THE LONG-RANGE DEMOGRAPHIC ASSUMPTIONS FOR THE 2022 TRUSTEES REPORT

OFFICE OF THE CHIEF ACTUARY
SOCIAL SECURITY ADMINISTRATION

June 2, 2022

PRINCIPAL DEMOGRAPHIC ASSUMPTIONS

OVERVIEW

SECTIONS

Overview

Each year the Board of Trustees of the Federal Old-Age and Survivors Insurance (OASI) and Disability Insurance (DI) Trust Funds provides an annual report to the Congress on the financial and actuarial status of the Old-Age, Survivors, and Disability Insurance (OASDI) program. The Office of the Chief Actuary (OCACT) produces projections of future cost and income based on three separate sets of long-range (75-year) assumptions for key demographic variables. The intermediate (alternative II) set of assumptions represents the Trustees' best estimate for future experience, while the low cost (alternative I) and high cost (alternative III) sets of assumptions are more and less favorable, respectively, from the perspective of program cost as a percent of taxable payroll. In addition, the intermediate assumptions serve as the central tendency for the stochastic projections presented in the OASDI annual report to the Board of Trustees (the "Trustees Report"). This memorandum presents the demographic assumptions used in the 2022 Trustees Report.

The 2021 Trustees Report, released on August 31, 2021, included the Trustees' best estimates of the effects of the pandemic and recession/recovery as of May 2021. The 2022 Trustees Report, released on June 2, 2022, includes the Trustees' best estimates of the effects of the pandemic and recession/recovery as of mid-February 2022. Developments since then have added to the uncertainty regarding the path of the pandemic and the economy. Given the extraordinary level of uncertainty about the magnitude and direction of long-term effects, the Trustees continue to assume that the pandemic and recession/recovery will have no effect on the individual long-range demographic assumptions for the 2022 Trustees Report. However, the Trustees did make several changes for the 2022 Trustees Report in the short-range (first 10-year) assumptions, as explained in more detail in the separate sections for fertility, mortality, and immigration.

The basic demographic assumptions are:

- The total fertility rate, along with the single-year-of-age birth rates,
- The annual rates of reduction in central death rates by broad age group (0 – 14, 15 – 49, 50 – 64, 65 – 84, and 85+) and cause of death (cardiovascular, cancer, violence and accidents, respiratory, dementia, and all other), and
- Immigration levels, by age and sex, of lawful permanent resident (LPR) new arrivals, LPR and citizen exits, adjustments of status, and other-than-LPR entrants; and other-than-LPR rates of exit.

For the 2022 Trustees Report, the long-range values for these basic assumptions were unchanged from those used in the 2021 Trustees Report.

The following table shows values for the long-range summary measures for the fertility, mortality, and immigration assumptions. Note that some of the values of the summary measures were affected by the incorporation of new data and their effects on the transition period.

Key Demographic Summary Measures for the Long-Range (75-year) Projection Period 2021 Trustees Report and 2022 Trustees Report									
	2021 Trustees Report Alternative			2022 Trustees Report Alternative			2022 Trustees Report Less 2021 Trustees Report		
	I	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
Average total fertility rate for the last 65 years of the 75-year projection period	2.19	1.99	1.69	2.19	1.99	1.69	0.00	0.00	0.00
Average annual percentage reduction in total age-sex-adjusted death rates for the last 65 years of the 75-year projection period	0.28	0.74	1.25	0.28	0.74	1.25	0.00	0.00	0.00
Average annual net LPR immigration (in thousands) for the last 65 years of the 75-year projection period	1,000	788	595	1,000	788	595	0	0	0
Average annual net other-than-LPR immigration (in thousands) for the last 65 years of the 75-year projection period	688	461	235	684	458	234	-4	-3	-1

Note: The ultimate total fertility rates of 2.00 for the intermediate assumptions, 2.20 for the low-cost assumptions, and 1.70 for the high-cost assumptions are fully reached for women of all ages in 2056.

In total, the demographic changes resulted in a decrease in the OASDI actuarial balance of about 0.06 percent of taxable payroll under the intermediate assumptions. More specifically:

- Law or policy changes related to the demographic assumptions (an assumed one-year delay in the scheduled re-implementation of the acceptance of new applicants to the Deferred Action for Childhood Arrivals, or DACA, program) has a negligible effect on the actuarial balance.
- Updating to using final 2020 fertility data from using the first three quarters of provisional data decreases the actuarial balance by about 0.01 percent of taxable payroll.
- Increasing the weights on the last two years of data for the regression used to calculate the starting death rates and starting rates of mortality improvement decreases the actuarial balance by about 0.02 percent of taxable payroll.
- Revising the path of LPR new arrival immigration for the COVID-19 pandemic to not decrease as much in 2020 and 2021 and to have the make-up in 2023 and 2024 instead of 2023 – 2025 decreases the actuarial balance by about 0.01 percent of taxable payroll.
- Updated data and implications for the transition to the ultimate values for LPR immigration decrease the actuarial balance by about 0.01 percent of taxable payroll.
- Other data updates and program changes decrease the actuarial balance by about 0.02 percent of taxable payroll.

The remainder of this memorandum provides details regarding the historical values and future values for each of the demographic assumptions, and the basis for the assumptions.

1. FERTILITY

ASSUMPTIONS FOR THE 2022 TRUSTEES REPORT
OFFICE OF THE CHIEF ACTUARY, SSA

TABLE OF CONTENTS PAGE

1.1 Summary

The ultimate total fertility rates (TFRs) assumed for the 2022 Trustees Report are 2.2, 2.0, and 1.7 children per woman for the low-cost, intermediate, and high-cost alternatives, respectively. These are the same ultimate TFRs used in the 2021 Trustees Report.

For the 2022 Trustees Report, the Office of the Chief Actuary continues using the cohort-based projection model implemented for the 2021 Trustees Report rather than the period-based model used in the 2020 and prior Trustees Reports. This newer model results in a much more extended transition to ultimate birth rates from the current low birth rates than the prior model. The ultimate TFRs are attained in 2056.

Final data for 2020 from the National Center for Health Statistics (NCHS) produce a TFR of 1.64. Although provisional rate data from NCHS for the first quarter of 2021 are around 5 percent lower than for the first quarter of 2020, second and third quarter state data (from the few states that have data available) indicate that the 2021 TFR will be slightly higher than the 2020 TFR. The Trustees assume the 2021 TFR will be 1.66 for the intermediate alternative.

In the 2021 Trustees Report, the Trustees projected a drop in birth rates for 2021 and 2022 due to the COVID-19 pandemic and that these low rates would be fully made up by increased rates in 2024 through 2026. However, given the available 2021 data thus far, the Trustees assume there will be no effect from the COVID-19 pandemic on annual fertility rates in either the near term or the long term for the 2022 Trustees Report.

There was a sharp drop in the historical TFR, from a level of 2.12 in 2007 to a level of 2.00 in 2009 and 1.85 in 2013. This drop was likely largely due to the persistent effects of the 2007-09 recession on employment opportunity. The TFR increased slightly to 1.86 in 2014, then decreased each year from 2015 through 2020, from 1.85 in 2015 to 1.64 in 2020. The decrease since 2014 may be partially due to lagging growth in average wages and "tempo" effects[1] as women are waiting to have children until older ages. The Trustees assume that the TFR will ultimately return to an average level of 2.0 by 2056, consistent with an ultimate completed cohort fertility rate of 2.0 for women reaching age 49 in that year and later. This assumption is consistent with the continued and persistent expectation among women of childbearing age that they will ultimately have more than two children on average (with the understanding that actual numbers of births typically fall slightly short of expectations). Compared to the intermediate path of the TFRs in the 2021 Trustees Report, the path of the TFRs in this year's report is higher in 2021 and 2022 and lower in 2024 through 2026, but extremely close all other years.

Removing COVID effects results in a negligible change in the long-range actuarial balance. Updated data and implications for the transition to the ultimate TFR result in a decrease in the long-range actuarial balance of about 0.01 percent of taxable payroll.

[1] Demographers refer to a temporary drop in the TFR due to a delay in childbearing to older ages as a tempo effect. For more information, see the discussion on "Tempo-adjusted total fertility rate" at: https://www.humanfertility.org/Docs/methods.pdf.

Note that TFRs can be considered on both a period basis (for a specified calendar year) and a completed cohort basis (for a cohort of women born in a specified year). The period TFR speaks to the birth rates of women at various ages in a given calendar year and is strongly influenced by economic and other factors affecting birth rates during that year. The completed cohort TFR answers the question: "how many children will women born in a given year have over their lifetime?" In the 2020 and prior Trustees Reports, the Trustees placed more emphasis on analysis of period TFRs. Beginning with the 2021 Trustees Report, with the change to a new cohort-based model, the Trustees' ultimate assumptions are for the completed cohort TFR, which is a more appropriate way to summarize an ultimate assumption. Note that in the long-term, as long as the distribution of birth rates by age of mother is assumed to stabilize, the period and cohort TFRs will eventually converge.

In addition to the overall level of the TFR, the distribution of birth rates by age of mother has implications for the size of the population. As in prior reports, the Trustees assume a continuation of the historical trend toward lower birth rates for women below age 20 and higher birth rates for women above age 30 through the transition to the ultimate period. The change to the cohort-based model reflects and extends these trends much more than in the 2020 Trustees Report.

1.2 Historical Experience

Past period TFRs in the United States are shown in table 1.1 and chart 1.1. The period TFR for a given year is defined as the average number of children that would be born to a woman if she were to survive the entire childbearing period and were to experience, at each age of her life, the birth rate[2] observed in that year. During the period 1917 through 1924, the period TFR was more than 3.0 children per woman. From 1924 through 1933, the TFR declined from 3.1 to 2.2 children per woman, and then remained level at 2.1 to 2.2 children per woman through 1940. After 1940, the TFR once again began to rise, reaching a peak of 3.7 in 1957 and stayed above 2.8 for the "baby boom" years of 1946 through 1965. This period of high fertility was followed by a period of declining fertility. The TFR fell to 1.7 in 1976. Beginning in 1977, the TFR remained fairly stable at 1.8 children per woman until 1987, when it started to increase, reaching 2.1 in 1990. Between 1990 and the start of the 2007-09 recession, the TFR remained fairly stable, fluctuating between 2.0 and 2.1. The TFR decreased from 2.12 in 2007 to 1.85 in 2013. The 1.86 TFR for 2014 represented the first increase in the TFR since 2007. However, the TFR decreased again each year from 2015 to 2020, reaching 1.64 in 2020. The 2020 TFR is now at a historical low. It is important to note that recent birth expectations of women are well above 2.0, as noted in the next section.

The increase in the TFR after 1976 was primarily due to increases in birth rates among women in their 30s. After dropping dramatically between 1960 and 1976, birth rates for women in their 20s remained quite stable between 1976 and 2007 (see chart 1.2). Because much of the decline in birth rates for women in their 20s was understood to represent a desire to defer births until women were in their 30s (i.e., the tempo effects mentioned above), the gradual increases in birth

[2] The ratio of: (1) the number of live births to mothers of a specified age, to (2) the midyear female population of that age.

rates for women in their 30s for 10 to 15 years after 1976 were expected. However, birth rates for women in their 30s continued to rise through 2007, partially due to advancements in infertility treatments.

1.3 Assumed Future Birth Rates

The Trustees do not expect cohort or period TFRs to return to the high levels experienced during the baby boom. Several changes in our society have occurred since the baby boom that have contributed to reducing birth rates. Some of these changes are:

- increased availability and use of birth control methods, including long-acting reversible contraceptives (LARCs),
- increased female participation in the labor force,
- increased postponement of family formation and childbearing among young women,
- increased prevalence of divorce,
- decreased death rates among children (requiring fewer births for a desired family size), and
- increased percentage of women choosing to remain childless (although this percentage has been trending down since the cohorts born in the mid-1950s).

The Trustees do not expect a significant reversal of these changes. In addition, a sustained TFR at the low levels experienced by certain other industrialized countries is unlikely due to economic, demographic, and cultural differences between the U.S. and those countries.

