note: Totals do not necessarily equal the sums of rounded components.

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H. ANALYSIS OF BENEFIT PAYMENTS FROM THE OASI TRUST FUND WITH RESPECT TO DISABLED BENEFICIARIES

(Required by section 201(c) of the Social Security Act)

Effective January 1957, the OASI Trust Fund pays monthly benefits to disabled children aged 18 and over of retired and deceased workers if the disability began before age 18. The age by which disability must have begun was later changed to age 22. Effective February 1968, the OASI Trust Fund pays reduced monthly benefits to disabled widows and widowers at ages 50 and over. Effective January 1991, the requirements for the disability of the widow or widower were made less restrictive.

At the end of 2018, the OASI Trust Fund was providing monthly benefit payments to about 1,139,000 people because of their disabilities or the disabilities of children. This total includes approximately 24,000 mothers and fathers (wives or husbands under normal retirement age of retired-worker beneficiaries and widows or widowers of deceased insured workers) who met all other qualifying requirements and were receiving unreduced benefits solely because they had disabled-child beneficiaries (or disabled children aged 16 or 17) in their care. In calendar year 2018, the OASI Trust Fund paid a total of $11,898 million to the people described above. Table VI.H1 shows OASI scheduled benefits for disability for selected calendar years during 1960 through 2018 and estimates for 2019 through 2028 based on the intermediate set of assumptions.

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Table VI.H1.—Scheduled Benefit Payments From the OASI Trust Fund With Respect to Disabled Beneficiaries

[Beneficiaries in thousands; scheduled benefits in millions]

	Disabled beneficiaries, end of year			Amount of scheduled benefits[a] [b]		
Calendar year	Total	Children[c]	Widows-widowers[d]	Total	Children[c]	Widows-widowers[e]
Historical data:						
1960	117	117	—	$59	$59	—
1965	214	214	—	134	134	—
1970	316	281	36	301	260	$41
1975	435	376	58	664	560	104
1980	519	460	59	1,223	1,097	126
1985	594	547	47	2,072	1,885	187
1990	662	613	49	2,882	2,649	233
1995	772	681	91	4,202	3,672	531
2000	811	707	104	5,203	4,523	680
2005	836	728	108	6,449	5,556	834
2010	996	879	117	8,858	7,848	1,008
2011	1,020	899	121	9,136	8,085	1,050
2012	1,045	920	125	9,698	8,595	1,102
2013	1,065	939	126	9,953	8,840	1,109
2014	1,079	954	125	10,326	9,217	1,108
2015	1,096	972	124	10,736	9,624	1,109
2016	1,109	988	121	11,025	9,933	1,087
2017	1,124	1,006	117	11,355	10,288	1,061
2018	1,139	1,027	112	11,898	10,860	1,031
Estimates under the intermediate assumptions:						
2019	1,154	1,046	108	12,450	11,429	1,014
2020	1,169	1,065	103	12,916	11,915	993
2021	1,184	1,084	100	13,503	12,509	985
2022	1,199	1,103	96	14,107	13,119	979
2023	1,215	1,121	93	14,720	13,740	970
2024	1,231	1,140	91	15,385	14,400	974
2025	1,247	1,158	89	16,089	15,101	977
2026	1,263	1,176	87	16,842	15,839	992
2027	1,279	1,193	86	17,634	16,617	1,006
2028	1,295	1,209	85	18,457	17,415	1,030

[a] Beginning in 1966, includes payments for vocational rehabilitation services.

[b] Amounts for 2015 and 2016 are adjusted to include in 2016 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2016, which were actually paid on December 31, 2015 as required by the statutory provision for early benefit payments when the normal delivery date is on a Saturday, Sunday, or public holiday. Such shifts in payments across calendar years occur periodically whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on scheduled benefits over time, scheduled benefits in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[c] Also includes certain mothers and fathers (see text).

[d] In 1984 and later years, includes only disabled widows and widowers aged 50-59, because disabled widows and widowers age 60 and older are eligible for the same benefit as a nondisabled aged widow or widower. Therefore, they are not receiving benefits solely because of a disability.

[e] In 1983 and prior years, includes the offsetting effect of lower benefits payable to disabled widows and widowers who continued to receive benefits after attaining age 60 (62, for disabled widowers prior to 1973), compared to the higher nondisabled widow's and widower's benefits that would otherwise be payable. In 1984 and later years, includes only scheduled benefits to disabled widows and widowers aged 50-59 (see footnote d).

Note: Totals do not necessarily equal the sums of rounded components.

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Under the intermediate assumptions, estimated total scheduled benefits paid from the OASI Trust Fund with respect to disabled beneficiaries will increase from $12,450 million in calendar year 2019 to $18,457 million in calendar year 2028.

In calendar year 2018, benefit payments (including payments for vocational rehabilitation services) with respect to disabled persons from the OASI Trust Fund and from the DI Trust Fund (including payments from the DI fund to all children and spouses of disabled-worker beneficiaries) totaled $155,658 million. Of this amount, $11,898 million, or 7.6 percent, represented payments from the OASI Trust Fund. Table VI.H2 contains these and similar figures for selected calendar years during 1960 through 2018 and estimates for calendar years 2019 through 2028.

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Table VI.H2.—Scheduled Benefit Payments[a] Under the OASDI Program With Respect to Disabled Beneficiaries
[Amounts in millions]

Calendar year	Total[b]	DI Trust Fund[c]	OASI Trust Fund	
			Amount[d]	Percentage of total
Historical data:				
1960	$627	$568	$59	9.4
1965	1,707	1,573	134	7.9
1970	3,386	3,085	301	8.9
1975	9,169	8,505	664	7.2
1980	16,738	15,515	1,223	7.3
1985	20,908	18,836	2,072	9.9
1990	27,717	24,835	2,882	10.4
1995	45,140	40,937	4,202	9.3
2000	60,204	55,001	5,203	8.6
2005	91,835	85,386	6,449	7.0
2010	133,103	124,245	8,858	6.7
2011	138,115	128,979	9,136	6.6
2012	146,623	136,925	9,698	6.6
2013	150,108	140,155	9,953	6.6
2014	152,031	141,705	10,326	6.8
2015	154,124	143,388	10,736	7.0
2016	153,824	142,800	11,025	7.2
2017	154,181	142,826	11,355	7.4
2018	155,658	143,760	11,898	7.6
Estimates under the intermediate assumptions:				
2019	159,397	146,947	12,450	7.8
2020	160,740	147,824	12,916	8.0
2021	164,979	151,476	13,503	8.2
2022	169,903	155,797	14,107	8.3
2023	175,572	160,852	14,720	8.4
2024	182,832	167,448	15,385	8.4
2025	191,183	175,094	16,089	8.4
2026	200,189	183,347	16,842	8.4
2027	209,582	191,947	17,634	8.4
2028	217,518	199,061	18,457	8.5

[a] Amounts for 2015 and 2016 are adjusted to include in 2016 operations those benefit payments regularly scheduled in the law to be paid on January 3, 2016, which were actually paid on December 31, 2015 as required by the statutory provision for early benefit payments when the normal delivery date is on a Saturday, Sunday, or public holiday. Such shifts in payments across calendar years occur periodically whenever January 3rd falls on a Sunday. In order to provide a consistent perspective on scheduled benefits over time, scheduled benefits in each year reflect the 12 months of benefits that are regularly scheduled for payment in that year.

[b] Beginning in 1966, includes payments for vocational rehabilitation services.

[c] Scheduled benefits for disabled workers and their children and spouses.

[d] Scheduled benefits for disabled children aged 18 and over, for certain mothers and fathers (see text), and for disabled widows and widowers (see footnote e, table VI.H1).

Note: Totals do not necessarily equal the sums of rounded components.

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I. GLOSSARY

Actuarial balance. The difference between the summarized income rate and the summarized cost rate as a percentage of taxable payroll over a given valuation period.

Actuarial deficit. A negative actuarial balance.

Administrative expenses. Expenses incurred by the Social Security Administration and the Department of the Treasury in administering the OASDI program and the provisions of the Internal Revenue Code relating to the collection of contributions. Such administrative expenses are paid from the OASI and DI Trust Funds.

Advance tax transfers. Amounts representing the estimated total OASDI tax contributions for a given month. From May 1983 through November 1990, such amounts were credited to the OASI and DI Trust Funds at the beginning of each month. The trust funds reimbursed the General Fund of the Treasury for the associated loss of interest. Advance tax transfers are no longer made unless needed in order to pay benefits.

Alternatives I, II, or III. See "Assumptions."

Annual balance. The difference between the income rate and the cost rate for a given year.

Asset reserves. The cumulative excess of trust fund income over trust fund cost over all years to date. These reserves are held by the trust funds in the form of Treasury notes and bonds, other securities guaranteed by the Federal Government, certain Federally sponsored agency obligations, and cash.

Assumptions. Values related to future trends in key factors that affect the trust funds. Demographic assumptions include fertility, mortality, net immigration, marriage, and divorce. Economic assumptions include unemployment rates, average earnings, inflation, interest rates, and productivity. Program-specific assumptions include retirement patterns, and disability incidence and termination rates. This report presents three sets of demographic, economic, and program-specific assumptions:

- Alternative II is the intermediate set of assumptions, and represents the Trustees' best estimates of likely future demographic, economic, and program-specific conditions.
- Alternative I is a low-cost set of assumptions—it assumes relatively rapid economic growth, high inflation, and favorable (from the standpoint of program financing) demographic and program-specific conditions.
- Alternative III is a high-cost set of assumptions—it assumes relatively slow economic growth, low inflation, and unfavorable (from the standpoint of program financing) demographic and program-specific conditions.

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See tables V.A2, V.B1, and V.B2.

Automatic cost-of-living benefit increase. The annual increase in benefits, effective for December, reflecting the increase, if any, in the cost of living. A benefit increase is applicable only after a beneficiary becomes eligible for benefits. In general, the benefit increase equals the percentage increase in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) measured from the third quarter of the previous year to the third quarter of the current year. If there is no increase in the CPI-W, there is no cost-of-living benefit increase. See table V.C1.

Auxiliary benefits. Monthly benefits payable to a spouse or child of a retired or disabled worker, or to a survivor of a deceased worker.

Average indexed monthly earnings—AIME. The measure of lifetime earnings used in determining the primary insurance amount (PIA) for most workers who attain age 62, become disabled, or die after 1978. A worker's actual past earnings are adjusted by changes in the average wage index, in order to bring them up to their approximately equivalent value at the time of retirement or other eligibility for benefits.

Average wage index—AWI. A series that generally increases with the average amount of total wages for each year after 1950, including wages in noncovered employment and wages in covered employment in excess of the OASDI contribution and benefit base. (See Title 20, Chapter III, section 404.211(c) of the Code of Federal Regulations for a more precise definition.) These average wage amounts are used to index the taxable earnings of most workers first becoming eligible for benefits in 1979 or later, and for automatic adjustments in the contribution and benefit base, bend points, earnings test exempt amounts, and other wage-indexed amounts. See tables V.C1 and VI.G6.

Award. An administrative determination that an individual is entitled to receive a specified type of OASDI benefit. Awards can represent not only new entrants to the benefit rolls but also persons already on the rolls who become entitled to a different type of benefit. Awards usually result in the immediate payment of benefits, although payments may be deferred or withheld depending on the individual's particular circumstances.