The Trustees assume an ultimate TFR of 2.00 for alternative II. The 2007 and 2011 Technical Panels both recommended an ultimate alternative II TFR assumption of 2.00, while the 2015 Technical Panel recommended an ultimate alternative II TFR assumption of 1.90. The 2019 Technical Panel recommended continued increases in births to older women throughout the 75-year projection period, resulting in lower period TFRs reaching 1.95 and completed cohort TFRs potentially closer to 2.00. They also recommended adopting a new projection framework using cohort TFRs and continued tempo effects as the drivers, and period TFRs as an outcome. The Trustees adopted this framework for the 2021 Trustees Report. The Congressional Budget Office adopted the 2015 Technical Panel's recommended TFR assumption of 1.90 for their 2016 projections but lowered this assumption to 1.85 for their 2021 projections, reaching the ultimate rate in 2029.[3] In the Census Bureau's 2017 National Population Projections, the projected TFR stays almost constant and is 1.83 in 2060.[4]

As shown in chart 1.2, the Trustees assume a continuation of the historical trend, which shows generally increasing birth rates for women age 30 and older, and generally decreasing rates for women below age 20. With the cohort-based model, birth rates for women at older ages reach ultimate values in later calendar years than those for women at younger ages, reflecting the deferral of births to older ages over time. The changing distribution of birth rates by age of woman has significant effects on population size, but these effects essentially stabilize after the age distribution of birth rates stabilizes.

[3] See https://www.cbo.gov/publication/57038#_idTextAnchor040.
[4] See https://www.census.gov/data-tools/demo/idb/#/trends?YR_ANIM=2021&menu=trendsViz&measures=TFR&FIPS_SINGLE=US&COUNTRY_YEAR=2060&FIPS=US.

Since the start of the 2007-09 recession, the age group that has had the steepest drop in fertility rates is 20-24. (See chart 1.2.) This drastic drop in birth rates for women aged 20-24 could be a sign of future tempo effects—an expected increase in birth rates at older ages for these cohorts. One cause of this drop could be the increased debt taken on by the millennial generation.

Examining data from other countries is useful in selecting a range of ultimate assumptions for the low-cost and high-cost alternatives. Historical TFRs during the period 1980-2019 that were reported to the Organisation for Economic Co-operation and Development (OECD) are shown for 24 countries in table 1.2. The TFRs for the most recent year shown in the table range from 1.2 for Spain to 2.2 for India. After India, the highest TFR is 2.1 for Mexico followed by 1.8 for France. Although the TFR in the industrialized countries has been observed at levels as low as the 1.2 to 1.5 range, the cultural and economic climate in the U.S. makes it highly unlikely that our TFR will remain below a level of 1.7 for any sustained period. Thus, the Trustees assume an ultimate TFR for the high-cost scenario of 1.7 children per woman. Using the range of past experience for the United States and other countries as a guide, the Trustees assume an ultimate TFR for the low-cost scenario of 2.2 children per woman. The ultimate period TFR is reached in 2056 for all alternatives. This is the same year as in the 2021 Trustees Report.

For the intermediate assumptions, the Trustees assume the TFR gradually increases from 2020 through the ultimate year of 2056, with more gradual increases in the TFR as the ultimate year approaches. For the low-cost and high-cost alternatives, the Trustees assume that the paths of the TFRs gradually grade away from the intermediate alternative path. Chart 1.3 shows the historical path of the TFR starting in 1917 and the projected paths of the TFRs for all three alternatives.

Examining the TFR by birth cohort is a useful tool in evaluating an ultimate assumption. As shown in chart 1.4, the cohort TFRs vary much less over time than the period TFRs shown in chart 1.3. Chart 1.4 also shows that the cohort TFR has been near or greater than 2.00 for all cohorts who have finished their childbearing years. The most recent cohorts that have just completed their childbearing years show an upward trend in their TFRs (see the dark purple line). The transition path for alternative II eventually comes back down to slightly below the ultimate assumption of 2.00, before rebounding back to 2.00. The dip below 2.00 for a few cohorts represents those that were significantly influenced by the effects of the Great Recession.

As mentioned above, reported birth expectations for women of childbearing age provide another measure to help assess trends in birth rates. NCHS conducts the National Survey of Family Growth (NSFG) to gather information about men[5] and women aged 15-44+.[6] Prior to the 1982 survey, NCHS only asked married women about birth expectations. However, beginning with the 1982 survey, NCHS asked all women about past and future expected births.[7] As shown in

[5] Men were not surveyed until the 2002 survey.
[6] For surveys prior to the 2015-17 survey, persons are aged 15-44 at the time of the sampling but may have had their 45th birthday by the interview date. Starting with the 2015-17 survey, interviewers surveyed men and women aged 15-49, with some attaining age 50 by the interview date.
[7] NCHS refers to the data collected prior to the 2006-10 survey as "Cycle x" where x = 3 for the 1982 survey and x = 6 for the 2002 survey as shown at http://www.cdc.gov/nchs/nsfg/nsfg_questionnaires.htm.

chart 1.5, past and future expected births in recent survey waves are well above 2.00. The consistency of recent birth expectations well above 2.00 strongly suggests that the current reduction in the TFR will not be permanent.

Table 1.1: Past and Projected Total Fertility Rates for the United States

Calendar Year			2021 TR	2022 TR		
1920			3.263	3.263		
1930			2.533	2.533		
1940			2.229	2.229		
1950			3.028	3.028		
1960			3.606	3.606		
1965			2.882	2.882		
1970			2.432	2.432		
1975			1.770	1.770		
1980			1.820	1.820		
1985			1.835	1.835		
1990			2.069	2.069		
1995			1.981	1.981		
2000			2.054	2.054		
2001			2.032	2.032		
2002			2.025	2.025		
2003			2.055	2.055		
2004			2.059	2.059		
2005			2.062	2.062		
2006			2.112	2.112		
2007			2.123	2.123		
2008			2.074	2.074		
2009			2.002	2.002		
2010			1.926	1.926		
2011			1.889	1.889		
2012			1.875	1.875		
2013			1.852	1.852		
2014			1.865	1.864		
2015			1.847	1.845		
2016			1.818	1.817		
2017			1.766	1.764		
2018			1.729	1.727		
2019			1.703	1.701		
2020			1.645 [1]	1.638		
	Alternative I		Alternative II		Alternative III	
	2021 TR	2022 TR	2021 TR	2022 TR	2021 TR	2022 TR
2021	1.615	1.709	1.538	1.662	1.428	1.599
2022	1.726	1.762	1.622	1.682	1.473	1.570
2023	1.834	1.809	1.708	1.703	1.528	1.552
2024	1.937	1.851	1.794	1.724	1.589	1.541
2025	1.973	1.891	1.815	1.745	1.590	1.538
2026	2.006	1.928	1.838	1.768	1.597	1.541
2027	1.973	1.963	1.795	1.793	1.541	1.549
2028	2.005	1.998	1.820	1.818	1.555	1.561
2029	2.036	2.031	1.845	1.843	1.572	1.576
2030	2.066	2.063	1.870	1.870	1.591	1.594
2031	2.080	2.078	1.881	1.880	1.596	1.598
2035	2.132	2.132	1.928	1.927	1.631	1.631
2040	2.178	2.178	1.976	1.976	1.677	1.676
2045	2.196	2.196	1.996	1.996	1.696	1.696
2050	2.200	2.199	2.000	2.000	1.700	1.700
2055	2.200	2.200	2.000	2.000	1.700	1.700
2060+	2.200	2.200	2.000	2.000	1.700	1.700

[1] Estimated, Intermediate Alternative

Social Security Administration
Office of the Chief Actuary
June 2, 2022

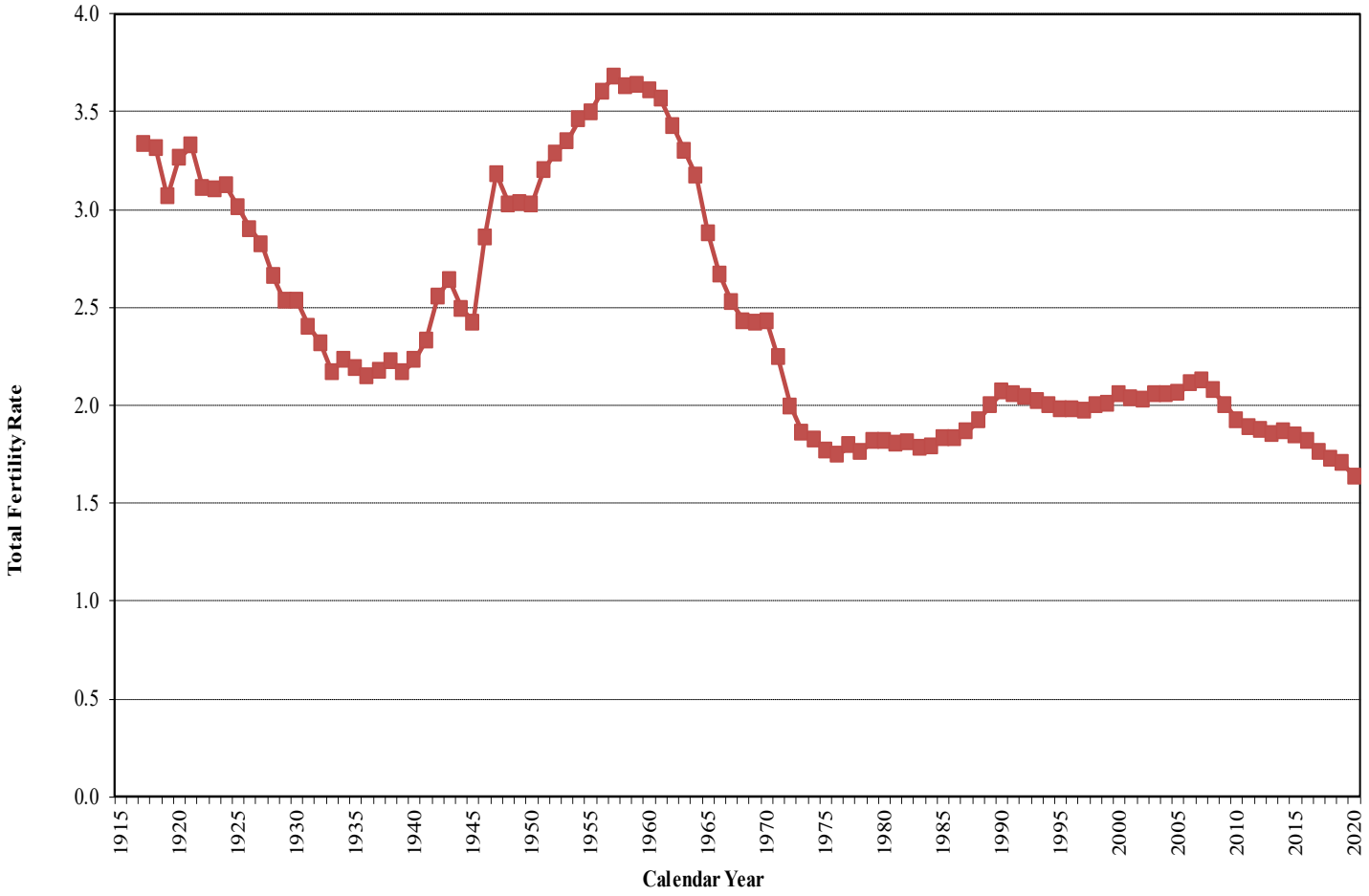
Table 1.2: Historical Total Fertility Rates, by Country
1980 – 2019

Country	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Most Recent TFR	Latest 10-Year Change
Australia	1.9	1.9	1.9	1.8	1.8	1.9	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.7	-0.3
Austria	1.7	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0.1
Belgium	1.7	1.5	1.6	1.6	1.6	1.7	1.8	1.8	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	-0.3
Canada	1.7	1.6	1.7	1.6	1.5	1.5	1.6	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	-0.2
China	2.6	2.7	2.3	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	0.1
Denmark	1.6	1.5	1.7	1.8	1.8	1.8	1.9	1.8	1.9	1.8	1.9	1.8	1.7	1.7	1.7	1.7	1.8	1.8	1.7	1.7	1.7	-0.1
Finland	1.6	1.6	1.8	1.8	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.6	1.5	1.4	1.4	1.4	-0.5
France	2.0	1.8	1.8	1.7	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	-0.2
Germany	1.6	1.4	1.5	1.3	1.4	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	1.5	1.5	0.2
Greece	2.2	1.7	1.4	1.3	1.3	1.3	1.4	1.4	1.5	1.5	1.5	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.3	1.3	-0.2
India	4.8	4.5	4.1	3.7	3.3	3.0	2.9	2.8	2.7	2.7	2.6	2.5	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.2	-0.5
Ireland	3.2	2.5	2.1	1.9	1.9	1.9	1.9	2.0	2.1	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	-0.4
Italy	1.7	1.5	1.4	1.2	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	-0.1
Japan	1.8	1.8	1.5	1.4	1.4	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4	1.4	1.4	0.0
Mexico	4.8	4.0	3.5	3.0	2.7	2.5	2.5	2.4	2.4	2.4	2.3	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1	-0.3
Netherlands	1.6	1.5	1.6	1.5	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6	-0.2
New Zealand	2.0	1.9	2.2	2.0	2.0	2.0	2.0	2.2	2.2	2.1	2.2	2.1	2.1	2.0	1.9	2.0	1.9	1.8	1.7	1.7	1.7	-0.4
Norway	1.7	1.7	1.9	1.9	1.9	1.8	1.9	1.9	2.0	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	1.5	-0.5
Portugal	2.2	1.7	1.6	1.4	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.2	1.3	1.4	1.4	1.4	1.4	1.4	0.1
Spain	2.2	1.6	1.4	1.2	1.2	1.3	1.4	1.4	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	-0.2
Sweden	1.7	1.7	2.1	1.7	1.6	1.8	1.9	1.9	1.9	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.7	1.7	-0.2
Switzerland	1.6	1.5	1.6	1.5	1.5	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0.0
United Kingdom	1.9	1.8	1.8	1.7	1.6	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.6	-0.3
United States	1.8	1.8	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	-0.3

Source: United States: Social Security Administration Office of the Chief Actuary calculations based on data from the National Center for Health Statistics and the Census Bureau
Other countries: Organisation for Economic Co-operation and Development website at: https://data.oecd.org/pop/fertility-rates.htm

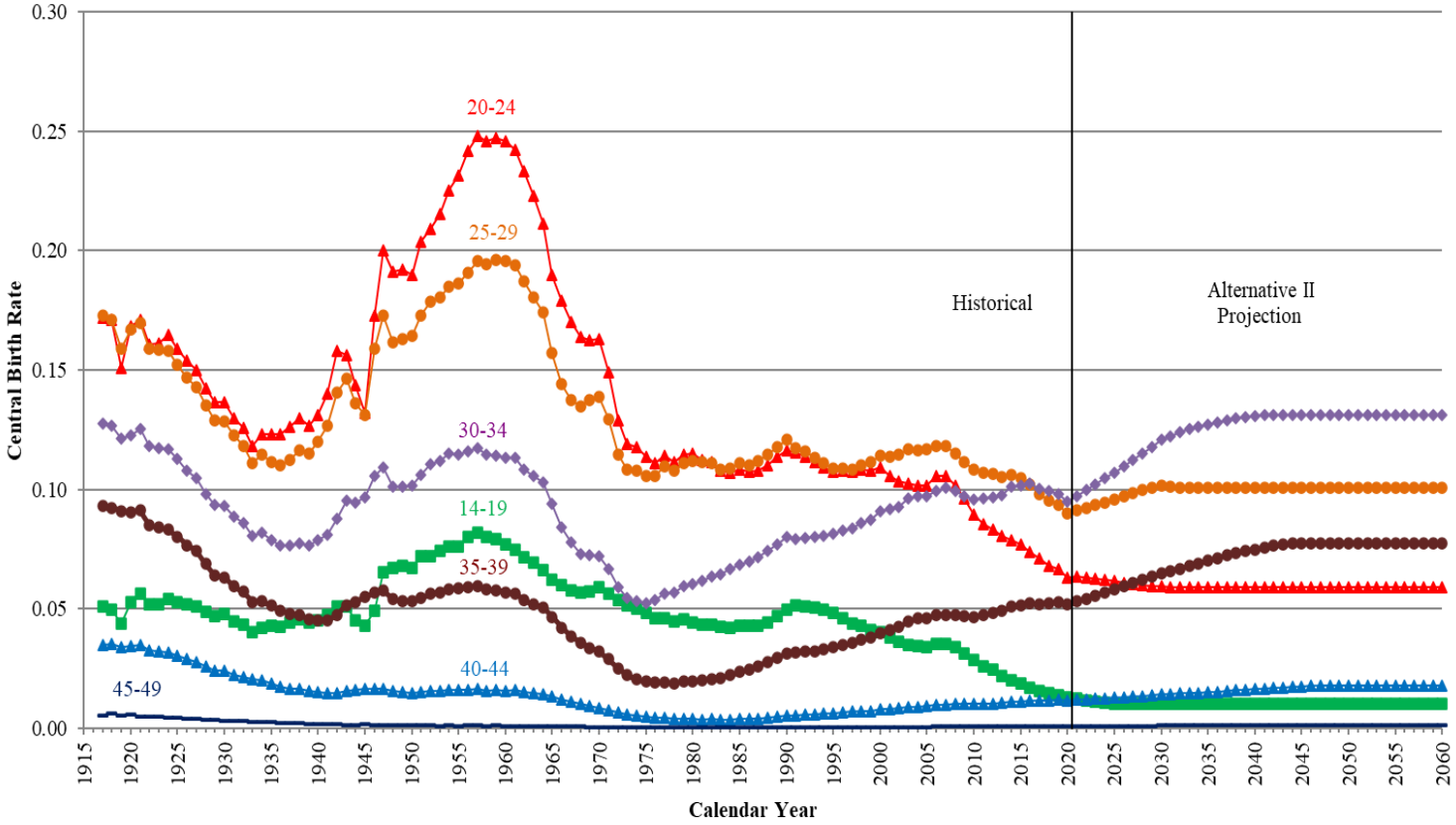
Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 1.1: Historical Total Fertility Rates for the United States



Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 1.2: Central Birth Rates for Five Year Age Groups: Historical and Alternative II Projection

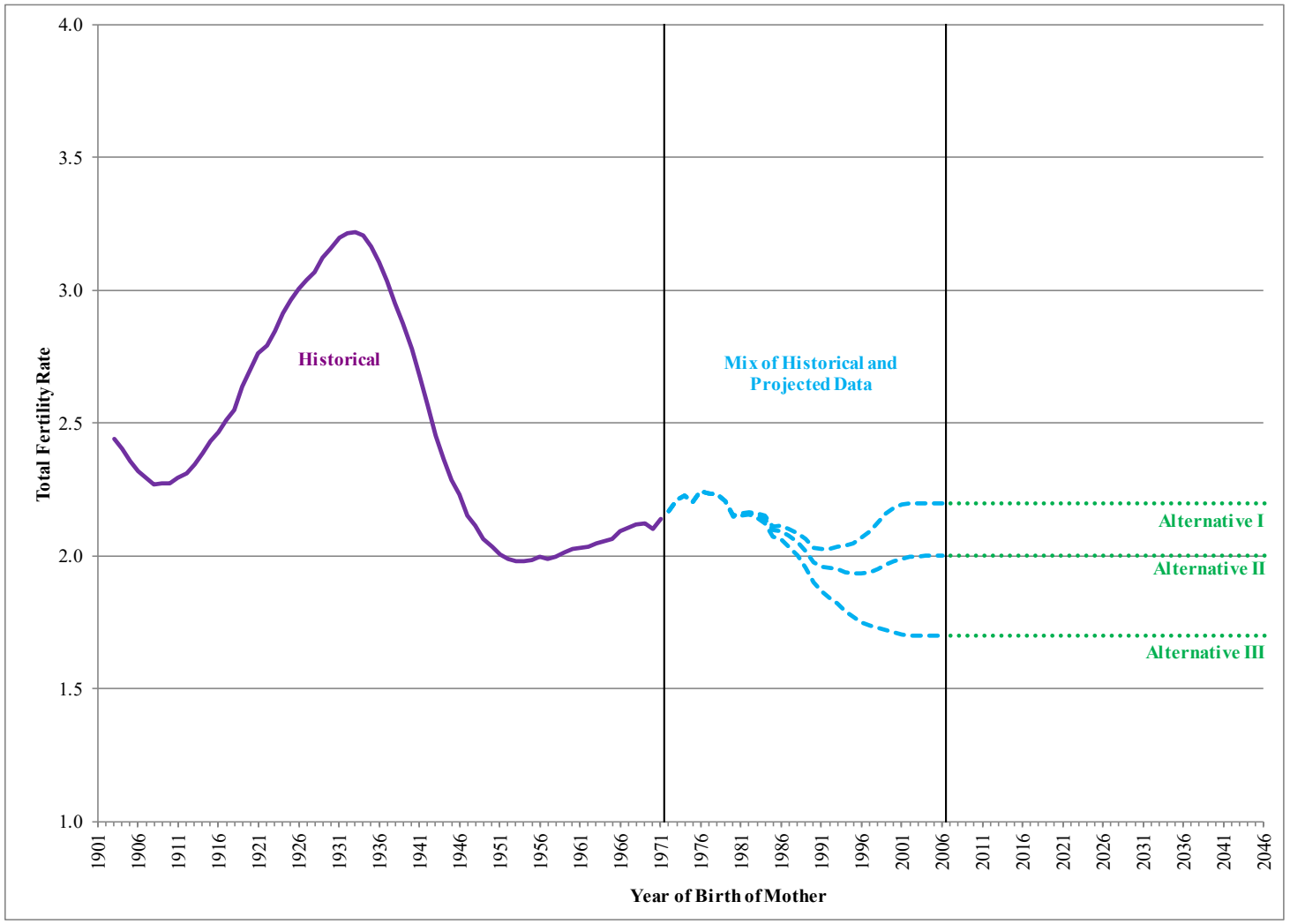


Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 1.3: Historical and Projected Total Fertility Rates

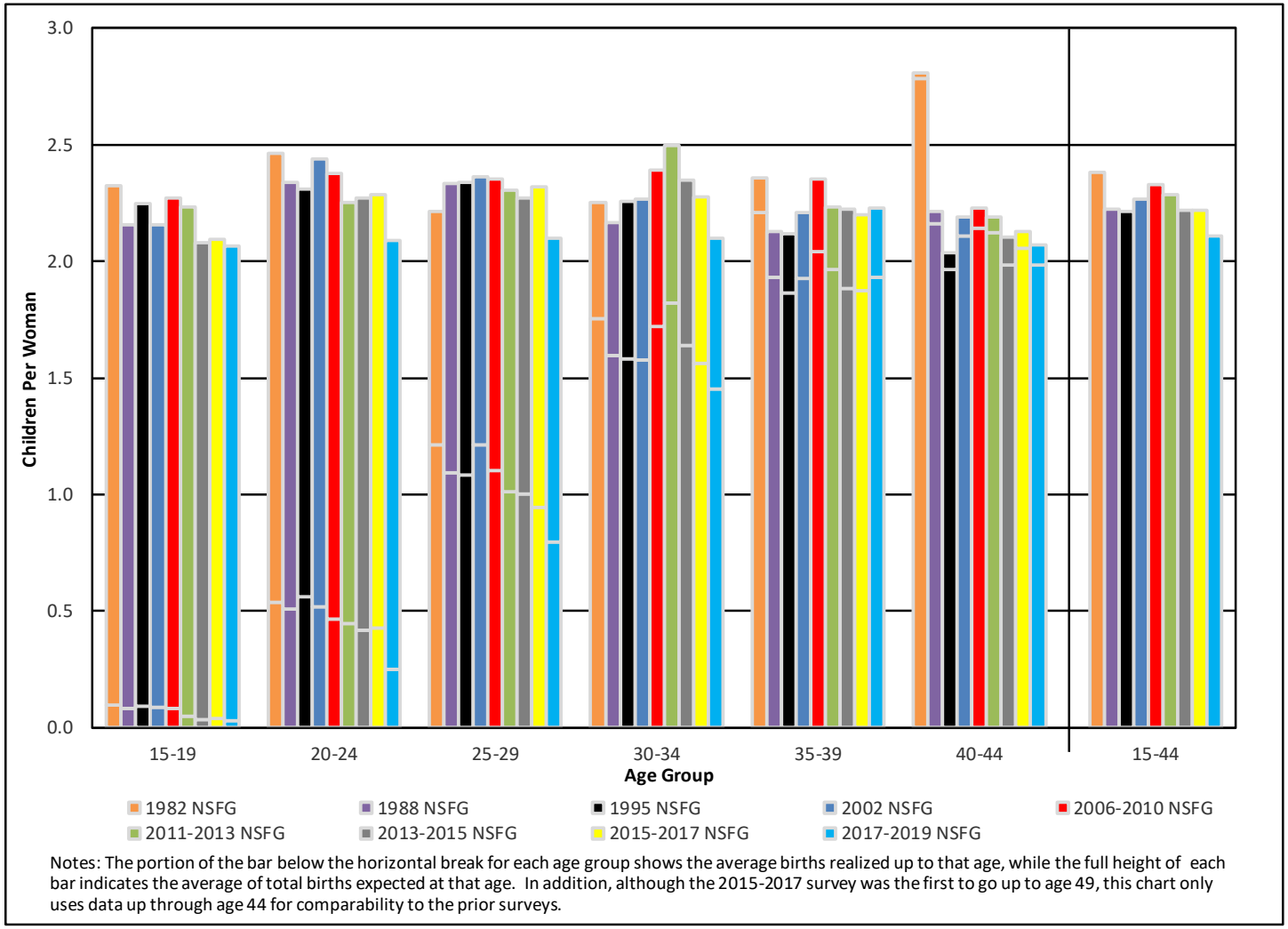
Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 1.4: Historical and Projected Total Fertility Rates by Birth Cohort



Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 1.5: Past and Future Expected Births per Woman Based on the National Survey of Family Growth (NSFG)



Notes: The portion of the bar below the horizontal break for each age group shows the average births realized up to that age, while the full height of each bar indicates the average of total births expected at that age. In addition, although the 2015-2017 survey was the first to go up to age 49, this chart only uses data up through age 44 for comparability to the prior surveys.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

2. MORTALITY

ASSUMPTIONS FOR THE 2022 TRUSTEES REPORT
OFFICE OF THE CHIEF ACTUARY, SSA

TABLE OF CONTENTS PAGE

2.1 Summary

For the 2022 Trustees Report, the ultimate annual rates of mortality reduction by age and cause of death are unchanged from those used for the 2021 Trustees Report. The assumed ultimate rates of reduction apply fully for years 2046 and later. For years between the most recent observed data and the full implementation of the ultimate rates of reduction, there is a transition from recently observed trends to the ultimate assumed rates of reduction by age, sex, and cause.

The Trustees assume that the COVID-19 pandemic, which began affecting death rates in 2020, will continue to affect death rates through 2023. While, in general, the pandemic has caused an increase in death rates, data show that for the youngest of the population, death rates have actually decreased. Additionally, data show that although the increases for ages 15 and older have been generally similar, there have been some noticeable differences across broad age groups. Therefore, the Trustees assumed a set of factors (representing the percentage increases or decreases that are applied to the death probabilities that would have been assumed in the absence of the pandemic) that vary by broad age group. The following table shows the percent increases/decreases used for the 2021 and 2022 Trustees Reports:

	2021 Trustees Report *		2022 Trustees Report			
Year	Ages 0 - 14	Ages 15+	Age 0	Ages 1 - 14	Ages 15 - 64	Ages 65+
2020	-14	16	-11	0	16.1	16.1
2021	-10	15	-4	4	19.5	17.5
2022	-2	4	-1	1	5.9	4.7
2023	0	1	0	0	1.2	0.9
* Percentage increases/decreases were applied to “no pandemic” death *rates*.						

The percentage increases and decreases used for the 2022 Trustees Report were applied uniformly for death probabilities across all causes of death. The combined effect of these increases and decreases for the different age groups is an overall increase in death rates above those that would have been assumed in the absence of the pandemic. See table 2.4 for the resulting age-sex-adjusted central death rates. It is certainly possible that the pandemic could have longer-lasting effects on death rates. The Trustees will continue to carefully monitor emerging experience and expectations. These changes to the percentage increases/decreases compared to those used in the 2021 Trustees Report result in a negligible change in the actuarial balance.

Projections for the 2022 Trustees Report reflect no new data from the National Center for Health Statistics (NCHS), but they do incorporate final Medicare data for 2018 and preliminary Medicare data for 2019. Incorporating these new data alone result in a negligible change in the actuarial balance.

The low-cost and high-cost alternative ultimate rates of improvement by age and cause are set as percentages of the intermediate alternative assumed rates and, as such, are not displayed separately in the tables. Once again, for the 2022 Trustees Report, male and female ultimate rates of improvement by age and cause are set equal to each other, but are displayed separately

because historical rates of change, projected rates of change through the transition years, and rates of change for all causes combined throughout the projection period vary by sex.

Finally, the method for calculating the starting death rates (for 2019) and the starting rates of improvement was changed. For last year's report, both of these starting rates were calculated using a regression on the most recent 12 years of data, with weightings of 0.2, 0.4, 0.6, 0.8, 1.0, …, 1.0, 1.0, and 1.0, respectively. For this year's report, the weightings for the final 2 years of data were changed to 2.0 and 3.0, respectively, to give more weight to the recent data. These new weightings alone result in lower starting levels for death rates and higher starting rates of improvement, and thus a decrease in the long-range actuarial balance of about 0.02 percent of taxable payroll.

The combined effects of all mortality changes, including incorporating the new Medicare data, revising the factors used to account for the pandemic, and using the new regression weightings, decreased the long-range actuarial balance by about 0.02 percent of taxable payroll.

2.2 Considerations in Selecting a Mortality Projection Method

Projections of mortality improvement are subject to uncertainty that is possibly greater than any other variable used in the Trustees' assumptions. Some demographers argue that life expectancy is potentially limitless and that rates of mortality reduction will match or exceed historical trends indefinitely into the future. Others believe that biological limitations make mortality improvement more difficult to achieve in the future and, combined with behavioral factors and economic considerations, future rates of reduction will be more modest than in the past.

Because the method for projecting future mortality is critical in determining the results, this section compares four approaches that are currently in use by demographers. These approaches can provide very different results, and make very different use of the available data. Some relatively simple approaches have been popular for illustrating trends in longevity but do not address the full complexities of changing conditions over time. Any projection of mortality used to model the size and age structure of the population, which is the foundation for analyzing the actuarial status of programs like Social Security and Medicare, should explicitly consider the past and expected future conditions that affect rates of improvement.

Perhaps the simplest approach to projecting future mortality is to extrapolate past trends in life expectancy. Some have presumed that the rate of increase in life expectancy at birth will be linear for the indefinite future. Oeppen and Vaupel in 2002 contended that a trend for the "best nation" would continue to rise linearly and that the U.S. would catch up to that trend. Further analysis by Ron Lee, and more recently by Jacques Villan and France Meslé, has shown that this historical trend has not been linear but has been decelerating in recent years. In addition, experience for the U.S. and for other countries has demonstrated that there are clear differences in the populations among developed nations that have made differences in mortality persist. Table 2.5 displays unisex life expectancy at birth for selected countries. Finally, life expectancy at birth is most highly affected by changes in death rates at young ages, particularly at infancy. Even if mortality reduction trends by age were to continue unchanged into the future, increase in life expectancy at any age would slow. For assessing the actuarial status of Social Security and

Medicare, extrapolation of life expectancy is not useful, because it does not address the age structure of mortality rates or of the population.

A second approach extrapolates death rates on a cohort basis. Shifts in death rates from one cohort to the next have been observed particularly in the U.K., and to a lesser extent in the U.S. However, extrapolating such shifts across ages within a cohort requires careful analysis. If a cohort shows lower death rates up to a given age due to better health, then the improvement may be expected to persist to older ages. However, if the shift is primarily due to interventions that have lowered death rates for individuals with compromised physiology, then death rates for the cohort at older ages might actually be worse than the prior cohort. In addition, advances for one cohort may reflect a level shift in mortality and not a trend of improvement that will continue for succeeding cohorts.

A third, more commonly used approach extrapolates past rates of reduction in mortality, by age and sex, indefinitely into the future. Lee and Carter are the most notable proponents of this approach. They developed a model for fitting a trend to a selected historical period that is then applied for projected future improvement, effectively assuming that future conditions for overall reduction by age and sex will match the conditions over the past. Key to this approach is the selection of the "appropriate" historical period. For many years, Lee and Carter suggested using the period starting with 1900. More recently, they suggested a period starting with 1950, which results in somewhat faster projected rates of mortality improvement for ages 65 and older. The specific historical time period chosen can have significant impacts on the projections by age group. The Lee and Carter extrapolation method presumes no deceleration in the future rate of reduction in mortality, and also presumes no change in the relative rate of decline across ages in the historical period. In 2016, Ron Lee produced projections of death rates through 2090 using national data by age and sex for the period 1950 through 2011. These death rates result in the same overall 75-year actuarial balance for the Social Security program as the death rates used in the 2015 Trustees Report. See Actuarial Note 158 at https://www.ssa.gov/OACT/NOTES/pdf_notes/note158.pdf.

The fourth approach for projecting mortality involves more comprehensive use of available data and flexibility for considering how future conditions are expected to differ from the past. This approach takes advantage of historical mortality data by cause of death, age, and sex, which is available on a relatively complete basis for the U.S. starting in 1979. Biologists and many demographers have long recognized the value of modeling mortality by cause. Ken Manton was a pioneer in evaluating effects of eliminating death by a given cause. Others, like Jay Olshansky, have emphasized the strides made in mortality for some causes and the failure to improve for other causes. The Trustees' model has, for decades, reflected past trends in mortality by cause, taking into account future expected changes based on input from researchers at the National Institutes of Health, the Centers for Disease Control and Prevention, and others. More recently, medical researchers and clinicians at Johns Hopkins University (JHU) independently assessed prospects for mortality improvement by cause and age. The JHU study has been extremely useful in evaluating and benchmarking the Trustees' assumptions. Of course, developing assumptions for future rates of mortality reduction by cause and age requires judgment about the expectation of future conditions relative to the past. Consideration of past changes in the rates of mortality reduction for individual causes, along with expert opinion, provides a rich basis for

such judgment. Perhaps most importantly, this approach provides a clear disclosure of specific assumptions used for improvement by age and cause of death. This can then be explicitly compared to the historical experience in considerable detail.

Note that the 2015 Technical Panel on Assumptions and Methods, appointed by the independent Social Security Advisory Board, endorsed the use of mortality assumptions by cause group. The 2019 Technical Panel also endorsed using cause of death, but only for the intermediate term (approximately 20 years).

2.3 Considerations in Selecting Mortality Assumptions by Age and Cause of Death

Simple extrapolation of the average trends experienced for any past period to project long-term future trends should only be considered when there is a basis for assuming that future conditions will, on average, replicate past conditions. This approach may have merit for processes where there is no reason to believe there are natural limits, such as for labor productivity of workers, where technology has no apparent limit. Human mortality, on the other hand, is limited by biology. The maximum verified age of survival for a human is age 122, and shows no signs of extending significantly. Biological researchers suggest that extension of the maximum lifespan would require fundamental alteration of the aging process. This may be possible, but there is no clear evidence that it will be achieved in the future.

In addition, reductions in mortality have occurred in a very irregular pattern over time, closely reflecting changes in the economy, access to medical care, and behavior of the population. Therefore, in developing assumptions for future mortality improvement by age and cause, it is crucial to study the differing historical rates of decline for various periods and the conditions that contributed to these variations. Only after considering how future conditions will differ from the past can one speculate about future mortality improvement.

The remainder of this section describes many of the overarching factors that have influenced mortality improvement since 1900 and that will affect it in the future. Section 2.5 provides greater detail regarding the Trustees' assumptions for rates of improvement for each cause of death.