Baby boom. The period from the end of World War II (1946) through 1965 marked by unusually high birth rates.

Bend points. The dollar amounts defining the AIME or PIA brackets in the benefit formulas. For the bend points for years 1979 and later, see table V.C2.

Beneficiary. A person who has been awarded benefits on the basis of his or her own or another's earnings record. The benefits may be either in current-payment status or withheld.

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Benefit award. See "Award."

Benefit conversion. See "Disability conversion."

Benefit payments. The amounts disbursed for OASI and DI benefits by the Department of the Treasury.

Benefit termination. See "Termination."

Best estimate assumptions. See "Assumptions."

Board. See "Board of Trustees."

Board of Trustees. A Board established by the Social Security Act to oversee the financial operations of the Federal Old-Age and Survivors Insurance Trust Fund and the Federal Disability Insurance Trust Fund. The Board is composed of six members. Four members serve by virtue of their positions in the Federal Government: the Secretary of the Treasury, who is the Managing Trustee; the Secretary of Labor; the Secretary of Health and Human Services; and the Commissioner of Social Security. The President appoints and the Senate confirms the other two members to serve as public representatives. Also referred to as the "Board" or the "Trustees."

Cash flow. Actual or projected revenue and costs reflecting the levels of payroll tax contribution rates and benefits scheduled in the law. Net cash flow is the difference between non-interest income and cost.

Consumer Price Index—CPI. An official measure of inflation in consumer prices. In this report, CPI refers to the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). The Bureau of Labor Statistics, Department of Labor, publishes historical values for the CPI-W.

Contribution and benefit base. Annual dollar amount above which earnings in employment covered under the OASDI program are neither taxable nor creditable for benefit-computation purposes. (Also referred to as maximum contribution and benefit base, annual creditable maximum, taxable maximum, and maximum taxable.) See tables V.C1 and V.C6. See "Hospital Insurance (HI) contribution base."

Contributions. See "Payroll tax contributions."

Conversion. See "Disability conversion."

Cost. The cost shown for a year includes benefits scheduled for payment in the year, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries.

Cost-of-living adjustment. See "Automatic cost-of-living benefit increase."

Cost rate. The cost rate for a year is the ratio of the cost of the program to the taxable payroll for the year.

Covered earnings. Wages or earnings from self-employment covered by the OASDI program.

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Covered employment. All employment for which earnings are creditable for Social Security purposes. The program covers almost all employment. Some exceptions are:

- State and local government employees whose employer has not elected to be covered under Social Security and who are participating in an employer-provided pension plan.
- Current Federal civilian workers hired before 1984 who have not elected to be covered.
- Self-employed workers earning less than $400 in a calendar year.

Covered worker. A person who has earnings creditable for Social Security purposes based on services for wages in covered employment or income from covered self-employment.

CPI-indexed dollars. Amounts adjusted by the CPI to the value of the dollar in a particular year.

Creditable earnings. Wages or self-employment earnings posted to a worker's earnings record. Such earnings determine eligibility for benefits and the amount of benefits on that worker's record. The contribution and benefit base is the maximum amount of creditable earnings for each worker in a calendar year.

Current-cost financing. See "Pay-as-you-go financing."

Current dollars. Amounts expressed in nominal dollars with no adjustment for inflation.

Currently insured status. A worker acquires currently insured status when he or she has accumulated six quarters of coverage during the 13-quarter period ending with the current quarter.

Current-payment status. Status of a beneficiary to whom a benefit is being paid for a given month (with or without deductions, provided the deductions add to less than a full month's benefit).

Deemed filing. Under certain circumstances, a person applying for or receiving either an aged-spouse benefit or a retired-worker benefit is required to also file for the other of these two types of benefits. For those first eligible for benefits before 2016, this requirement applies to any person under normal retirement age who is eligible for the other benefit as of the starting month for the first benefit. For those first eligible for benefits in 2016 and later, this requirement applies whenever the person is eligible for the other benefit. This can occur at any age, and in months after the starting month of the first benefit.

Deemed wage credit. See "Military service wage credits."

Delayed retirement credits. Increases in the benefit amount for certain individuals who did not receive benefits for months after attaining normal retirement age but before age 70. Delayed retirement credits apply to benefits for

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January of the year following the year they are earned or for the month of attainment of age 70, whichever comes first. See table V.C3.

Demographic assumptions. See "Assumptions."

Disability. For Social Security purposes, the inability to engage in any substantial gainful activity (see "Substantial gainful activity—SGA") by reason of any medically determinable physical or mental impairment that can be expected to result in death or to last for a continuous period of not less than 12 months. Special rules apply for workers at ages 55 and over whose disability is based on blindness.

The law generally requires that a person be disabled continuously for 5 months before he or she can qualify for a disabled-worker benefit.

Disability conversion ratio. For a given year, the ratio of the number of disability conversions to the average number of disabled-worker beneficiaries at all ages during the year.

Disability conversion. Upon attainment of normal retirement age, a disabled-worker beneficiary is automatically converted to retired-worker status.

Disability incidence rate. The proportion of workers in a given year, insured for but not receiving disability benefits, who apply for and are awarded disability benefits.

Disability Insurance (DI) Trust Fund. See "Trust fund."

Disability insured status. A worker acquires disability insured status if he or she is: (1) a fully insured worker who has accumulated 20 quarters of coverage during the 40-quarter period ending with the current quarter, (2) a fully insured worker aged 24-30 who has accumulated quarters of coverage during one-half of the quarters elapsed after the quarter of attainment of age 21 and up to and including the current quarter, or (3) a fully insured worker under age 24 who has accumulated six quarters of coverage during the 12-quarter period ending with the current quarter.

Disability prevalence rate. The proportion of persons insured for disability benefits who are disabled-worker beneficiaries in current-payment status.

Disability termination rate. The proportion of disabled-worker beneficiaries in a given year whose disability benefits terminate as a result of their recovery or death.

Disabled-worker benefit. A monthly benefit payable to a disabled worker under normal retirement age and insured for disability. Before November 1960, disability benefits were limited to disabled workers aged 50-64.

Dual entitlement. A person may be entitled to more than one benefit at the same time. For example, a person may be entitled as a retired worker on his or her own record and as a spouse on another record. However, a person's benefit amount can never exceed the highest single benefit to which that per-

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son is entitled. Some benefits are calculated independently with the larger benefit being paid or the smaller benefit being paid plus the excess amount of the larger one.

Earnings. Unless otherwise qualified, all wages from employment and net earnings from self-employment, whether or not they are taxable or covered.

Earnings test. The provision requiring the withholding of benefits if beneficiaries under normal retirement age have earnings in excess of certain exempt amounts. See table V.C1.

Economic assumptions. See "Assumptions."

Effective interest rate. See "Interest rate."

Excess wages. Wages in excess of the contribution and benefit base on which a worker initially makes payroll tax contributions, usually as a result of working for more than one employer during a year. Employee payroll taxes on excess wages are refundable to affected employees, while the employer taxes are not refundable.

Expenditures. Actual payments made or expected to be made under current law, including benefits paid or payable, administrative expenses, financial interchange with the Railroad Retirement program, and payments for vocational rehabilitation services for disabled beneficiaries.

Federal Insurance Contributions Act—FICA. Provision authorizing payroll taxes on the wages of employed persons to provide for Old-Age, Survivors, and Disability Insurance, and for Hospital Insurance. Workers and their employers generally pay the tax in equal amounts.

File and suspend. The ability to apply for a retired-worker benefit at or after normal retirement age, then voluntarily suspend it, allowing the worker to earn delayed retirement credits and a spouse or child to receive benefits on the worker's record. Voluntary suspensions requested after April 29, 2016 no longer allow spouses (other than divorced spouses) and children to receive benefits while the worker's benefit is suspended.

Financial interchange. Provisions of the Railroad Retirement Act providing for transfers between the trust funds and the Social Security Equivalent Benefit Account of the Railroad Retirement program in order to place each trust fund in the same financial position it would have been had railroad employment always been covered under Social Security.

Fiscal year. The accounting year of the United States Government. Starting in 1976, a fiscal year is the 12-month period ending September 30. For example, fiscal year 2019 began October 1, 2018, and will end September 30, 2019.

Full advance funding. A financing method in which contributions are established to match the full cost of future benefits as these costs are incurred through current service. Such financing methods also provide for amortiza-

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tion over a fixed period of any financial obligation that is incurred at the beginning of the program (or subsequent modification) as a result of granting credit for past service.

Fully insured status. A worker acquires fully insured status when his or her total number of quarters of coverage is greater than or equal to the number of years elapsed after the year of attainment of age 21 (but not less than six). Once a worker has accumulated 40 quarters of coverage, he or she remains permanently fully insured.

General Fund of the Treasury. Funds held by the Treasury of the United States, other than income collected for a specific purpose (such as Social Security), and maintained in a separate account for that purpose.

General Fund reimbursements. Payments from the General Fund of the Treasury to the trust funds for specific purposes defined in the law, including:

- The cost of noncontributory wage credits for military service before 1957, and periodic adjustments of previous determinations.
- The cost in 1971-82 of deemed wage credits for military service performed after 1956.
- The cost of benefits to certain uninsured persons who attained age 72 before 1968.
- The cost of payroll tax credits provided to employees in 1984 and self-employed persons in 1984-89 by Public Law 98-21.
- The cost in 2009-17 of excluding certain self-employment earnings from SECA taxes under Public Law 110-246.
- Payroll tax revenue forgone under the provisions of Public Laws 111-147, 111-312, 112-78, and 112-96.

The General Fund also reimburses the trust funds for various other items, including interest on checks which are not negotiated 6 months after the month of issue and costs incurred in performing certain legislatively mandated activities not directly related to administering the OASI and DI programs.

Gross domestic product—GDP. The total dollar value of all goods and services produced by labor and property located in the United States, regardless of who supplies the labor or property.

Hospital Insurance (HI) contribution base. Annual dollar amount above which earnings in employment covered under the HI program are not taxable. (Also referred to as maximum contribution base, taxable maximum, and maximum taxable.) Beginning in 1994, the HI contribution base was eliminated.

High-cost assumptions. See "Assumptions."

Hospital Insurance (HI) Trust Fund. See "Trust fund."

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Immigration. See "Lawful permanent resident (LPR) immigration" and "Other-than-LPR immigration."

Income. Income for a given year is the sum of tax revenue on a cash basis (payroll tax contributions and income from the taxation of scheduled benefits), reimbursements from the General Fund of the Treasury, if any, and interest credited to the trust funds.

Income rate. Ratio of non-interest income to the OASDI taxable payroll for the year.

Infinite horizon. The period extending indefinitely into the future.

Inflation. An increase in the general price level of goods and services.

Insured status. The state or condition of having sufficient quarters of coverage to meet the eligibility requirements for retired-worker or disabled-worker benefits, or to permit the worker's spouse and children or survivors to establish eligibility for benefits in the event of his or her disability, retirement, or death. See "Quarter of coverage."

Interest. A payment in exchange for the use of money during a specified period.