A number of extremely important developments have contributed to the generally rapid overall rate of mortality improvement since 1900. These developments include:

- Access to primary medical care for the general population (in particular, the access due to Medicare and Medicaid health coverage for the elderly, disabled, and poor),
- Discovery of and general availability of antibiotics and immunizations,
- Clean water supply and waste removal,
- The rapid rate of growth in the general standard of living, and
- Medical advancements (such as prenatal and postnatal care, blood pressure and cholesterol medications, bypass surgery, angioplasty, etc.).

Each of these developments is expected to make a substantially smaller contribution to annual rates of mortality improvement in the future.

Future reductions in mortality will depend upon such factors as:

- The development and application of new diagnostic, surgical, and life-sustaining techniques,
- The rate of future increase in health spending and the efficiency of that spending relative to mortality improvement,
- The presence of environmental pollutants,
- Changes in amount and type of physical activity,
- Improvements in nutrition,
- The incidence of violence and suicide,
- The isolation and treatment of causes of disease,
- The emergence of new forms of disease,
- The evolution of existing forms of disease,
- Improvements in prenatal care,
- The prevalence of obesity,
- The prevalence of cigarette smoking,
- The misuse of drugs (including alcohol),
- The extent to which people assume responsibility for their own health,
- Education regarding health, and
- Changes in perception of the value of life.

In reviewing the above list, future progress for some factors seems questionable when recent statistics are considered. Recent NCHS releases have reported a substantial increase in the prevalence of obesity and diabetes, decreased environmental air quality, and an increase in negative side effects from invasive surgical procedures. On the other hand, there is good basis for speculation that there will continue to be substantial breakthroughs in advancing medical technology and treatment in the future. The extent to which such new technologies will have purely positive effects (like improved sanitation) versus mixed effects (as in the case of chemotherapy) will determine their potential for improving mortality. A fundamental consideration, however, is the ability and willingness of society to pay for the development of new treatments and technologies, and to provide these to the population as a whole.

The expansion of national expenditures for health services, research, and development over the last 60 years has been remarkable. Total national health expenditures have risen from 4 percent of GDP in 1952 to nearly 18 percent of GDP by 2019. This expansion has both enhanced health care for those who already had access and extended access to tens of millions through Medicare, Medicaid, and more recently, the Affordable Care Act. However, national health expenditures cannot continue to expand at this pace in the future. In fact, the Medicare Trustees Report projects a dramatic slowdown in the rate of increase in per-enrollee Medicare spending in the future, even as the average number of enrollees will be increasing. Even with improved efficiency and targeting of medical care in the future, a deceleration in spending per enrollee of this magnitude will tend to slow the rate of reduction in mortality.

Much has been made of the reduction in smoking in the U.S. over the past 30 years, particularly for men. However, there is a looming concern over other behavioral factors. Reduced physical activity and consumption of excess calories has led to the rising epidemic of obesity. In the future, assuming the prevalence of obesity stabilizes, an increasing portion of the adult and aged

population will have been obese for long durations. The effects of prolonged obesity will clearly have negative cumulative effects for diabetes, cardiovascular disease, and cancer in the future.

Education and income are correlated with mortality differences in the population. More education and higher income are associated with lower mortality. It is not entirely clear whether this correlation is largely due to the benefits of higher income and education, or to the "selection" of more advantaged (and thus healthier) individuals in gaining access to the best education and job opportunities. To the extent that the former factor is important, then increasing education and income for the population as a whole may provide some further benefits, but substantially less than in the past, given that further increases in education are likely to slow.

Future progress in treatment of currently predominant diseases is contingent on the availability of funding, research outcomes, and education about lifestyle choices that affect one's health. Quality of life and average years of healthy living have improved on a continual basis. Much progress has been made in the predominant causes of death (cardiovascular and respiratory disease) over the past several decades. These medical advances have caused the predominant causes of death to become less dominant, so that other causes, which have had slower rates of improvement or have only recently emerged, are becoming more predominant. For the still-predominant causes of death where significant progress has been made, further progress may be more difficult. In contrast, causes that have been less addressed may receive more research attention in the future. Therefore, many causes of death that have recently had rapid rates of reduction may have slower rates in the future. Causes that have had slower rates of improvement in the past may have more rapid rates of improvement in the future.

Finally, note that improvements in mortality and extension of longevity through the last century were relatively unconstrained by limitations of senescence and gradual deterioration of body systems, as we had not yet reached the apparent practical limit to life span. While there is likely no fixed limit for human longevity, it is true that the average human lifespan has improved much more than the maximum observed lifespan. This suggests that even with continued technological advances, the inherent limitations of the physical body and the mind to endure successfully past about 110 years will gradually result in a decelerating force of mortality improvement.

2.4 Past Experience by Cause of Death

In the past, the reduction of mortality rates has varied greatly by cause of death. In assessing experience and future possible improvement in mortality, it is important to understand the varying trends in mortality by cause of death. For the relatively recent period 1979-2019, average annual reductions in central death rates[1] by age group and sex were analyzed for six basic categories of cause of death (the dementia cause was added for the 2021 Trustees Report): five major groups of cause of death, and a residual group (Other) that contains all other causes (see table 2.3). (Note that in the past, death rates by more than six categories were analyzed and the Trustees developed assumptions for the same. For example, in the 1990s there were 10

[1] The average annual reduction over an "n" year period is calculated as the complement of the n^{th} root of the ratio of the death rate in the last year over that of the first year.

different categories. See Actuarial Study 112 at https://www.ssa.gov/OACT/NOTES/pdf_studies/study112.pdf.) The analysis has focused on the period 1979-2019 because NCHS has provided death rates by cause on a consistent basis since 1979, allowing for consistent groupings of death rates by selected cause groups.

For all ages combined, the largest average annual rate of reduction over the period 1979-2019 was in the category of **Cardiovascular Disease**, which has been about 2.3 percent for men and about 2.2 percent for women. The rate of reduction for **Cancer** has been about 1.0 percent for men and about 0.6 percent for women. For the category of **Violence and Accidents**, which includes domestic violence, opioid abuse, and suicides, there has been a rate of reduction of about 0.1 percent for men, but a rate of *increase* of about 0.3 percent for women. For the **Respiratory Disease** category, there has been a rate of reduction of about 0.2 percent for men and a rate of *increase* of about 1.5 percent for women. For the **Dementia** category, there has been a rate of *increase* of 7.7 percent for men and 8.8 percent for women. For the **Other** category, the rate of *increase* has been about 0.2 percent for men and 0.3 percent for women.

2.5 Assumed Future Rates of Reduction in Mortality by Cause of Death

The ultimate average annual percentage reductions by age group and cause of death that are assumed for the intermediate alternative of the 2022 Trustees Report are presented in table 2.3, along with the intermediate assumptions from the 2021 Trustees Report, and the average rates experienced during the periods 1979-2019 and 2009-19. The ultimate rates of improvement by age, sex, and cause for the low-cost and high-cost alternatives are developed as a ratio to the intermediate alternative, with low-cost being one-third of the intermediate rates of improvement and the high-cost being two times the intermediate rates.

As seen in table 2.3, the rate of reduction in mortality due to cardiovascular disease has generally slowed in the last 10 data years (2009-19) for all ages. The Trustees believe that ultimate rates of decline for this cause will generally be higher than for the last 10 years, but somewhat lower than the rapid pace since 1979. For ages 65 and over, reductions in death rates from respiratory disease have generally increased in the last 10 years, consistent with a partial continuation of the gains at younger ages in the previous 10 years. For the ultimate rates of reduction, the Trustees expect more modest improvement at ages 65 and over for both the cardiovascular and respiratory causes as the gains from reduced smoking and interventions for heart disease will slow, while effects of obesity will increase.

Reductions in death rates due to cancer for those over age 65 have improved significantly in the last 10 data years (2009-19). As indicated by researchers at NCHS, cancer is actually many different diseases and each will be addressed gradually. Progress has been made for lung cancer in large part due to reduced smoking. Progress has been made in other areas such as breast cancer and prostate cancer due to increased awareness and medical treatments. However, progress for other cancers has been slower. In addition, there are indications that treatment for a first cancer may result in greater susceptibility to a second cancer at a later time. On balance, however, the Trustees expect that the ultimate average rate of reduction in death due to cancer will match or exceed the rate of reduction experienced from 1979 to 2019.

Death rates from violence and accidents have actually increased substantially in the last 10 years for all ages. The Trustees believe that this trend will not continue. However, because this category includes suicide, it is not clear that the rate of decline will be substantial at older ages.

Death rates from dementia have increased significantly over the last 40 years, especially at ages 65 and over. Those increases have slowed somewhat in the last 10 years, but they have continued to be substantial. Public health and other government researchers that the Office of the Chief Actuary consulted have expressed pessimism about the prospects for significant breakthroughs in treating dementia in the near future, and even beyond. However, the Trustees do assume some modest progress over the next 75 years.

Analyzing death rates from all other causes is always a challenge, because this category incorporates new causes that are identified over time. Death rates for this category (all other causes) have risen substantially since 1979. Progress in reducing death rates in this category will be extremely challenging in the future, even as the proportion of all deaths from this group increases. Even with decelerating spending on health research and services relative to GDP for the future, it is reasonable to assume that spending will be redirected from the largest causes of death in the past (cardiovascular disease and respiratory disease) to other causes (emerging diseases). Thus, the Trustees expect that some progress, even if modest, will be achieved for the all other category.

Advice from the medical research community (including CDC, NCHS, and others) has been received on a largely informal basis and has been an essential component in guiding the Trustees' assumptions for reductions in mortality by cause. Insights were gained from a Johns Hopkins University (JHU) study that was published in 2016, which enlisted medical researchers and clinicians to develop expectations for reductions in death rates over about the period 2009-40. This specific input has been highly instructive in corroborating the Trustees' assumptions for the medium-term and long-term reductions in death rates by cause. The JHU work was published in the North American Actuarial Journal, Volume 20, Issue 3 (see https://www.tandfonline.com/doi/full/10.1080/10920277.2016.1179123). Note that the JHU expectations included an assumption that declines for causes not specifically considered by their experts would occur at about one-half of the rate for all other causes combined, somewhat similar to the Trustees' assumptions for the "Other" category.

There are three directly comparable categories of cause of death between the JHU experts and the Trustees. As an example, consider these three categories at ages 85+. For cardiovascular disease, the JHU experts project an average annual rate of decline from 2009-40 of 0.5 percent for women and 0.6 percent for men. The Trustees' ultimate assumption for cardiovascular disease is 1.5 percent. For cancer, the JHU experts project an average annual rate of decline from 2009-40 of 0.4 percent for women and 0.6 percent for men. The Trustees' ultimate assumption for cancer is 0.5 percent. For respiratory disease, the JHU experts project an average annual rate of decline from 2009-40 of 0.1 percent for women and 0.4 percent for men. The Trustees' ultimate assumption for respiratory disease is 0.2 percent. Note in particular the similarity of expectations for the respiratory disease and cancer categories between the JHU experts and those assumed for the 2022 Trustees Report.

2.6 Projected Future Rates of Reduction based on Assumptions by Age, Sex, and Cause of Death

The period for determining the starting levels of annual mortality reduction is the most recent 12 years of historical data (2008-19), with variable weighting on these 12 years. These starting levels were calculated by age group, sex, and cause as the percent reductions in log linear regressions of the central death rates.[2] The rates of improvement begin grading to the ultimate rates immediately after the last year of data. The annual reductions in mortality are assumed to change rapidly from the starting levels of annual reductions to the assumed ultimate rates of reduction for years 2046 and later. Under the low-cost and high-cost scenarios, the starting levels of annual reduction are assumed to be 50 percent and 150 percent,[3] respectively, of the starting levels for the intermediate assumptions.

Instead of using the measured mortality rates for the last single year of data (calendar year 2019) as the starting point of the mortality projections, mortality rates were calculated to be consistent with the trend inherent in the last 12 years of available data. The last 12 years of data are 2008-19. This approach reduces the impact of wide fluctuations that tend to occur in annual data on the starting levels used for the mortality projection.

It is also useful to compare the resulting reductions in death rates for all causes combined to past trends. These are the "Resulting Total" entries displayed in table 2.3. This analysis allows for a further look at the reasonableness of the projections that result from the cause-specific assumptions. In addition, results using the Trustees' assumptions are compared with those of demographers who prefer to extrapolate past trends without specific consideration of the underlying causes of death.

Table 2.4 provides age-sex-adjusted death rates[4] for historical years and projected years, based on the assumed future rates of reduction by cause group. The age-sex-adjusted death rates presented in table 2.4 use the April 1, 2010, Census resident population as the standard population for the age-sex adjustment.

Because reductions in mortality have differed widely by age in the past, the ultimate reductions in death rates vary by age group. Historically, reductions have been very rapid at the youngest ages. However, reductions at the oldest ages, ages 85 and over, have been very slow. For many years, the Trustees' assumptions have reflected the belief that neither of these extremes will persist indefinitely into the future. The Trustees' assumptions have reflected slower improvement at the youngest ages than evidenced since 1900, and faster improvement at the oldest ages (85 and over) than experienced historically.

---

[2] If the starting level of annual reductions for a particular cause age-sex group is negative, then 75 percent of that starting level is assumed for the intermediate alternative.

[3] If the starting level of annual reductions for a particular cause age-sex group is negative, then 100 percent of that starting level is assumed for the low-cost alternative and 50 percent is assumed for the high-cost alternative.

[4] The age-sex-adjusted death rate is the crude rate that would occur in the enumerated total population as of a specific date, if that population were to experience the death rates by age and sex observed in, or projected for, the selected year.

Table 2.2 shows historical rates of improvement and the projected rates of improvement based on assumed rates of reduction by cause, by alternative for the 2022 Trustees Report, summarized by age group and sex. For the intermediate alternative, projected rates of improvement for ages under 50 are generally lower than those experienced over the period 1900-2019, consistent with the Trustees' expectation of continued generally slower improvement in the future for these age groups. For men age 50 and older, the average projected rates of improvement for years after 2019 are slightly higher than those experienced since 1900. The projected rates of improvement for women age 50 and older are slightly lower than those assumed for men and generally lower than the rates experienced by this group of women over the period 1900-2019. This is consistent with the Trustees' long-held belief that average rates of mortality improvement for women, which had been faster than for men until around 1980, would ultimately converge with male improvement rates. Evidence that improvement for women will not always be faster than for men is apparent in data for years since about 1980. As shown in table 2.3, the rate of improvement in mortality for women ages 65-84 averaged only 0.80 percent per year during the period 1979-2019. This amount was about three-fifths of the average rate of improvement for men ages 65-84 during this period (1.36 percent). Similarly, the rate of improvement in mortality for women age 85 and older averaged only 0.23 percent per year during the period 1979-2019. This amount was about two-thirds of the average rate of improvement for men age 85 and older during this period (0.35 percent).

Table 2.2 also shows that, for all ages combined, the projected rate of improvement under the intermediate alternative for the period 2046-96 is 0.74 percent per year for men and 0.69 percent per year for women. The ultimate rates of improvement for the 2021 Trustees Report (for years 2045-95) were also 0.74 and 0.69 percent per year for men and women, respectively.

A comparison of the basis for past improvement in mortality with the expected basis for future improvement suggests that future improvement is likely to continue, but at a generally slower rate than experienced during the extraordinary 1900-2019 period for ages under 65. Based on analysis of experience by cause of death, and expected future conditions affecting mortality improvement, it seems reasonable to expect the rate of mortality improvement for the age group 65 and older for the next 75 years to be slightly slower compared to that experienced during 1900-2019 (0.78 percent as shown in table 2.2). The Trustees believe that the average annual rate of decline of 0.67 percent for ages 65 and older (as shown in table 2.2) over the period 2019-96 for the intermediate assumption is reasonable in this context.

2.7 Trustees' Assumptions versus Historical Trends and Other Assumptions

Table 2.1 shows average rates of reduction in mortality for three broad age groups over two historical periods. In addition, the table includes the following ultimate rates of reduction (the rate of reduction in mortality averaged over the last 50 years of the 75-year long-range period):

- Those assumed for the intermediate ultimate assumptions for various Trustees Reports (choosing those reports that included changes in the ultimate assumptions or in the methodology and the most recent report),
- Those recommended by various Technical Panels, and
- Those resulting from a survey taken at a Society of Actuaries (SOA) seminar.

Rates of improvement shown on the first page of table 2.1 reflect age-sex adjustment to the distribution of the 1990 U.S. population; those on the second page use the distribution of the 2000 U.S. population; and those on the third page use the distribution of the 2010 U.S. population. As seen by comparing the rates on the first and second pages in table 2.1 under the intermediate assumptions of the 2002 and the 2004 Trustees Reports (for which ultimate rates of improvement were the same), the difference in using the different populations for age-sex adjusting makes little difference in the *ultimate average rates* by the broad age groups. This conclusion is further supported by comparing the rates from the 2013 Trustees Report using two different populations for age-sex adjusting, as shown on the second and third pages in table 2.1. For presentations other than table 2.1 of this memorandum, rates of improvement are presented with age-sex adjustment to the distribution of the 2010 U.S. population.

Table 2.1 provides the assumed ultimate average annual percent reductions in mortality for the intermediate assumptions of the 1999, 2000, 2002, 2004, 2008, 2009, 2011, 2013, 2021 and 2022 Trustees Reports. The 1999 and 2000 Trustees Reports are included because ultimate annual percent reductions were increased substantially in the 2000 Trustees Report. The 2002 Trustees Report is included because changes in methodology were made that resulted in increased ultimate annual percent reductions. The 2004 Trustees Report is included to provide comparability in the results using a different population for the purpose of age-sex adjustment. The 2008 and 2009 Trustees Reports are included because ultimate annual percent reductions were revised. The 2011 Trustees Report is included because changes in methodology were made that put more emphasis on the recent historical data. The 2013 Trustees Report values are shown on both the second and third pages of the table to compare results using different populations for age-sex adjustment. The 2021 Trustees Report is included because the dementia category was added as a cause of death and changes were made to the ultimate rates of improvement for the cardiovascular disease category.

Also included in table 2.1 are the assumed ultimate annual percent reductions in mortality recommended by the 1994-96, 1999, 2003, 2007, 2011, 2015, and 2019 Technical Panels and the median response from actuaries, demographers, biologists, and economists who participated in the 1997 Society of Actuaries Seminar. Focusing on mortality for ages 65 and over, it should be noted that since 2000, the Trustees' intermediate assumptions have provided for an ultimate rate of reduction that is somewhat less than the average experienced since 1900. A description of the recommendations of recent technical panels is presented in section 2.8.

Comparisons of historical and assumed rates of improvement are included in table 2.2. All rates of improvement shown in this table reflect age-sex adjustment to the distribution of the 2010 U.S. population. For the age group 65 and over (where mortality is concentrated), the average annual rate of improvement experienced during 1900-2019 was 0.78 percent. In the most recent two sub-periods, there has been both a period of fast improvement (1.79 percent per year for 1999 through 2009) and a period of slow improvement (0.63 percent per year for 2009 through 2019). In fact, mortality at ages 65 and over generally improved at about 0.78 percent per year, or less, during 1900-2019 with the exception of three notable periods. The first was for the World War II period and subsequent years, 1936-54. During this period, dramatic advances in the standard of living were achieved due to expanded medical practice including the introduction

of antibiotics. The second period was from 1968-82, during which additional dramatic advancements in medicine were made and access to medical services was greatly expanded through Medicare and Medicaid for the old, frail, and disadvantaged, who account for the vast majority of deaths in the population. During the third period, 1999-2009, advances in medicines and surgical treatments led to rapid improvements. Cancer and cardiovascular patients especially benefitted from these advancements.

Chart 2.1 displays the annual age-sex-adjusted central death rates experienced since 1900. An examination of these rates reveals a sequence of distinct periods of mortality reduction. Table 2.2 provides average annual rates of reduction for these periods. During the period 1900-36, annual mortality reduction averaged about 0.5 percent for men and 0.8 percent for women. During the following period, 1936-54, there was more rapid reduction (partially due to antibiotics and other medical advances), averaging 1.8 percent per year for men and 2.5 percent per year for women. The period 1954-68 saw a much slower reduction of 0.6 percent per year for women and an increase of 0.4 percent per year for men. From 1968 through 1982, the rate of reduction in mortality surged (partially due to Medicare and Medicaid), averaging 1.8 percent for men and 2.1 percent for women, annually. From 1982 to 1999, moderately slow reduction in mortality returned, averaging 0.8 percent per year for men and 0.2 percent per year for women. From 1999 to 2009, another more rapid period occurred, averaging 1.8 percent per year for men and 1.4 percent per year for women, annually. The latest period, 2009-19, has mortality reduction slowing with average mortality improvement of 0.5 percent per year for men and 0.5 percent per year for women.

For the first four periods mentioned above, spanning 1900 through 1982, the average annual rate of improvement for men was less than that for women. For the last three periods, spanning 1982 through 2019, the opposite was true, i.e., the average annual rate of improvement for women was less than that for men. Chart 2.2 shows differences between male and female annual rates of mortality improvement for the age group 65 and older for each year of the period 1969 through 2019. Differences are shown for rates based on Medicare data. Even with normal year-to-year variation, improvement was generally greater for women until about 1980, as had been the case since the beginning of the past century. However, female improvement was generally less than or equal to that for men beginning in about 1980.

2.8 Recommendations of the Previous Technical Panels and Other Projections

The 2007 Technical Panel appointed by the Social Security Advisory Board recommended generally larger rates of decline than those assumed under the 2007 Trustees Report. Their recommendation was for an assumption of 1.0 percent annual reduction in death rates for all ages and both sexes. Their recommendation was based on the average rate of reduction in the total population (all ages combined) observed for the period 1953-2003.

The 2011 Technical Panel recommended an increase in life expectancy at birth that was consistent with generally larger rates of mortality reduction than those assumed under the 2011 Trustees Report. Their recommendation was for reductions in mortality at the same rate for all ages that would result in a life expectancy at birth of 88.7 years in 2085. This is consistent with having an annual 1.26 percent reduction in death rates for all ages and both sexes.

The approach of the 2007 and 2011 Technical Panels fails to take into account significant deviations in the rates of reduction by age groups as evidenced by the data shown in tables 2.2 and 2.3. The rates of reduction at younger ages have been much larger than the rates experienced at older ages. While differences by age will likely diminish in the future, it is unlikely that they will vanish completely.

The 2015 Technical Panel recommended substantially larger rates of decline than those assumed under the 2015 Trustees Report. Their recommendation was for an assumption of an overall average 1.00 percent annual reduction in the age-sex-adjusted death rate for the ultimate period (2040 to 2089), compared to the 0.71 percent overall average rate of decline for the 2015 Trustees Report. However, they supported having an age gradient (i.e., having the rates of improvement at younger ages be greater than rates of improvement at the older ages) and using cause-specific assumptions. Their 1.00 percent annual reduction recommendation was based on the average rate of reduction in the total population (all ages and causes combined) observed for the period since 1950. However, the mortality data through 2016 have continued to improve much less than was assumed for the 2015 through 2018 Trustees Reports. Based on recent slow rates of mortality improvement, the chairperson of the panel stated that she was glad that the Trustees did not follow the panel's recommendation for faster overall mortality reduction (see http://crr.bc.edu/briefs/social-securitys-financial-outlook-the-2016-update-in-perspective/).

The 2019 Technical Panel recommended a 1.0 percent ultimate average annual reduction for all ages combined, but felt that the Trustees' assumed age gradient was reasonable. They also recommended considering cause of death in the intermediate term (approximately 20 years), while eliminating cause of death projections for the long term. Finally, they recommended reflecting little or no improvement in aggregate mortality in the near-term and a slower transition to the ultimate rates of improvement.

Since 2016, the Congressional Budget Office has assumed an age gradient in the decline of mortality rates. Specifically, they assume each five-year age group will continue to decline at the average rate that it has declined since 1950. For their 2021 Long-Term Budget Outlook, CBO assumed mortality rates result in a life expectancy at birth of 82.2 years in 2051.[5] In the Census Bureau's 2017 National Population Projections, the assumed mortality rates result in a life expectancy at birth of 85.6 years in 2060.[6]

[5] See https://www.cbo.gov/publication/57038#_idTextAnchor040.