Interest rate. Interest rates on new public-debt obligations issuable to Federal trust funds (see "Special public-debt obligation") are determined monthly. Such rates are equal to the average market yield on all outstanding marketable U.S. securities not due or callable until after 4 years from the date the rate is determined. See table V.B2 for historical and assumed future interest rates on new special-issue securities. The effective interest rate for a trust fund is the ratio of the interest earned by the fund over a given period of time to the average level of asset reserves held by the fund during the period. The effective rate of interest thus represents a measure of the overall average interest earnings on the fund's portfolio of investments. See table VI.G6 for projected compound new-issue interest factors and compound effective trust-fund interest factors.

Interfund borrowing. The borrowing of asset reserves by a trust fund (OASI, DI, or HI) from another trust fund when the first fund is in danger of depletion. The Social Security Act permitted interfund borrowing only during 1982 through 1987, and required all amounts borrowed to be repaid prior to the end of 1989. The only exercise of this authority occurred in 1982, when the OASI Trust Fund borrowed from the DI and HI Trust Funds. The final repayment of borrowed amounts occurred in 1986.

Intermediate assumptions. See "Assumptions."

Lawful permanent resident (LPR) immigration. Persons who enter the Social Security area population and are granted LPR status, or who are already in the Social Security area population and adjust their status to become LPRs. Persons who enter the country with legal visas but without LPR status, such as temporary foreign workers and students, are not included in the "LPR immigration" category.

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Legal emigration. Lawful permanent residents and citizens who leave the Social Security area population.

Life expectancy. Average remaining number of years expected prior to death. Period life expectancy is calculated for a given year using the actual or expected death rates at each age for that year. Cohort life expectancy, sometimes referred to as generational life expectancy, is calculated for individuals at a specific age in a given year using actual or expected death rates from the years in which the individuals would actually reach each succeeding age if they survive.

Long-range. The next 75 years. The Trustees make long-range actuarial estimates for this period because it covers approximately the maximum remaining lifetime for virtually all current Social Security participants.

Low-cost assumptions. See "Assumptions."

Lump-sum death payment. A lump sum, generally $255, payable on the death of a fully or currently insured worker. The lump sum is payable to the surviving spouse of the worker, under most circumstances, or to the worker's children.

Maximum family benefit. The maximum monthly amount that can be paid on a worker's earnings record. Whenever the total of the individual monthly benefits payable to all the beneficiaries entitled on one earnings record exceeds the maximum, each dependent's or survivor's benefit is proportionately reduced. Benefits payable to divorced spouses or surviving divorced spouses are not reduced under the family maximum provision.

Medicare. A nationwide, Federally administered health insurance program authorized in 1965 under Title XVIII of the Social Security Act to cover the cost of hospitalization, medical care, and some related services for most persons age 65 and over. In 1972, lawmakers extended coverage to persons receiving Social Security Disability Insurance payments for 2 years and persons with End-Stage Renal Disease. (For beneficiaries whose primary or secondary diagnosis is Amyotrophic Lateral Sclerosis, the 2-year waiting period is waived.) In 2010, persons exposed to environmental health hazards within areas under a corresponding emergency declaration became Medicare-eligible. In 2006, prescription drug coverage was added as well. Medicare consists of two separate but coordinated trust funds—Hospital Insurance (HI, Part A) and Supplementary Medical Insurance (SMI). The SMI Trust Fund is composed of two separate accounts—the Part B account and the Part D account. Almost all persons who are aged 65 and over or disabled and who are entitled to HI are eligible to enroll in Part B and Part D on a voluntary basis by paying monthly premiums.

Military service wage credits. Credits toward OASDI earnings records for benefit computation purposes, recognizing that military personnel receive non-wage compensation (such as food and shelter) in addition to their basic

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pay and other cash payments. Military personnel do not pay payroll taxes on these credits. Noncontributory wage credits of $160 were provided for each month of active military service from September 16, 1940, through December 31, 1956. For years after 1956, the basic pay of military personnel is covered under the Social Security program on a contributory basis. In addition to the contributory credits for basic pay, noncontributory wage credits of $300 were granted for each calendar quarter, from January 1957 through December 1977, in which a person received pay for military service. Noncontributory wage credits of $100 were granted for each $300 of military wages, up to a maximum credit of $1,200 per calendar year, from January 1978 through December 2001.

National average wage index—AWI. See "Average wage index—AWI."

Non-interest income. Non-interest income for a given year is the sum of tax revenue on a cash basis (payroll tax contributions and income from the taxation of scheduled benefits) and reimbursements from the General Fund of the Treasury, if any.

Nonresident alien beneficiary. An OASDI beneficiary who is not a U.S. citizen and who is living abroad while receiving benefits.

Normal retirement age—NRA. The age at which a person may first become entitled to retirement benefits without reduction based on age. For persons reaching age 62 before 2000, the normal retirement age is 65. It will increase gradually to 67 for persons reaching that age in 2027 or later, beginning with an increase to 65 years and 2 months for persons reaching age 65 in 2003. See table V.C3.

Old-Age and Survivors Insurance (OASI) Trust Fund. See "Trust fund."

Old-law base. Amount the contribution and benefit base would have been if the 1977 amendments had not provided for ad hoc increases. The Social Security Amendments of 1972 provided for automatic annual indexing of the contribution and benefit base. The Social Security Amendments of 1977 specified ad hoc bases for 1978-81, with subsequent bases updated in accordance with the normal indexing procedure. See table V.C2.

Open-group unfunded obligation. See "Unfunded obligation."

Other-than-LPR emigration. Other-than-LPR immigrants who leave the Social Security area population or who adjust their status to become LPRs.

Other-than-LPR immigration. Persons who enter the Social Security area population and stay to the end of the year without being granted LPR status, such as undocumented immigrants, and foreign workers and students entering with temporary visas.

Par value. The value printed on the face of a bond. For both public and special issues held by the trust funds, par value is also the redemption value at maturity.

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Partial advance funding. A financing method in which contributions are established to provide a substantial accumulation of trust fund asset reserves, thereby generating additional interest income to the trust funds and reducing the need for payroll tax increases in periods when costs are relatively high. Higher general contributions or additional borrowing may be required, however, to support the payment of such interest. While substantial, the trust fund buildup under partial advance funding is much smaller than it would be with full advance funding.

Pay-as-you-go financing. A financing method in which contributions are established to produce just as much income as required to pay current benefits, with trust fund asset reserves built up only to the extent needed to prevent depletion of the fund by random economic fluctuations.

Payroll tax contributions. The amount based on a percent of earnings, up to an annual maximum, that must be paid by:

- employers and employees on wages from employment under the Federal Insurance Contributions Act,
- the self-employed on net earnings from self-employment under the Self-Employment Contributions Act, and
- States on the wages of State and local government employees covered under the Social Security Act through voluntary agreements under section 218 of the act.

Also referred to as payroll taxes.

Population in the Social Security area. See "Social Security area population."

Present value. The equivalent value, at the present time, of a stream of values (either income or cost, past or future). Present values are used widely in calculations involving financial transactions over long periods of time to account for the time value of money, by discounting or accumulating these transactions at the rate of interest. Present-value calculations for this report use the effective yield on trust fund asset reserves.

Primary insurance amount—PIA. The monthly amount payable to a retired worker who begins to receive benefits at normal retirement age or, generally, to a disabled worker. This amount, which is typically related to the worker's average monthly wage or average indexed monthly earnings, is also used as a base for computing all types of benefits payable on an individual's earnings record.

Primary-insurance-amount formula. The mathematical formula relating the PIA to the AIME for workers who attain age 62, become disabled, or die after 1978. The PIA is equal to the sum of 90 percent of AIME up to the first bend point, plus 32 percent of AIME above the first bend point up to the second bend point, plus 15 percent of AIME in excess of the second bend point.

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Automatic benefit increases are applied beginning with the year of eligibility. See table V.C2 for historical and assumed future bend points and table V.C1 for historical and assumed future benefit increases.

Quarter of coverage. Basic unit of measurement for determining insured status. In 2019, a worker receives one quarter of coverage (up to a total of four) for each $1,360 of annual covered earnings. For years after 1978, the amount of earnings required for a quarter of coverage increases automatically with increases in the national average wage index. See table V.C2.

Railroad Retirement. A Federal insurance program, similar to Social Security, designed for workers in the railroad industry. The provisions of the Railroad Retirement Act provide for a system of coordination and financial interchange between the Railroad Retirement program and the Social Security program.

Reallocation of payroll tax rates. An increase in the payroll tax rate for either the OASI or DI Trust Fund, with a corresponding reduction in the rate for the other fund, so that the total OASDI payroll tax rate is not changed.

Real-wage differential. The difference between the percentage increases in: (1) the average annual wage in covered employment and (2) the average annual Consumer Price Index. See table V.B1.

Recession. A period of adverse economic conditions, generally defined as two or more successive calendar quarters of negative real growth in gross domestic product.

Reserves. See "Asset reserves."

Retired-worker benefit. A monthly benefit payable to a fully insured retired worker aged 62 or older or to a person entitled under the transitionally insured status provision in the law.

Retirement earnings test. See "Earnings test."

Retirement eligibility age. The age, currently age 62, at which a fully insured individual first becomes eligible to receive retired-worker benefits.

Scheduled benefits. The level of benefits specified under current law.

Scenario-based model. A model with specified assumptions for and relationships among variables. Under such a model, any specified set of assumptions determines a single outcome directly reflecting the specifications.

Self-employment. Operation of a trade or business by an individual or by a partnership in which an individual is a member.

Self-Employment Contributions Act–SECA. Provision authorizing Social Security payroll taxes on the net earnings of most self-employed persons.

Short-range. The next 10 years. The Trustees prepare short-range actuarial estimates for this period because of the test of short-range financial adequacy. The Social Security Act requires estimates for 5 years; the Trustees

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prepare estimates for an additional 5 years to help clarify trends which are only starting to develop in the mandated first 5-year period.

Social Security Act. Provisions of the law governing most operations of the Social Security program. The original Social Security Act is Public Law 74-271, enacted August 14, 1935. With subsequent amendments, the Social Security Act consists of 21 titles, of which three have been repealed. Title II of the Social Security Act authorized the Old-Age, Survivors, and Disability Insurance program.

Social Security area population. The population composed of: (1) residents of the 50 States and the District of Columbia (adjusted for net census undercount); (2) civilian residents of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Northern Mariana Islands; (3) Federal civilian employees and persons in the U.S. Armed Forces abroad and their dependents; (4) non-citizens living abroad who are insured for Social Security benefits; and (5) all other U.S. citizens abroad.

Solvency. A program is solvent at a point in time if it is able to pay scheduled benefits when due with scheduled financing. For example, the OASDI program is solvent over any period for which the trust funds maintain a positive level of asset reserves.

Special public-debt obligation. Securities of the United States Government issued exclusively to the OASI, DI, HI, and SMI Trust Funds and other Federal trust funds. Section 201(d) of the Social Security Act provides that the public-debt obligations issued for purchase by the OASI and DI Trust Funds shall have maturities fixed with due regard for the needs of the funds. The usual practice has been to spread the holdings of special issues, as of each June 30, so that the amounts maturing in each of the next 15 years are approximately equal. Special public-debt obligations are redeemable at par value at any time and carry interest rates determined by law (see "Interest rate"). See tables VI.A4 and VI.A5 for a listing of the obligations held by the OASI and DI Trust Funds, respectively.