[6] See https://www.census.gov/data-tools/demo/idb/#/trends?YR_ANIM=2060&COUNTRY_YEAR=2060&menu=trendsViz&FIPS_SINGLE=US&dashPages=DASH&FIPS=US&measures=E0.

Table 2.1: Historical and Assumed Rates of Reduction in Mortality[1]

(Using the 1990 Census Resident population as the standard population for age-sex adjusting)

	Historical average annual percent reductions in age-sex-adjusted death rates (Based on data from the 2003 Trustees Report)		Assumed ultimate annual percent reductions in age-sex-adjusted death rates						
	1900-2000	1982-2000	1994-96 Technical Panel[2]	October-97 SOA Seminar[3]	1999 Trustees Alternative 2[4]	1999 Technical Panel[5]	2000 Trustees Alternative 2[6]	2002 Trustees Alternative 2[7]	2003 Technical Panel[8]
0 - 14	3.22	2.51	3.30	0.95	1.20	2.23	1.34	1.54	2.29
15 - 64	1.40	1.19	1.40	0.75	0.58	1.13	0.75	0.79	1.11
65 & Over	0.73	0.36	0.75	0.60	0.50	0.99	0.66	0.70	0.90

[1]For the 1999 Trustees Report (ages 65 and over), the 1999 Technical Panel (all 3 age groups), and the 2000 Trustees Report (ages 65 and over), the rates of reduction are the average of male and female annual rates of reduction in age-adjusted central death rates.

[2]The 1994-96 Technical Panel (appointed by the Advisory Council) recommended assuming reduction at the average rate experienced during the century.

[3]The Society of Actuaries Seminar included 60 actuaries, demographers, economists, and other experts on Social Security financing. Values shown are the median responses of the participants.

[4]The 1999 Trustees ultimate intermediate assumptions are for the period 2023-2073.

[5]The 1999 Technical Panel (appointed by the Advisory Board) recommended that ultimate rate of reduction in mortality be increased at all ages (over the 1999 Trustees Report assumptions) by enough to increase the projected life expectancy at birth for 2070 by 3.7 years (to the level assumed for the high-cost alternative).

[6]The 2000 Trustees ultimate intermediate assumptions are for the period 2024-2074. Ultimate rates of mortality reduction increased.

[7]The 2002 Trustees ultimate intermediate assumptions are for the period 2026-2076. Changes to projection methodology increased rates of mortality reduction.

[8]The 2003 Technical Panel ultimate assumptions are for the period 2027-2077.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.1 (Continued): Historical and Assumed Rates of Reduction in Mortality

(Using the 2000 Census Resident population as the standard population for age-sex adjusting)

	Historical average annual percent reductions in age-sex-adjusted death rates (Based on data from the 2013 Trustees Report)		Ultimate annual percent reductions in age-sex-adjusted death rates						
	1900-2009	1982-2009	2004 Trustees Alternative 2[1]	2007 Technical Panel[2]	2008 Trustees Alternative 2[3]	2009 Trustees Alternative 2[4]	2011 Trustees Alternative 2[5]	2011 Technical Panel[6]	2013 Trustees Alternative 2[7]
0 - 14	3.10	2.26	1.54	1.00	1.56	1.55	1.56	1.26	1.57
15 - 64	1.35	1.17	0.79	1.00	1.00	0.99	0.96	1.26	0.98
65 & Over	0.81	0.84	0.68	1.00	0.65	0.71	0.66	1.26	0.64

[1]The 2004 Trustees ultimate intermediate assumptions are for the period 2028-2078.
[2]The 2007 Technical Panel ultimate assumptions are for the period 2031-2081.
[3]The 2008 Trustees ultimate intermediate assumptions are for the period 2032-2082.
[4]The 2009 Trustees ultimate intermediate assumptions are for the period 2033-2083.
[5]The 2011 Trustees ultimate intermediate assumptions are for the period 2035-2085.
[6]The 2011 Technical Panel ultimate assumptions are for the period 2035-2085.
[7]The 2013 Trustees ultimate intermediate assumptions are for the period 2037-2087.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.1 (Continued): Historical and Assumed Rates of Reduction in Mortality

(Using the 2010 Census Resident population as the standard population for age-sex adjusting)

	Historical average annual percent reductions in age-sex-adjusted death rates (Based on data from the 2022 Trustees Report)		Ultimate annual percent reductions in age-sex-adjusted death rates				
	1900-2019	1982-2019	2013 Trustees Alternative 2[1]	2015 Technical Panel[2]	2019 Technical Panel[3]	2021 Trustees Alternative 2[4]	2022 Trustees Alternative 2[5]
0 - 14	2.97	2.04	1.57	2.44	2.10	1.52	1.52
15 - 64	1.18	0.85	1.00	1.48	1.35	0.92	0.92
65 & Over	0.78	0.77	0.63	0.86	0.87	0.64	0.64

[1]The 2013 Trustees ultimate intermediate assumptions are for the period 2037-2087.
[2]The 2015 Technical Panel ultimate assumptions are for the period 2039-2089.
[3]The 2019 Technical Panel ultimate assumptions are for the period 2043-2093.
[4]The 2021 Trustees ultimate intermediate assumptions are for the period 2045-2095.
[5]The 2022 Trustees ultimate intermediate assumptions are for the period 2046-2096.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.2: Average Annual Percent Reductions in Age-Adjusted Central Death Rates for the 2022 Trustees Report [1]

		Historical Period (last year of final data is 2019)								Intermediate Alternative		
Sex	Age	1900-1936	1936-1954	1954-1968	1968-1982	1982-1999	1999-2009	2009-2019	1900-2019	2019-2046	2019-2096	2046-2096
Male	0-14	2.85	4.76	1.70	4.26	2.76	1.58	1.49	2.94	1.47	1.50	1.51
	15-49	1.18	3.32	-0.40	2.13	1.09	0.84	-0.74	1.23	0.55	0.73	0.82
	50-64	0.13	1.30	-0.22	2.21	1.87	1.14	0.03	0.84	0.83	0.91	0.95
	65-84	0.07	1.32	-0.32	1.49	1.04	2.44	0.92	0.79	0.87	0.79	0.74
	85+	0.19	1.68	-1.07	1.81	-0.53	1.50	0.38	0.49	0.64	0.60	0.58
	65+	0.11	1.44	-0.57	1.60	0.48	2.06	0.70	0.68	0.77	0.70	0.67
	Total	0.53	1.77	-0.41	1.83	0.81	1.80	0.45	0.90	0.77	0.75	0.74
Female	0-14	3.10	4.99	1.78	4.06	2.56	1.49	1.42	3.00	1.51	1.53	1.54
	15-49	1.70	4.89	0.30	2.74	0.72	0.14	-0.21	1.72	0.67	0.81	0.89
	50-64	0.72	2.79	0.68	1.65	1.01	1.33	0.02	1.17	0.85	0.93	0.98
	65-84	0.29	2.23	0.87	2.00	0.23	1.70	0.93	1.02	0.81	0.72	0.68
	85+	0.22	1.59	0.04	2.29	-0.52	1.21	0.16	0.63	0.58	0.55	0.54
	65+	0.27	2.00	0.55	2.12	-0.08	1.48	0.58	0.86	0.70	0.64	0.61
	Total	0.80	2.54	0.59	2.14	0.20	1.37	0.45	1.13	0.73	0.71	0.69
Total	0-14	2.96	4.86	1.73	4.18	2.67	1.54	1.46	2.97	1.49	1.51	1.52
	15-49	1.42	3.95	-0.15	2.33	0.97	0.60	-0.55	1.43	0.59	0.76	0.85
	50-64	0.40	1.91	0.10	2.02	1.54	1.21	0.03	0.99	0.84	0.92	0.96
	65-84	0.19	1.77	0.22	1.72	0.70	2.10	0.92	0.91	0.84	0.75	0.71
	85+	0.21	1.62	-0.34	2.10	-0.51	1.34	0.24	0.58	0.61	0.57	0.55
	65+	0.20	1.72	0.02	1.86	0.24	1.79	0.63	0.78	0.73	0.67	0.64
	Total	0.66	2.13	0.08	1.98	0.57	1.59	0.43	1.02	0.75	0.73	0.72

[1]Using the 2010 Census Resident population as the standard population for age adjusting.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.2 (Continued): Average Annual Percent Reductions in Age-Adjusted Central Death Rates for the 2022 Trustees Report [1]

		Low-Cost Alternative			High-Cost Alternative		
Sex	Age	2019-2046	2019-2096	2046-2096	2019-2046	2019-2096	2046-2096
Male	0-14	0.50	0.51	0.52	2.87	2.89	2.91
	15-49	-0.03	0.17	0.28	1.35	1.51	1.60
	50-64	0.18	0.28	0.34	1.74	1.72	1.71
	65-84	0.28	0.29	0.29	1.63	1.33	1.17
	85+	0.19	0.22	0.23	1.23	1.03	0.92
	65+	0.25	0.26	0.26	1.45	1.19	1.05
	Total	0.21	0.26	0.28	1.51	1.32	1.22
Female	0-14	0.53	0.52	0.52	2.93	2.95	2.96
	15-49	0.06	0.22	0.31	1.52	1.64	1.70
	50-64	0.19	0.29	0.35	1.77	1.76	1.76
	65-84	0.26	0.27	0.27	1.51	1.22	1.06
	85+	0.15	0.19	0.21	1.14	0.94	0.83
	65+	0.21	0.23	0.24	1.33	1.08	0.95
	Total	0.20	0.24	0.27	1.43	1.22	1.11
Total	0-14	0.51	0.52	0.52	2.89	2.92	2.93
	15-49	0.00	0.19	0.29	1.41	1.55	1.63
	50-64	0.18	0.29	0.34	1.75	1.74	1.73
	65-84	0.27	0.28	0.28	1.57	1.28	1.12
	85+	0.17	0.20	0.22	1.17	0.97	0.86
	65+	0.23	0.24	0.25	1.39	1.13	0.99
	Total	0.20	0.25	0.28	1.47	1.27	1.16

[1]Using the 2010 Census Resident population as the standard population for age adjusting.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.3: Average Annual Rates of Reduction in Central Death Rates by Age Group, Sex, and Cause