Stochastic model. A model used for projecting a probability distribution of potential outcomes. Such models allow for random variation in one or more variables through time. The random variation is generally based on fluctuations observed in historical data for a selected period. A large number of simulations, each of which reflects random variation in the variable(s), produce a distribution of potential outcomes.

Substantial gainful activity—SGA. The level of work activity used to establish disability. A finding of disability requires that a person be unable to engage in substantial gainful activity. A person who earns more than a certain monthly amount (net of impairment-related work expenses) is ordinarily considered to be engaging in SGA. The amount of monthly earnings considered as SGA depends on the nature of a person's disability. The Social Security Act specifies a higher SGA amount for statutorily blind individuals;

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Federal regulations specify a lower SGA amount for non-blind individuals. Both SGA amounts increase with increases in the national average wage index.

Summarized balance. The difference between the summarized income rate and the summarized cost rate, expressed as a percentage of GDP. The difference between the summarized income rate and cost rate as a percentage of taxable payroll is referred to as the actuarial balance.

Summarized cost rate. The ratio of the present value of cost to the present value of the taxable payroll (or GDP) for the years in a given period, expressed as a percentage. To evaluate the financial adequacy of the program, the summarized cost rate is adjusted to include the cost of reaching and maintaining a target trust fund level. A trust fund level of about 1 year's cost is considered to be an adequate reserve for unforeseen contingencies; therefore, the targeted trust fund ratio is 100 percent of annual cost. Accordingly, the adjusted summarized cost rate is equal to the ratio of: (1) the sum of the present value of the cost during the period plus the present value of the targeted ending trust fund level to (2) the present value of the taxable payroll (or GDP) during the projection period.

Summarized income rate. The ratio of the present value of scheduled noninterest income to the present value of taxable payroll (or GDP) for the years in a given period, expressed as a percentage. To evaluate the financial adequacy of the program, the summarized income rate is adjusted to include asset reserves on hand at the beginning of the period. Accordingly, the adjusted summarized income rate equals the ratio of: (1) the sum of the trust fund reserve at the beginning of the period plus the present value of noninterest income during the period to (2) the present value of the taxable payroll (or GDP) for the years in the period.

Supplemental Security Income—SSI. A Federally administered program (often with State supplementation) of cash assistance for needy aged, blind, or disabled persons. The General Fund of the Treasury funds Federal expenditures for the SSI program. The Social Security Administration administers it.

Supplementary Medical Insurance (SMI) Trust Fund. See "Trust fund."

Survivor benefit. Benefit payable to a survivor of a deceased worker.

Sustainable solvency. Sustainable solvency for the financing of the program under a specified set of assumptions is achieved when the projected trust fund ratio is positive throughout the 75-year projection period and is either stable or rising at the end of the period.

Taxable earnings. Wages or self-employment income, in employment covered by the OASDI or HI programs, that is under the applicable annual maxi-

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mum taxable limit. For 1994 and later, no maximum taxable limit applies to the HI program.

Taxable payroll. A weighted sum of taxable wages and taxable self-employment income. When multiplied by the combined employee-employer payroll tax rate, taxable payroll yields the total amount of payroll taxes incurred by employees, employers, and the self-employed for work during the period.

Taxable self-employment income. The maximum amount of net earnings from self-employment by an earner which, when added to any taxable wages, does not exceed the contribution and benefit base. For HI beginning in 1994, all net earnings from self-employment.

Taxable wages. See "Taxable earnings."

Taxation of benefits. Beginning in 1984, Federal law subjected up to 50 percent of an individual's or a couple's OASDI benefits to Federal income taxation under certain circumstances. Treasury allocates the revenue derived from this provision to the OASI and DI Trust Funds on the basis of the income taxes paid on the benefits from each fund. Beginning in 1994, the law increased the maximum percentage from 50 percent to 85 percent. The HI Trust Fund receives the additional tax revenue resulting from the increase to 85 percent.

Taxes. See "Payroll tax contributions" and "Taxation of benefits."

Termination. Cessation of payment because the beneficiary is no longer entitled to receive a specific type of benefit. For example, benefits might terminate as a result of the death of the beneficiary, the recovery of a disabled beneficiary, or the attainment of age 18 by a child beneficiary. In some cases, an individual may cease one benefit and this is not a termination because they become immediately entitled to another type of benefit, such as the conversion of a disabled-worker beneficiary at normal retirement age to a retired-worker beneficiary.

Test of long-range close actuarial balance. The conditions required to meet this test are:

- The trust fund satisfies the test of short-range financial adequacy; and
- The trust fund ratios stay above zero throughout the 75-year projection period, such that benefits would be payable in a timely manner throughout the period.

The Trustees apply the test to OASI, DI, and the combined OASDI program based on the intermediate set of assumptions.

Test of short-range financial adequacy. The conditions required to meet this test are:

- If the trust fund ratio is at least 100 percent at the beginning of the projection period, then it must remain at or above 100 percent throughout the 10-year projection period;

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- If the ratio is initially less than 100 percent, then it must reach at least 100 percent within 5 years (without asset reserve depletion at any time during this period) and then remain at or above 100 percent throughout the remainder of the 10-year period.

The Trustees apply the test to OASI, DI, and the combined OASDI program based on the intermediate set of assumptions.

Total-economy productivity. The ratio of real GDP to hours worked by all workers. Also referred to as "labor productivity."

Total fertility rate. The sum of the single year of age birth rates for women aged 14 through 49, where the rate for age 14 includes births to women aged 14 and under, and the rate for age 49 includes births to women aged 49 and over. The total fertility rate may be interpreted as the average number of children that would be born to a woman if she were to experience, at each age of her life, the birth rate observed in, or assumed for, a specified year, and if she were to survive the entire childbearing period.

Trust fund. Separate accounts in the United States Treasury which hold the payroll taxes received under the Federal Insurance Contributions Act and the Self-Employment Contributions Act; payroll taxes resulting from coverage of State and local government employees; any sums received under the financial interchange with the railroad retirement account; voluntary hospital and medical insurance premiums; and reimbursements or payments from the General Fund of the Treasury. As required by law, the Department of the Treasury invests funds not required to meet current expenditures in interest-bearing securities backed by the full faith and credit of the U.S. Government. The interest earned is also deposited in the trust funds.

- **Old-Age and Survivors Insurance (OASI).** The trust fund used for paying monthly benefits to retired-worker (old-age) beneficiaries, their spouses and children, and to survivors of deceased insured workers.
- **Disability Insurance (DI).** The trust fund used for paying monthly benefits to disabled-worker beneficiaries, their spouses and children, and for providing rehabilitation services to the disabled.
- **Hospital Insurance (HI).** The Medicare trust fund that covers specified inpatient hospital services, posthospital skilled nursing care, home health services, and hospice care for aged and disabled individuals who meet the eligibility requirements. Also known as Medicare Part A.
- **Supplementary Medical Insurance (SMI).** The Medicare trust fund composed of the Part B Account, the Part D Account, and the Transitional Assistance Account. The Part B Account pays for a portion of the costs of physicians' services, outpatient hospital services, and other related medical and health services for voluntarily enrolled aged and disabled individuals. The Part D Account pays private plans to provide

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prescription drug coverage, beginning in 2006. The Transitional Assistance Account paid for transitional assistance under the prescription drug card program in 2004 and 2005.

The trust funds are distinct legal entities which operate independently. Fund operations are sometimes combined on a hypothetical basis.

Trust fund ratio. A measure of trust fund adequacy. The asset reserves at the beginning of a year, which do not include advance tax transfers, expressed as a percentage of the cost for the year. The trust fund ratio represents the proportion of a year's cost which could be paid solely with the reserves at the beginning of the year.

Trustees. See "Board of Trustees."

Undisbursed balances. In general, refers to the cumulative differences between the actual cash payments for a month compared to security redemptions from the trust fund reserves made on a preliminary basis to cover such cash payments during the same month. On a monthly basis, the Social Security Administration (SSA) pays benefits and makes payments for other programmatic expenses associated with the trust funds. During each month, SSA draws cash from the trust funds on a preliminary basis, which results in Treasury redeeming invested securities to cover such payments. This monthly difference can be either positive or negative depending on net monthly activity, and is added to the balance at the end of the prior month.

A net positive undisbursed balance represents a situation where cumulative redemptions from the trust fund's securities are more than was needed to cover actual program cash payments through the end of the month. A net negative balance represents a situation where cumulative program cash payments exceeded the amount redeemed from the invested securities. A negative value requires future redemption of additional invested securities.

In addition, about every seven years, when January 3 falls on a Sunday, benefit payments scheduled to be paid on January 3rd are actually paid on December 31 of the preceding year, as required by the statutory provision included in the 1977 Social Security Amendments for early delivery of benefit payments when the normal payment delivery date is a Saturday, Sunday, or legal public holiday. Consistent with practice in prior reports and for comparability with other historical years and the projections in this report, all trust fund operations and asset reserves reflect the 12 months of benefits scheduled for payment in each year. Therefore, such advance payments are included as positive values in the undisbursed balance at the end of the calendar years in which the advance payments are made.

Unfunded obligation. A measure of the shortfall of trust fund income to fully cover program cost through a specified date after depletion of trust fund asset reserves. This measure can be expressed in present value dollars, discounted to the beginning of the valuation period, by computing the excess of

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the present value of the projected cost of the program through a specified date over the sum of: (1) the value of trust fund reserves at the beginning of the valuation period; and (2) the present value of the projected non-interest income of the program through a specified date, assuming scheduled tax rates and benefit levels. This measure can apply for all participants through a specified date, i.e., the open group, or be limited to a specified subgroup of participants.

Unfunded obligation ratio. The unfunded obligation accumulated through the beginning of a year expressed as a percentage of the cost for the year.

Unnegotiated check. A check which has not been cashed 6 months after the end of the month in which the check was issued. When a check has been outstanding for a year, the Department of the Treasury administratively cancels the check and reimburses the issuing trust fund separately for the amount of the check and interest for the period the check was outstanding. The appropriate trust fund also receives an interest adjustment for the time the check was outstanding if it is cashed 6 to 12 months after the month of issue. If a check is presented for payment after it has been administratively canceled, a replacement check is issued.

Valuation period. A period of years which is considered as a unit for purposes of calculating the financial status of a trust fund.

Vocational rehabilitation (VR). Services provided to disabled persons to help them to return to gainful employment. VR services are designed to provide an individual with the training or other services that are needed to return to work, to begin working, or to enter a new line of work. The trust funds, and the General Fund in the case of individuals also receiving Supplemental Security Income disability benefits, reimburse the providers of such services only in those cases where the services contributed to the successful rehabilitation of the beneficiaries.

Year of depletion. The year in which a trust fund becomes unable to pay benefits when due because the fund's asset reserves have been used up.

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STATEMENT OF ACTUARIAL OPINION

It is my opinion that, with the important caveat noted below: (1) the techniques and methodology used herein to evaluate the actuarial status of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds are based upon sound principles of actuarial practice and are generally accepted within the actuarial profession; and (2) the assumptions used and the resulting actuarial estimates are, individually and in the aggregate, reasonable for the purpose of evaluating the actuarial status of the trust funds, taking into consideration the past experience and future expectations for the population, the economy, and the program. I am an Associate of the Society of Actuaries, a member of the American Academy of Actuaries, and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Federal Budget Accounting

This report focuses on the actuarial status of the OASI and DI Trust Funds, as required by law. It includes important information on (1) the years in which trust fund asset reserves are projected to be depleted and (2) the degree to which benefits scheduled in the law would no longer be fully payable on a timely basis after reserve depletion. However, the footnote on page 43 of this report directs the reader to an appendix in the Medicare Trustees Report, which states, "The trust fund perspective does not encompass the interrelationship between the Medicare and Social Security trust funds and the overall Federal budget." The reader of this report should consider this "overall" Federal unified budget perspective with care because the assumptions underlying unified budget accounting are inconsistent with the assumptions of trust fund accounting.

In particular, trust fund accounting accurately reflects the law, under which benefits cannot be paid in full on a timely basis after reserve depletion. In contrast, unified budget accounting assumes that full scheduled benefits will continue to be paid through transfers from the General Fund of the Treasury, thus representing "a draw on other Federal resources for which there is no earmarked source of revenue from the public." Not only are such "draws" not permissible under current law, no precedent exists for a change in the Social Security Act to finance unfunded trust fund obligations with such draws on other Federal resources. Under this unified budget accounting assumption, $13.9 trillion of OASDI unfunded obligations, which are not payable under the law over the next 75 years, are referred to as "expenditures" requiring a "draw" from the General Fund of the Treasury.

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In addition, unified budget accounting treats redemptions of trust fund reserves as an addition to annual Federal deficits, referring to these redemptions also as "a draw on other Federal resources." In fact, redemptions of trust fund reserves represent a deferred use of revenues earmarked for the trust fund program alone, which have been collected in prior years and saved for later use. These redemptions utilize the entire $2.9 trillion accumulation of net past earmarked revenue for OASDI, but are referred to as draws on the General Fund of the Treasury under the unified budget perspective.

Therefore, the actual operations of the trust funds under current law do not draw on other Federal resources. Expenditures can only be paid from current or deferred earmarked resources for the specific program financed from the trust fund. Assertions that trust fund reserve redemption and shortfalls after reserve depletion represent draws on other Federal resources are based on assumptions that are inconsistent with the law and with actual trust fund annual cash-flow operations.

In addition to Federal budget annual cash flows, the budget perspective is equally concerned with the build-up of Federal debt. The total Federal debt subject to limit includes trust fund reserves. Thus, as trust fund reserves are accumulated or redeemed, they are offset in the total Federal debt by securities issued to the public, with no net effect on the total Federal debt. Moreover, even in considering the Federal debt owed to (held by) the public, there is no net direct effect on that debt from accumulating and then redeeming trust fund asset reserves. However, budget analysis frequently refers to both trust fund reserve redemptions and trust fund obligations not payable under the law after reserve depletion as factors that increase the Federal debt held by the public in the future. This assertion is not consistent with a full assessment of the investment and redemption flows of the trust funds or with the limitations in the law on paying benefits after trust fund reserves are depleted.



Stephen C. Goss

Associate of the Society of Actuaries
Member of the American Academy of Actuaries
Chief Actuary, Social Security Administration

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EXHIBIT 8a

116th Congress, 1st Session – – – – – – – – – – – – – – – House Document 116-28

THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

COMMUNICATION

FROM

THE BOARD OF TRUSTEES, FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

TRANSMITTING

THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS



April 25, 2019—Referred to the Committee on Ways and Means
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LETTER OF TRANSMITTAL

BOARD OF TRUSTEES OF THE
FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND
FEDERAL DISABILITY INSURANCE TRUST FUNDS,
Washington, D.C., April 22, 2019

HON. NANCY PELOSI,
Speaker of the House of Representatives.

HON. MICHAEL R. PENCE,
President of the Senate.

DEAR MADAM SPEAKER AND MR. PRESIDENT:

We have the honor of transmitting to you the 2019 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds, the 79th such report.

Respectfully,

STEVEN T. MNUCHIN,
Secretary of the Treasury,
and Managing Trustee of the Trust Funds.

R. ALEXANDER ACOSTA,
Secretary of Labor,
and Trustee.

ALEX M. AZAR II,
Secretary of Health and Human Services,
and Trustee.

NANCY A. BERRYHILL,
Acting Commissioner
of Social Security, and Trustee.

VACANT,
Public Trustee.

VACANT,
Public Trustee.

MARK J. WARSHAWSKY,
Deputy Commissioner
for Retirement and Disability Policy,
Social Security Administration,
and Acting Secretary, Board of Trustees.

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THE 2019 ANNUAL REPORT OF THE BOARD OF TRUSTEES OF THE FEDERAL OLD-AGE AND SURVIVORS INSURANCE AND FEDERAL DISABILITY INSURANCE TRUST FUNDS

I. INTRODUCTION

The Old-Age, Survivors, and Disability Insurance (OASDI) program makes monthly income available to insured workers and their families at retirement, death, or disability. The OASDI program consists of two parts. Retired workers, their families, and survivors of deceased workers receive monthly benefits under the Old-Age and Survivors Insurance (OASI) program. Disabled workers and their families receive monthly benefits under the Disability Insurance (DI) program.

The Social Security Act established the Board of Trustees to oversee the financial operations of the OASI and DI Trust Funds. The Board is composed of six members. Four members serve by virtue of their positions in the Federal Government: the Secretary of the Treasury, who is the Managing Trustee; the Secretary of Labor; the Secretary of Health and Human Services; and the Commissioner of Social Security. The President appoints and the Senate confirms the other two members to serve as public representatives. These two positions are currently vacant. The Deputy Commissioner of the Social Security Administration serves as Secretary of the Board.

The Social Security Act requires that the Board, among other duties, report annually to the Congress on the actuarial status and financial operations of the OASI and DI Trust Funds. The 2019 report is the 79th such report.

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B. ECONOMIC ASSUMPTIONS AND METHODS

The three alternative sets of economic assumptions provide a reasonable range for estimating the financial status of the trust funds. The intermediate assumptions reflect the Trustees' consensus expectation of sustained moderate economic growth after completion of the recovery from the last recession and their best estimate for other economic parameters. The low-cost assumptions represent a more optimistic outlook with recovery to a higher level of economic output, stronger long-term economic growth, and relatively optimistic levels for other parameters. The high-cost assumptions represent a more pessimistic scenario with weaker economic growth interrupted by a recession in the near term, slower economic growth in the long term, and relatively pessimistic levels for other parameters.

Actual economic data were available through the third quarter of 2018 at the time the assumptions for this report were set. The data indicated that economic activity peaked in the fourth quarter of 2007.[1] A severe recession followed, with a low point in the economic cycle reached in the second quarter of 2009 with gross domestic product (GDP) about 7 percent below the estimated sustainable trend level. The annual growth rate in real GDP has been positive in all years since then, but not as rapid as in most past recoveries.

The economy is projected to return to the assumed sustainable trend level of output within the first 10 years of the projection period under all three alternatives and to remain on that trend thereafter. However, the speed of the return varies by alternative. The economy is projected to fully return to its sustainable trend level of output in 2021 under the intermediate assumptions, four years earlier than in last year's report, mainly because economic growth in 2018 exceeded projections from last year's report. Under the low-cost assumptions, the economy is also projected to return to its sustainable trend level of output by 2021, one year earlier than in last year's report. Under the high-cost assumptions, the estimated sustainable trend level of output is lower, and actual output has already exceeded that level. However, due to the assumed recession, GDP is projected to drop to 2.5 percent below the sustainable trend level in the second half of 2020, and the subsequent recovery is assumed to return GDP to the sustainable trend level in 2028. Complete economic cycles have little effect on the long-range estimates of financial status, so the assumptions do not include cycles beyond the short-range period (2019 through 2028).

[1] See www.nber.org/cycles/cyclesmain.html.

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The key economic assumptions underlying the three sets of projections of the future financial status of the OASI and DI Trust Funds are discussed in the remainder of this section.

1. Productivity Assumptions

Total U.S. economy productivity is defined as the ratio of real GDP to hours worked by all workers.[1] The rate of change in total-economy productivity is a major determinant of the growth of average earnings. Over the last five complete economic cycles (1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, measured peak to peak), the annual increases in total-economy productivity averaged 2.65, 1.07, 1.41, 1.85, and 2.19 percent, respectively. For the period from 1969 to 2007, covering those last five complete economic cycles, the annual increase in total-economy productivity averaged 1.73 percent.

The assumed ultimate annual increases in total-economy productivity are 1.93, 1.63, and 1.33 percent for the low-cost, intermediate, and high-cost assumptions, respectively.[2] These rates of increase are 0.05 percentage point lower than in the 2018 report.

The average annual rate of change in total-economy productivity from 2007 (the end of the last complete economic cycle) to 2018 is estimated to be 1.01 percent. For the intermediate assumptions, the annual change in productivity is 1.82 percent for 2019, 2.17 percent for 2020, and declines to its ultimate value of 1.63 percent by 2023. For the low-cost assumptions, the annual change in productivity is 2.45 percent for 2019, then increases to 2.96 percent for 2020, and gradually approaches its ultimate value of 1.93 percent for 2023 and thereafter. For the high-cost assumptions, the annual change in productivity is 1.24 percent for 2019, 1.17 percent for 2020 due to the assumed recession, rebounds to 1.85 percent for 2021, and then averages 1.34 for 2022 through 2028, and stabilizes at its ultimate value of 1.33 thereafter.

2. Price Inflation Assumptions

Changes in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI) directly affect the OASDI program through the automatic

[1] Historical levels of real GDP are from the National Income and Product Accounts (NIPA) produced by the Bureau of Economic Analysis (BEA). Historical total hours worked are provided by the Bureau of Labor Statistics (BLS) and cover all U.S. Armed Forces and civilian employment.

[2] These assumptions are consistent with ultimate annual increases in private non-farm business productivity of 2.36, 2.00, and 1.63 percent. Compared to total-economy productivity, private non-farm business productivity is a more widely known concept that excludes the farm, government, non-profit institution, and private household sectors.

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cost-of-living benefit increases. Changes in the GDP price index (GDP deflator) affect the nominal levels of GDP, wages, self-employment income, average earnings, and taxable payroll.

The annual increases in the CPI averaged 4.91, 8.54, 5.30, 2.73, and 2.63 percent over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. The annual increases in the GDP deflator averaged 5.04, 7.54, 4.61, 2.08, and 2.49 percent for the respective economic cycles. For the period from 1969 to 2007, covering the last five complete economic cycles, the annual increases in the CPI and GDP deflator averaged 4.59 and 4.03 percent, respectively. The estimated average annual change from 2007 (the end of the last complete economic cycle) to 2018 is 1.74 percent for the CPI and 1.62 percent for the GDP deflator.

The assumed ultimate annual increases in the CPI are 3.20, 2.60, and 2.00 percent for the low-cost, intermediate, and high-cost assumptions, respectively.[1] These assumptions are unchanged from the 2018 report. For a given rate of growth in average real earnings, a higher price inflation rate results in faster nominal earnings and revenue growth immediately, while the resulting added growth in benefit levels occurs with a delay, causing an overall improvement in the actuarial balance. Similarly, a lower price inflation rate causes an overall decline in the actuarial balance.

The Federal Reserve Board's monetary policy changed in the 1980s toward more vigilance in preventing high inflation. Consistent with the Board's continued emphasis on containing inflation, as indicated by their current target for the Personal Consumption Expenditures (PCE) price index,[2] the Trustees lowered the assumed ultimate annual rate of increase in the CPI for the intermediate assumptions from 4.00 percent for the 1996 report to 2.80 percent for the 2004 through 2013 reports, to 2.70 percent for the 2014 and 2015 reports, and to 2.60 percent for the 2016 through 2019 reports.

For the intermediate assumptions, the annual change in the CPI is 1.83 percent for 2019, 2.63 percent for 2020, and reaches the ultimate growth rate of 2.60 percent for 2021 and later. For the low-cost assumptions,

[1] BLS produces a series called the Consumer Price Index Research Series Using Current Methods (CPI-U-RS) that approximates the measured rate of inflation over the 1978-2018 period had the method currently used been in effect since 1978. BLS does not revise the CPI values published in earlier years, for which different methods were used. These CPI published values are shown in table V.B1. The Trustees use an adjusted CPI series based on the CPI-U-RS when setting the ultimate price inflation assumption because it provides a time series that is consistent with the current method for computing the CPI.

[2] The Trustees' assumed ultimate annual growth rate for the GDP deflator of 2.25 percent is based on an assumed 2.30 percent annual growth rate for the PCE price index. The Trustees' assumption takes into account the Federal Open Market Committee target, as well as the potential for inflationary shocks during the 2028-2093 projection period.

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the annual change in the CPI is 2.40 percent for 2019, increases to 3.23 percent for 2020, and reaches its ultimate annual growth rate of 3.20 percent for 2021 and later. For the high-cost assumptions, the annual rate of change in the CPI is 1.27 percent for 2019, increases to 2.02 percent for 2020, and reaches its ultimate annual change of 2.00 percent for 2021 and later.

The annual increase in the GDP deflator differs from the annual increase in the CPI because the two indices are constructed using different computational methods and coverage. The difference between the rate of change in the CPI and the rate of change in the GDP deflator is called the price differential in this report. For the period including 1969 through 2007, covering the last five complete economic cycles, the average annual price differential was 0.57 percentage point. From 2007 (the end of the last complete economic cycle) to 2018, the average annual price differential is estimated to be 0.14 percentage point.

The assumed ultimate price differentials are 0.25, 0.35, and 0.45 percentage point for the low-cost, intermediate, and high-cost alternatives, respectively. Varying the ultimate projected price differential across alternatives recognizes the historical variation in this measure. Accordingly, the assumed ultimate annual increases in the GDP deflator are 2.95 (3.20 less 0.25), 2.25 (2.60 less 0.35), and 1.55 (2.00 less 0.45) percent for the low-cost, intermediate, and high-cost alternatives, respectively. The ultimate price differentials for the three alternatives are 0.05 percentage point lower than in the 2018 report.

The price differential was 0.21 percentage point in 2017, is estimated to be 0.36 in 2018, and is assumed to be -0.17 for 2019. The negative price differential assumed for 2019 primarily reflects a recent decline in oil prices. Changes in oil prices affect the CPI much more than the GDP deflator because oil represents a much larger share of U.S. consumption than of U.S. production. For 2020 and later, oil prices are assumed to grow at a relatively stable rate. For the intermediate assumptions, the price differential is 0.30 percentage point for 2020 and 0.35 for 2021 and later.

3. Average Earnings Assumptions

The average level of nominal earnings in OASDI covered employment for each year has a direct effect on the size of the taxable payroll and on the future level of average benefits. In addition, under the automatic adjustment provisions in the law, growth in the average wage in the U.S. economy directly affects certain parameters used in the OASDI benefit formulas as well as the contribution and benefit base, the exempt amounts under the

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retirement earnings test, the amount of earnings required for a quarter of coverage, and in certain circumstances, the automatic cost-of-living benefit increases.

Projected growth rates in average covered earnings are derived from projections of the most inclusive measure, average U.S. earnings. Average U.S. earnings is defined as the ratio of the sum of total U.S. wages and net proprietors' income to the sum of total U.S. civilian employment and Armed Forces. The growth rate in average U.S. earnings for any period is equal to the combined growth rates for total U.S. economy productivity, average hours worked, the ratio of earnings to total labor compensation (which includes fringe benefits), the ratio of total labor compensation to GDP, and the GDP deflator.

The average annual change in average hours worked was -0.26 percent over the last five complete economic cycles covering the period from 1969 to 2007. The annual change in average hours worked averaged -0.87, -0.54, -0.10, 0.10, and -0.50 percent over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. From 2007 (the end of the last complete economic cycle) to 2018, the average annual change in average hours worked is estimated to be 0.00 percent.

The assumed ultimate annual rates of change for average hours worked are 0.05, -0.05, and -0.15 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These values are unchanged from the 2018 report.

The average annual change in the ratio of earnings to total labor compensation was -0.20 percent from 1969 to 2007. Most of this decrease was due to the relative increase in the cost of employer-sponsored group health insurance for wage workers. Assuming that the level of total employee compensation is not affected by the amount of employer-sponsored group health insurance, any increase or decrease in the cost of employer-sponsored group health insurance leads to a commensurate decrease or increase in other components of employee compensation, including wages. Projections of future ratios of earnings to total labor compensation follow this principle. The Trustees assume that the total amount of future employer-sponsored group health insurance premiums will increase more slowly than in the past due to provisions of the Affordable Care Act of 2010, as described in the 2010 report. Data from BEA indicate that the other significant component of nonwage employee compensation is employer contributions to retirement plans. This component is assumed to grow faster than employee compensation in the future as life expectancy and potential time in retirement increase.

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The average annual rates of change in the ratio of wages to employee compensation from 2028 to 2093 are about 0.04, -0.06, and -0.16 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These assumed rates are about 0.02 percentage point higher (less negative) than those assumed for the 2018 report. Under the intermediate assumptions, the ratio of wages to employee compensation declines from 0.814 for 2018 to 0.780 for 2093.

Because earnings and compensation are the same for self-employed workers, the ratio of earnings to total labor compensation includes self-employment income both in the numerator and in the denominator. As a result, the rate of decline in the ratio of earnings to total labor compensation (which, under the intermediate assumptions, averages 0.05 percent from 2028 to 2093) is less than the rate of decline in the ratio of wages to employee compensation.

The ratio of total labor compensation (i.e., employee compensation and net proprietors' income) to GDP varies over the economic cycle and with changes in the relative sizes of different sectors of the economy. Over the last five economic cycles from 1969 to 2007, this ratio has averaged 0.627. The ratio declined from 0.649 for 2001 to 0.602 in 2009, increased to 0.612 in 2012, and is 0.611 in 2017. This ratio is assumed to rise as the economy recovers, reaching a level of 0.632 for 2028. For years after 2028, relative sizes of different sectors of the economy are assumed to remain about constant,[1] and therefore the ratio of total labor compensation to GDP remains at about the 2028 level for each set of assumptions. The ultimate level of this ratio is 0.001 higher than in last year's report due to an upward revision of proprietors' income in the NIPA.[2]

The projected average annual growth rate in average nominal U.S. earnings from 2028 to 2093 is about 3.81 percent for the intermediate assumptions. This growth rate reflects the average annual growth rate of approximately -0.05 percent for the ratio of earnings to total labor compensation, and also reflects the assumed ultimate annual growth rates of 1.63 percent for productivity, -0.05 percent for average hours worked, and 2.25 percent for the GDP deflator. Similarly, the projected average annual growth rates in average nominal U.S. earnings are 5.03 percent for the low-cost assumptions and 2.61 percent for the high-cost assumptions.

[1] However, employment in the uniformed military sector has declined in size over the last 40 years, and is assumed to remain at its 2018 level throughout the 75-year projection period.

[2] In July 2018, BEA released a comprehensive revision to NIPA. Under the revision, BEA increased the estimate of the amount of proprietors' income that goes unreported for tax purposes. Thus, the estimated ratio of reported income to GDP is unchanged from last year's report.

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Over long periods, the average annual growth rate in the average wage in OASDI covered employment (henceforth the "average covered wage") is expected to be very close to the average annual growth rate in average U.S. earnings. The projected average annual growth rates in the average covered wage from 2028 to 2093 are 5.04, 3.81, and 2.60 percent for the low-cost, intermediate, and high-cost assumptions, respectively. The estimated annual rate of change in the average covered wage is 2.98 percent for 2018. For the intermediate assumptions, as the economy continues to recover, the annual rate of change in the average covered wage averages 4.23 percent from 2018 to 2028. Thereafter, the average annual rate of change in the average covered wage is 3.81 percent.

4. Assumed Real-Wage Differential

The real increase in the average covered wage has traditionally been expressed in the form of a real-wage differential—the annual percentage change in the average covered wage minus the annual percentage change in the CPI. For the period from 1969 to 2007, covering the last five complete economic cycles, the real-wage differential averaged 0.80 percentage point, the result of averages of 1.02, 0.04, 0.44, 1.47, and 0.83 percentage points over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively.

For the years 2029-93, the projected average annual real-wage differentials for OASDI covered employment are 1.84, 1.21, and 0.60 percentage points for the low-cost, intermediate, and high-cost assumptions, respectively. The rounded average annual real-wage differentials are 0.02, 0.01, and 0.02 percentage point higher than in the 2018 report.

The estimated real-wage differential averaged 0.56 percentage point for 2008 through 2018 (the years since the peak of the last complete economic cycle). The real-wage differential increased from 0.05 percentage point in 2016 to 1.19 percentage points in 2017, an increase that reflects faster growth in GDP and productivity. For the intermediate assumptions, the real-wage differential is projected to rise from 0.40 in 2018 to 2.19 in 2019 before reaching its long-run average of 1.21 percentage points for 2029 through 2093. For the low-cost assumptions, the real-wage differential is 2.96 percentage points for 2019, increases to 3.29 percentage points in 2020, and reaches its long-run average of 1.84 percentage points for 2029 through 2093. For the high-cost assumptions, the real-wage differential is 1.42 percentage points for 2019, drops to -1.02 percentage points in 2020 due to the assumed recession, and rises to 1.59 percentage points in 2022 before gradually declining to its long-run average of 0.60 percentage point for 2029 through 2093.

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Table V.B1.—Principal Economic Assumptions

Calendar year	Annual percentage change[a] in— Productivity (Total U.S. economy)	Earnings as a percent of total labor compensation	Average hours worked	GDP price index	Average annual wage in covered employment	Consumer Price Index	Real-wage differential[b]
Historical data:							
5-year periods:							
1960 to 1965 . . .	3.28	-0.18	0.15	1.36	3.22	1.24	1.98
1965 to 1970 . . .	2.06	-.30	-.68	4.02	5.84	4.23	1.61
1970 to 1975 . . .	2.08	-.49	-.88	6.61	6.58	6.76	-.22
1975 to 1980 . . .	.95	-.33	-.17	7.21	8.89	8.91	-.04
1980 to 1985 . . .	1.74	-.36	.01	5.24	6.52	5.22	1.29
1985 to 1990 . . .	1.34	-.20	-.06	3.14	4.79	3.83	.96
1990 to 1995 . . .	1.31	-.11	.33	2.45	3.54	3.03	.51
1995 to 2000 . . .	2.32	.28	.14	1.67	5.31	2.43	2.88
2000 to 2005 . . .	2.66	-.38	-.79	2.29	2.69	2.49	.20
2005 to 2010 . . .	1.76	-.02	-.47	1.92	2.51	2.30	.22
2010 to 2015 . . .	.49	.15	.37	1.74	2.93	1.61	1.32
Economic cycles:[c]							
1969 to 1973 . . .	2.65	-.34	-.87	5.04	5.93	4.91	1.02
1973 to 1979 . . .	1.07	-.43	-.54	7.54	8.58	8.54	.04
1979 to 1990 . . .	1.41	-.29	-.10	4.61	5.78	5.30	.44
1990 to 2001 . . .	1.85	.05	.10	2.08	4.19	2.73	1.47
2001 to 2007 . . .	2.19	-.18	-.50	2.49	3.45	2.63	.83
2007 to 2018 . . .	1.01	.05	[d]	1.62	2.30	1.74	.56
Single years:							
2008	1.07	-.22	-.75	1.91	2.42	4.09	-1.66
2009	3.12	-.57	-1.86	.78	-1.56	-.67	-.89
2010	2.59	.21	.55	1.17	2.59	2.07	.53
2011	.04	.32	.94	2.08	3.14	3.56	-.41
2012	.48	.47	-.04	1.92	3.36	2.10	1.26
2013	.60	-.33	.24	1.77	1.20	1.37	-.17
2014	.56	.26	.27	1.88	3.57	1.50	2.07
2015	.76	.03	.43	1.03	3.42	-.41	3.83
2016	.25	.10	-.39	1.09	1.03	.98	.05
2017	.86	.10	.11	1.92	3.32	2.13	1.19
2018[e]	.82	.17	.55	2.22	2.98	2.58	.40
Intermediate:							
2019	1.82	.01	-.04	2.00	4.02	1.83	2.19
2020	2.17	-.01	-.35	2.33	4.71	2.63	2.08
2021	1.88	.02	-.21	2.25	4.45	2.60	1.85
2022	1.66	.02	-.08	2.25	4.21	2.60	1.61
2023	1.63	-.06	-.05	2.25	4.09	2.60	1.49
2024	1.63	-.06	-.05	2.25	4.15	2.60	1.55
2025	1.63	-.04	-.05	2.25	4.21	2.60	1.61
2026	1.63	-.04	-.05	2.25	4.25	2.60	1.65
2027	1.63	-.04	-.05	2.25	4.26	2.60	1.66
2028	1.63	-.04	-.05	2.25	4.01	2.60	1.41
2028 to 2093 . . .	1.63	-.05	-.05	2.25	3.81	2.60	1.21

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Table V.B1.—Principal Economic Assumptions (Cont.)

Calendar year	Annual percentage change[a] in— Productivity (Total U.S. economy)	Earnings as a percent of total labor compensation	Average hours worked	GDP price index	Average annual wage in covered employment	Consumer Price Index	Real-wage differential[b]
Low-cost:							
2019	2.45	0.02	0.04	2.43	5.36	2.40	2.96
2020	2.96	[d]	-.25	2.97	6.52	3.23	3.29
2021	2.41	.05	-.11	2.95	5.99	3.20	2.79
2022	1.99	.05	.02	2.95	5.47	3.20	2.27
2023	1.93	-.02	.05	2.95	5.26	3.20	2.06
2024	1.93	[d]	.05	2.95	5.28	3.20	2.08
2025	1.93	.02	.05	2.95	5.35	3.20	2.15
2026	1.93	.03	.05	2.95	5.42	3.20	2.22
2027	1.93	.04	.05	2.95	5.46	3.20	2.26
2028	1.93	.04	.05	2.95	5.25	3.20	2.05
2028 to 2093	1.93	.03	.05	2.95	5.04	3.20	1.84
High-cost:							
2019	1.24	[d]	-.14	1.54	2.69	1.27	1.42
2020	1.17	-.02	-1.04	1.69	1.00	2.02	-1.02
2021	1.85	.01	-.36	1.55	2.79	2.00	.79
2022	1.43	-.02	-.09	1.55	3.59	2.00	1.59
2023	1.41	-.11	-.06	1.55	3.52	2.00	1.52
2024	1.38	-.11	-.05	1.55	3.49	2.00	1.49
2025	1.33	-.11	-.05	1.55	3.38	2.00	1.38
2026	1.32	-.11	-.05	1.55	3.28	2.00	1.28
2027	1.30	-.12	-.05	1.55	3.24	2.00	1.24
2028	1.30	-.13	-.08	1.55	2.90	2.00	.90
2028 to 2093	1.33	-.13	-.15	1.55	2.60	2.00	.60

[a] For rows with a single year listed, the value is the annual percentage change from the prior year. For rows with a range of years listed, the value is the compound average annual percentage change.

[b] For rows with a single year listed, the value is the annual percentage change in the average annual wage in covered employment less the annual percentage change in the Consumer Price Index. For rows with a range of years listed, the value is the average of annual values of the real wage differential, beginning with the year following the first year of the range. Values are rounded after all computations.

[c] Economic cycles are shown from peak to peak, except for the last cycle, which is not yet complete.

[d] Greater than -0.005 and less than 0.005.

[e] Historical data are not available for the full year. Estimated values vary slightly by alternative and are shown for the intermediate assumptions.

5. Labor Force and Unemployment Projections

The model used by the Office of the Chief Actuary projects the civilian labor force by age, sex, marital status, and presence of children. Projections of the labor force participation rates reflect changes in disability prevalence, educational attainment, the average level of Social Security retirement benefits, the state of the economy, and the change in life expectancy. The projections also include a "cohort effect," which reflects an upward trend in female participation rates across cohorts born through 1948.

The annual rate of growth in the size of the labor force decreased from an average of about 2.6 percent during the 1969-73 economic cycle and 2.7 percent during the 1973-79 cycle to 1.7 percent during the 1979-90 cycle,

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1.2 percent during the 1990-2001 cycle, and 1.1 percent during the 2001-07 cycle. Further slowing of labor force growth is expected to follow from a substantial slowing of growth in the working age population in the future—a consequence of the baby-boom generation reaching retirement ages and succeeding lower-birth-rate cohorts reaching working ages. Under the intermediate assumptions, the labor force is projected to increase by an average of 0.8 percent per year from 2018 to 2028 and 0.4 percent per year over the remainder of the 75-year projection period.

Labor force participation rates are projected with a model that uses demographic and economic assumptions specific to each alternative. More optimistic economic assumptions in the low-cost alternative are consistent with higher labor force participation rates, while demographic assumptions in the low-cost alternative (such as slower improvement in longevity) are consistent with lower labor force participation rates. These economic and demographic influences have largely offsetting effects. Therefore, the projected labor force participation rates do not vary substantially across alternatives.

Historically, labor force participation rates reflect trends in demographics and pensions. Between the mid-1960s and the mid-1980s, labor force participation rates at ages 50 and over declined for males but were fairly stable for females. During this period, the baby-boom generation reached working age and more women entered the labor force. This increasing supply of labor allowed employers to offer attractive early retirement options. Between the mid-1980s and the mid-1990s, participation rates at ages 55 and older roughly stabilized for males and increased for females. Since the mid-1990s, however, participation rates for both sexes at ages 50 and over have generally risen.

Many economic and demographic factors, including longevity, health, disability prevalence, the business cycle, incentives for retirement in Social Security and private pensions, education, and marriage patterns, will influence future labor force participation rates. The Office of the Chief Actuary models some of these factors explicitly. To model the effects of other factors related to increases in life expectancy, projected participation rates are adjusted upward for mid-career and older ages to reflect projected increases in life expectancy. For the intermediate projections, this adjustment increases the total labor force by 2.8 percent for 2093.

For men age 16 and over, the projected age-adjusted labor force participation rates[1] for 2093 are 73.3, 73.3, and 73.0 percent for the low-cost, intermedi-

[1] The Office of the Chief Actuary adjusts the labor force participation rates to the 2011 age distribution of the civilian noninstitutional U.S. population.

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ate, and high-cost assumptions, respectively. The low-cost assumptions result in a larger working-age population and a larger labor force when compared to the intermediate assumptions, but a slightly lower labor force participation rate for men. This occurs because the low-cost assumptions include shorter life expectancies and relatively higher numbers of never-married individuals in the population. Shorter life expectancies tend to reduce work at older ages, while labor force participation rates tend to be lower for never-married men and higher for never-married women compared to their married counterparts.[1] For women age 16 and over, the projected age-adjusted labor force participation rates for 2093 are 62.3, 61.7, and 60.8 percent for the low-cost, intermediate, and high-cost assumptions, respectively.

The age-adjusted rates for 2093 are higher under all three alternatives than the age-adjusted rates for 2017 of 70.7 percent for men and 58.5 percent for women (based on actual age-specific rates published by the Bureau of Labor Statistics), primarily due to the Trustees' projected increases in life expectancy.

The total civilian unemployment rates are presented in table V.B2. For years through 2028, the table presents total civilian rates without adjustment for the changing age-sex distribution of the population. For years after 2028, the table presents age-sex-adjusted rates, using the age-sex distribution of the 2011 civilian labor force. Age-sex-adjusted rates allow for more meaningful comparisons across longer time periods.

The total civilian unemployment rate reflects the projected levels of unemployment for various age-sex groups of the population. Each group's unemployment rate is projected in relation to changes in the economic cycle, as measured by the ratio of actual to potential GDP.[2] For each alternative, the total civilian unemployment rate moves toward the ultimate assumed rate as the economy moves toward the long-range sustainable growth path.

The assumed ultimate age-sex-adjusted unemployment rates are 4.5, 5.5, and 6.5 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These values are unchanged from the 2018 report. Improvements in labor market conditions will eventually draw more nonparticipants back into the labor force and unemployment rate will increase from an estimated 3.9 percent for 2018 to the assumed 5.5 percent for 2023 under the

[1] The labor force participation rate under the high-cost assumptions is also lower than under the intermediate assumptions because life expectancy has a non-linear effect on labor force participation rates in the Office of the Chief Actuary's model.

[2] Potential GDP is the level of GDP assuming the economy is operating at the underlying sustainable trend rate of growth.

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intermediate assumptions. Under the low-cost assumptions, the ultimate unemployment rate is reached in 2022.[1] Under the high-cost assumptions, the ultimate unemployment rate is reached in 2025.

6. Gross Domestic Product Projections

The value of real GDP equals the product of three components: (1) average weekly total employment,[2] (2) productivity, and (3) average hours worked per week. Consequently, the growth rate in real GDP is approximately equal to the sum of the growth rates for total employment, productivity, and average hours worked. For the period from 1969 to 2007, which covers the last five complete economic cycles, the average growth rate in real GDP was 3.1 percent. This average growth rate approximately equals the sum of the average growth rates of 1.6 percent for total employment, 1.7 percent for productivity, and -0.3 percent for average hours worked. The real GDP for 2017 was 15.5 percent above the 2007 level. The estimated real GDP growth from 2017 to 2018 is 2.9 percent.

For the intermediate assumptions, the average annual growth in real GDP is 2.3 percent from 2018 to 2028, the approximate sum of component growth rates of 0.6 percent for total employment, 1.7 percent for productivity, and -0.1 percent for average hours worked. The projected average annual growth in real GDP of 2.3 percent for this period is approximately 0.1 percentage point higher than the underlying sustainable trend rate. This growth of 0.1 percentage point above trend reflects a relatively rapid increase in employment and total economy productivity. After 2028, the assumptions do not explicitly reflect economic cycles. The projected annual growth rate in real GDP combines the projected growth rates for total employment, total U.S. economy productivity, and average hours worked. After 2028, the annual growth in real GDP averages 2.0 percent, based on the projected average annual growth rate of 0.4 percent for total employment and the assumed ultimate growth rates of 1.63 percent for productivity and -0.05 percent for average hours worked. The projected growth rate of real GDP is slower than the past average growth rate mainly because the working-age population is expected to grow more slowly than in the past.

For the low-cost assumptions, the annual growth in real GDP averages 3.0 percent over the decade ending in 2028. The relatively fast growth is due mostly to high assumed rates of growth for employment and worker produc-

[1] The assumed ultimate unemployment rate is an age-sex-adjusted rate.

[2] Total employment is the sum of the U.S. Armed Forces and total civilian employment, which depends on the total civilian labor force and unemployment rate.

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tivity. For the high-cost assumptions, the annual growth in real GDP averages 1.5 percent for the decade ending in 2028.

7. Interest Rates

Table V.B2 presents average annual nominal and real interest rates for newly issued trust fund securities. The nominal rate is the average of the nominal interest rates for special U.S. Government obligations issuable to the trust funds in each of the 12 months of the year. Interest for these securities is generally compounded semiannually. The real interest rate is defined as the annual yield rate for investments in these securities divided by the annual rate of growth in the CPI for the first year after issuance. The real rate shown for each year reflects the actual realized (historical) or expected (future) real yield on securities issuable in the prior year.

To develop a reasonable range of assumed ultimate future real interest rates for the three alternatives, the Office of the Chief Actuary examined historical experience for the last five complete economic cycles. For the period from 1969 to 2007, the real interest rate averaged 2.9 percent per year. The real interest rates averaged 1.6, -1.0, 5.1, 4.1, and 2.0 percent per year over the economic cycles 1969-73, 1973-79, 1979-90, 1990-2001, and 2001-07, respectively. The assumed ultimate real interest rates are 3.0 percent, 2.5 percent, and 2.0 percent for the low-cost, intermediate, and high-cost assumptions, respectively. These rates are 0.2 percentage point lower than in the 2018 report.

The actual average annual nominal interest rate was approximately 2.3 percent for 2017, which means that securities newly issued in 2017 would yield 2.3 percent if held one year. Estimated average prices rose from 2017 to 2018 by approximately 2.6 percent. The annual real interest rate for 2018 is -0.2 percent, the approximate difference between the nominal interest rate and the rate of price increase. For the 10-year short-range projection period, projected nominal interest rates depend on changes in the economic cycle and in the CPI. When combined with the ultimate CPI assumptions of 3.2, 2.6, and 2.0 percent, the assumed ultimate real interest rates produce ultimate nominal interest rates of 6.2 percent for the low-cost assumptions, 5.1 percent for the intermediate assumptions, and 4.0 percent for the high-cost assumptions. These nominal rates for newly issued trust fund securities reach their ultimate levels by 2028, the end of the short-range period.

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Table V.B2.—Additional Economic Factors

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in— Labor force[c]	Total employment[d]	Real GDP[e]	Average annual interest rate Nominal[f]	Real[g]
Historical data:						
5-year periods:						
1960 to 1965	5.5	1.3	1.6	5.1	4.0	2.5
1965 to 1970	3.9	2.2	2.1	3.5	5.9	1.0
1970 to 1975	6.1	2.5	1.5	2.7	6.7	[h]
1975 to 1980	6.8	2.7	2.9	3.7	8.5	-.9
1980 to 1985	8.3	1.5	1.5	3.3	12.1	6.9
1985 to 1990	5.9	1.7	2.0	3.3	8.5	5.1
1990 to 1995	6.6	1.0	.9	2.6	7.0	4.3
1995 to 2000	4.6	1.5	1.8	4.3	6.2	3.9
2000 to 2005	5.4	.9	.7	2.6	4.6	2.4
2005 to 2010	6.8	.6	-.4	.9	3.8	1.8
2010 to 2015	7.2	.4	1.3	2.2	2.0	.5
Economic cycles:[i]						
1969 to 1973	5.3	2.6	1.8	3.6	6.5	1.6
1973 to 1979	6.8	2.7	2.4	3.0	7.7	-1.0
1979 to 1990	7.1	1.7	1.7	3.0	10.3	5.1
1990 to 2001	5.5	1.2	1.2	3.2	6.5	4.1
2001 to 2007	5.3	1.1	1.1	2.8	4.5	2.0
2007 to 2018	6.7	.5	.6	1.6	2.4	.8
Single years:						
2008	5.8	.8	-.4	-.1	3.6	.6
2009	9.3	-.1	-3.7	-2.5	2.9	4.4
2010	9.6	-.2	-.6	2.6	2.8	.9
2011	8.9	-.2	.6	1.6	2.4	-.7
2012	8.1	.9	1.8	2.2	1.5	.3
2013	7.4	.3	1.0	1.8	1.9	.1
2014	6.2	.3	1.6	2.5	2.3	.4
2015	5.3	.8	1.7	2.9	2.0	2.7
2016	4.9	1.3	1.7	1.6	1.8	1.0
2017	4.4	.7	1.2	2.2	2.3	-.3
2018[j]	3.9	1.1	1.5	2.9	2.9	-.2

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Table V.B2.—Additional Economic Factors (Cont.)

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in—			Average annual interest rate	
		Labor force[c]	Total employment[d]	Real GDP[e]	Nominal[f]	Real[g]
Intermediate:						
2019	4.1	1.1	1.0	2.8	3.3	1.0
2020	4.5	1.0	.6	2.4	3.5	.7
2021	4.9	1.0	.6	2.3	3.7	.9
2022	5.3	1.0	.6	2.2	4.0	1.1
2023	5.5	.9	.7	2.2	4.3	1.4
2024	5.5	.7	.7	2.3	4.6	1.7
2025	5.5	.6	.6	2.2	4.8	2.0
2026	5.5	.5	.5	2.1	4.9	2.2
2027	5.5	.5	.5	2.1	5.0	2.3
2028	5.5	.5	.5	2.1	5.1	2.4
2030	5.5	.4	.4	2.0	5.1	2.5
2035	5.5	.4	.4	2.0	5.1	2.5
2040	5.5	.4	.4	2.0	5.1	2.5
2045	5.5	.5	.5	2.1	5.1	2.5
2050	5.5	.5	.5	2.1	5.1	2.5
2055	5.5	.5	.5	2.1	5.1	2.5
2060	5.5	.4	.4	2.0	5.1	2.5
2065	5.5	.4	.4	2.0	5.1	2.5
2070	5.5	.4	.4	2.0	5.1	2.5
2075	5.5	.5	.5	2.0	5.1	2.5
2080	5.5	.5	.5	2.1	5.1	2.5
2085	5.5	.5	.5	2.1	5.1	2.5
2090	5.5	.4	.4	2.0	5.1	2.5
2095	5.5	.4	.4	2.0	5.1	2.5
Low-cost:						
2019	3.8	1.2	1.3	3.8	4.2	.5
2020	4.0	1.2	1.0	3.7	4.6	.9
2021	4.2	1.3	1.0	3.4	4.8	1.4
2022	4.5	1.1	.8	2.9	5.1	1.6
2023	4.5	1.0	.9	2.9	5.4	1.9
2024	4.5	.9	.9	2.9	5.6	2.2
2025	4.6	.9	.9	2.9	5.9	2.4
2026	4.6	.7	.7	2.7	6.0	2.7
2027	4.6	.6	.6	2.6	6.1	2.8
2028	4.5	.6	.6	2.6	6.2	2.9
2030	4.5	.5	.5	2.5	6.2	3.0
2035	4.5	.5	.5	2.5	6.2	3.0
2040	4.5	.6	.6	2.6	6.2	3.0
2045	4.5	.8	.7	2.7	6.2	3.0
2050	4.5	.8	.8	2.8	6.2	3.0
2055	4.5	.7	.7	2.7	6.2	3.0
2060	4.5	.6	.7	2.6	6.2	3.0
2065	4.5	.6	.6	2.6	6.2	3.0
2070	4.5	.7	.7	2.7	6.2	3.0
2075	4.5	.8	.8	2.8	6.2	3.0
2080	4.5	.8	.8	2.8	6.2	3.0
2085	4.5	.8	.8	2.8	6.2	3.0
2090	4.5	.7	.7	2.7	6.2	3.0
2095	4.5	.7	.7	2.7	6.2	3.0

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Table V.B2.—Additional Economic Factors (Cont.)

Calendar year	Average annual unemployment rate[a]	Annual percentage change[b] in— Labor force[c]	Total employment[d]	Real GDP[e]	Average annual interest rate Nominal[f]	Real[g]
High-cost:						
2019	4.3	1.0	0.6	1.7	2.3	1.6
2020	6.1	1.6	-.4	-.3	1.4	.3
2021	7.2	.5	-.6	.9	2.4	-.6
2022	7.0	.3	.5	1.8	3.2	.4
2023	6.8	.3	.5	1.8	3.5	1.2
2024	6.6	.3	.5	1.8	3.7	1.5
2025	6.5	.5	.6	1.9	3.9	1.7
2026	6.5	.7	.6	1.9	4.0	1.9
2027	6.5	.6	.6	1.8	4.0	2.0
2028	6.5	.5	.5	1.7	4.0	2.0
2030	6.5	.3	.3	1.5	4.0	2.0
2035	6.5	.3	.3	1.5	4.0	2.0
2040	6.5	.3	.3	1.5	4.0	2.0
2045	6.5	.3	.2	1.4	4.0	2.0
2050	6.5	.3	.3	1.4	4.0	2.0
2055	6.5	.2	.2	1.4	4.0	2.0
2060	6.5	.1	.1	1.3	4.0	2.0
2065	6.5	.1	.1	1.3	4.0	2.0
2070	6.5	.1	.1	1.3	4.0	2.0
2075	6.5	.1	.1	1.3	4.0	2.0
2080	6.5	.1	.1	1.3	4.0	2.0
2085	6.5	.1	.1	1.3	4.0	2.0
2090	6.5	.1	.1	1.3	4.0	2.0
2095	6.5	.1	.1	1.3	4.0	2.0

[a] The Office of the Chief Actuary adjusts the civilian unemployment rates for 2029 and later to the age-sex distribution of the civilian labor force in 2011. For years through 2028, the values are the total rates without adjustment for the changing age-sex distribution.

[b] For rows with a single year listed, the value is the annual percentage change from the prior year. For rows with a range of years listed, the value is the compounded average annual percentage change.

[c] The U.S. civilian labor force.

[d] Total U.S. military and civilian employment.

[e] The value of the total output of goods and services in 2012 dollars.

[f] The average of the nominal interest rates, compounded semiannually, for special public-debt obligations issuable to the trust funds in each of the 12 months of the year.

[g] The realized or expected annual real yield for each year on securities issuable in the prior year.

[h] Greater than -0.05 and less than 0.05 percent.

[i] Economic cycles are shown from peak to peak, except for the last cycle, which is not yet complete.

[j] Historical data are not available for the full year. Estimated values vary slightly by alternative and are shown for the intermediate assumptions.