	Historical		Alternative II*		Historical		Alternative II*	
			2021 TR	2022 TR			2021 TR	2022 TR
	1979 to 2019	2009 to 2019	2045 to 2095	2046 to 2096	1979 to 2019	2009 to 2019	2045 to 2095	2046 to 2096
Under Age 15	**Male**				**Female**			
Cardiovascular Disease	1.94	2.22	1.9	1.9	1.68	1.62	1.9	1.9
Cancer	2.35	1.69	1.5	1.5	1.98	1.51	1.5	1.5
Violence and Accidents	2.38	0.25	1.0	1.0	2.07	-0.09	1.0	1.0
Respiratory Disease	2.27	2.04	2.0	2.0	2.45	2.63	2.0	2.0
Dementia	3.07	3.93	0.1	0.1	1.80	-1.78	0.1	0.1
Other	2.24	1.75	1.7	1.7	2.13	1.67	1.7	1.7
Resulting Total **	2.27	1.49	1.51	1.51	2.11	1.42	1.54	1.54
Ages 15 - 49	**Male**				**Female**			
Cardiovascular Disease	1.78	0.75	1.3	1.3	1.19	0.42	1.3	1.3
Cancer	1.88	2.26	1.5	1.5	1.58	1.77	1.5	1.5
Violence and Accidents	0.28	-2.44	0.7	0.7	-0.21	-2.35	0.7	0.7
Respiratory Disease	0.45	1.92	0.5	0.5	-0.47	2.08	0.5	0.5
Dementia	1.06	0.50	0.1	0.1	0.96	1.84	0.1	0.1
Other	0.14	0.32	0.8	0.8	-0.09	-0.06	0.8	0.8
Resulting Total **	0.72	-0.74	0.82	0.82	0.49	-0.21	0.89	0.89
Ages 50 - 64	**Male**				**Female**			
Cardiovascular Disease	2.36	0.19	1.5	1.5	1.96	0.06	1.5	1.5
Cancer	1.55	2.04	1.5	1.5	1.22	1.39	1.5	1.5
Violence and Accidents	-0.39	-3.34	0.5	0.5	-0.68	-2.73	0.5	0.5
Respiratory Disease	0.45	-0.33	0.7	0.7	-1.17	-0.75	0.7	0.7
Dementia	-2.51	-2.80	0.1	0.1	-3.23	-3.53	0.1	0.1
Other	-0.34	-0.66	0.6	0.6	-0.31	-0.84	0.6	0.6
Resulting Total **	1.23	0.03	0.95	0.95	0.82	0.02	0.98	0.98
Ages 65 - 84	**Male**				**Female**			
Cardiovascular Disease	2.73	1.31	1.9	1.9	2.61	1.69	1.9	1.9
Cancer	1.07	2.18	0.9	0.9	0.35	1.84	0.9	0.9
Violence and Accidents	0.25	-1.78	0.5	0.5	-0.13	-1.58	0.5	0.5
Respiratory Disease	0.48	1.50	0.3	0.3	-1.83	1.07	0.3	0.3
Dementia	-6.65	-1.89	0.1	0.1	-7.73	-2.39	0.1	0.1
Other	-0.29	-0.63	0.3	0.3	-0.44	0.15	0.3	0.3
Resulting Total **	1.36	0.92	0.74	0.74	0.80	0.93	0.68	0.68
Ages 85 and older	**Male**				**Female**			
Cardiovascular Disease	1.67	1.01	1.5	1.5	1.87	1.24	1.5	1.5
Cancer	0.00	0.83	0.5	0.5	-0.29	0.13	0.5	0.5
Violence and Accidents	-0.83	-1.80	0.3	0.3	-1.18	-2.16	0.3	0.3
Respiratory Disease	-0.45	1.59	0.2	0.2	-1.58	0.51	0.2	0.2
Dementia	-9.48	-2.15	0.1	0.1	-10.32	-2.36	0.1	0.1
Other	-0.83	0.06	0.3	0.3	-0.78	0.75	0.3	0.3
Resulting Total **	0.35	0.38	0.58	0.58	0.23	0.16	0.54	0.54
Total	**Male**				**Female**			
Cardiovascular Disease	2.27	0.99			2.18	1.26		
Cancer	1.04	1.87			0.62	1.44		
Violence and Accidents	0.12	-2.40			-0.27	-2.16		
Respiratory Disease	0.20	1.33			-1.54	0.69		
Dementia	-7.71	-2.06			-8.77	-2.38		
Other	-0.20	-0.26			-0.25	0.19		
Resulting Total **	1.02	0.45	0.74	0.74	0.62	0.45	0.69	0.69

* Alternative I is 1/3 times Alternative 2; Alternative 3 is 2 times Alternative 2.

** For the "Alternative II" columns, resulting total represents average annual percent reduction in age-adjusted death rates for the last 50 years of the 75-year projection period.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 2.4: Age-Sex-Adjusted Central Death Rates

(per 100,000 population)

Year	2021 TR	2022 TR
1900	2,684.3	2,684.3
1910	2,495.9	2,495.9
1920	2,304.5	2,304.5
1930	2,094.9	2,094.9
1940	1,919.8	1,919.8
1945	1,716.6	1,716.6
1950	1,561.9	1,561.9
1955	1,453.8	1,453.8
1960	1,454.3	1,454.3
1965	1,428.8	1,428.8
1970	1,340.0	1,340.0
1975	1,204.8	1,204.8
1980	1,136.9	1,136.9
1985	1,081.0	1,081.0
1990	1,022.9	1,022.9
1991	1,009.2	1,009.2
1992	994.0	994.0
1993	1,017.7	1,017.7
1994	1,005.3	1,005.3
1995	1,002.7	1,002.7
1996	988.8	988.8
1997	972.9	972.9
1998	964.8	964.8
1999	971.7	971.7
2000	961.5	961.5
2001	951.9	951.9
2002	947.6	947.6
2003	933.9	933.9
2004	899.3	899.3
2005	901.9	901.9
2006	879.1	879.1
2007	858.1	858.1
2008	858.1	858.1
2009	827.8	827.8
2010	820.8	820.8
2011	820.8	820.7
2012	811.8	811.8
2013	812.4	812.4
2014	805.2	805.2
2015	815.4	815.4
2016	808.8	808.7
2017	812.8	812.8
2018	803.4	803.7
2019	792.3	792.8
2020	923.7 [1]	924.4 [1]
2021	908.3 [1]	935.6 [1]

	Alternative I		Alternative II		Alternative III	
	2021 TR	2022 TR	2021 TR	2022 TR	2021 TR	2022 TR
2022	831.7	838.5	818.1	824.8	802.2	808.8
2023	807.5	804.7	789.8	787.1	768.8	766.2
2024	798.5	795.6	776.7	773.9	750.4	747.6
2025	797.3	794.3	771.1	768.2	739.2	736.4
2030	788.6	785.4	741.5	738.4	683.4	680.4
2040	767.4	764.1	683.0	679.8	584.2	581.2
2050	745.9	742.6	630.3	627.2	505.0	502.1
2060	725.2	721.9	583.7	580.6	442.1	439.3
2070	705.4	702.1	542.3	539.3	391.5	388.8
2080	686.3	683.1	505.5	502.6	350.2	347.7
2090	668.1	664.9	472.7	469.9	316.1	313.7
2100	650.6	647.4	443.3	440.6	287.5	285.3

[1] Estimated, intermediate alternative.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

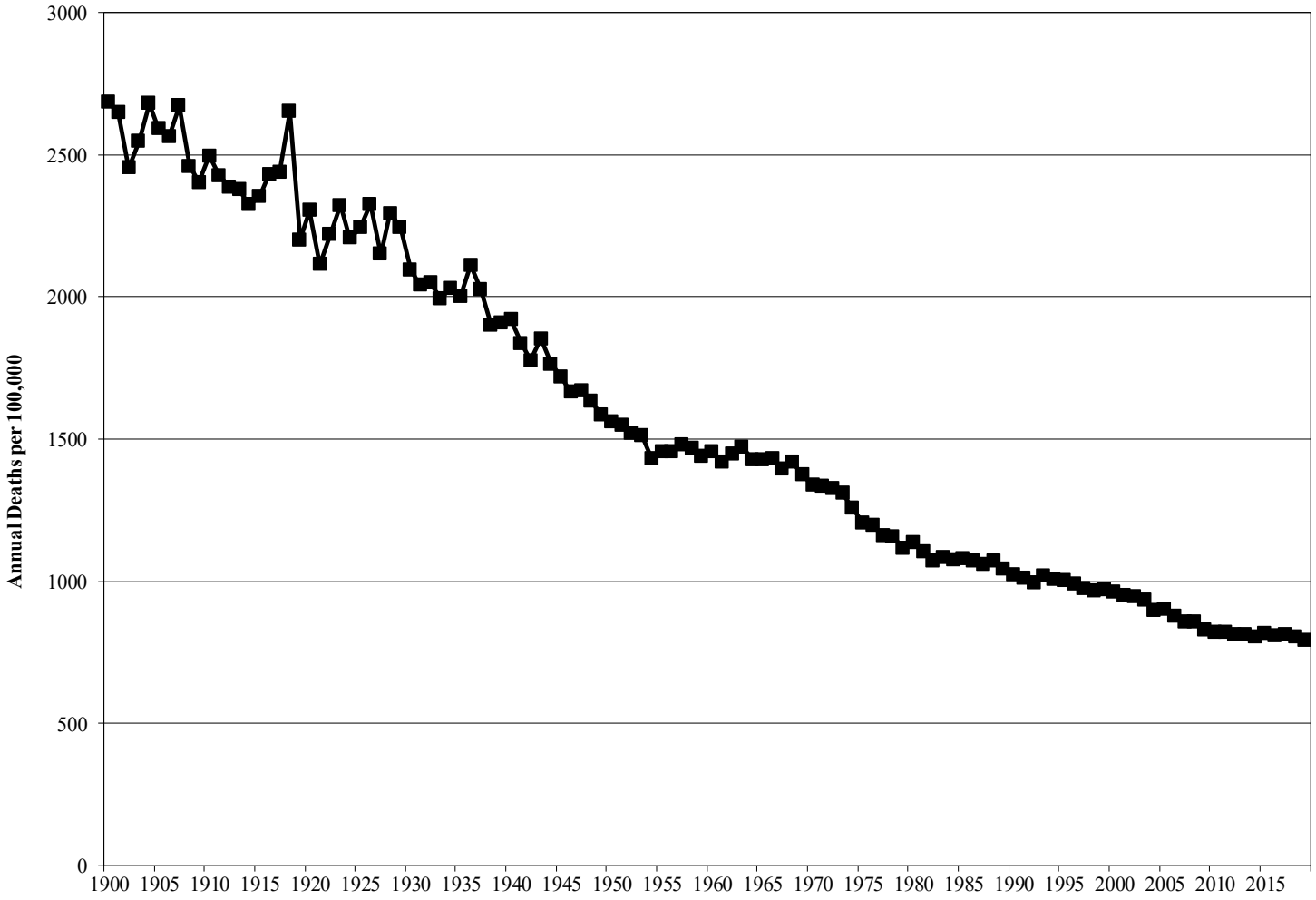
Table 2.5: Historical Unisex Life Expectancy at Birth, by Country
1980 – 2019

Country	1980	1985	1990	1995	1996	1997	1998	1999	2000	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Most Recent Life Expectancy	Latest 10-Year Change
Australia	74.6	75.6	77.0	77.9	78.2	78.5	78.7	79.0	79.3	77.9	79.3	80.9	81.1	81.4	81.5	81.6	81.8	82.0	82.1	82.2	82.4	82.5	82.5	82.6	82.8	83.0	83.0	1.4
Austria	72.6	73.9	75.7	76.8	77.0	77.4	77.8	78.0	78.2	76.8	78.2	79.4	80.0	80.3	80.5	80.4	80.7	81.1	81.0	81.2	81.6	81.3	81.7	81.7	81.8	82.0	82.0	1.6
Belgium	73.3	74.6	76.1	77.0	77.3	77.5	77.6	77.7	77.8	77.0	77.8	79.1	79.5	79.9	79.8	80.1	80.3	80.7	80.5	80.7	81.4	81.1	81.5	81.6	81.7	82.1	82.1	2.0
Canada	75.3	76.3	77.2	77.9	78.1	78.3	78.5	78.7	79.0	77.9	79.0	80.0	80.3	80.4	80.6	80.8	81.1	81.3	81.5	81.7	81.8	81.9	82.0	82.0	82.0	82.1	82.1	1.3
China	66.9	68.5	69.2	70.0	70.3	70.6	70.9	71.2	71.5	70.0	71.5	73.1	73.4	73.6	73.9	74.2	74.5	74.8	75.1	75.4	75.7	76.0	76.3	76.6	76.8	77.0	77.0	2.8
Denmark	74.3	74.6	74.9	75.3	75.7	76.1	76.5	76.6	76.9	75.3	76.9	78.3	78.4	78.4	78.8	79.0	79.3	79.9	80.1	80.4	80.8	80.8	80.9	81.2	81.0	81.5	81.5	2.5
Finland	73.6	74.5	75.0	76.6	76.9	77.1	77.3	77.5	77.7	76.6	77.7	79.1	79.5	79.6	79.9	80.1	80.2	80.6	80.7	81.1	81.3	81.6	81.5	81.7	81.8	82.1	82.1	2.0
France	74.3	75.4	77.0	78.1	78.3	78.6	78.8	78.9	79.2	78.1	79.2	80.4	81.0	81.2	81.4	81.5	81.8	82.3	82.1	82.3	82.8	82.4	82.7	82.7	82.8	82.9	82.9	1.4
Germany	72.9	74.9	77.2	76.6	76.9	77.3	77.7	77.9	78.2	76.6	78.2	79.4	79.8	80.1	80.2	80.3	80.5	80.5	80.6	80.6	81.2	80.7	81.1	81.1	81.0	81.4	81.4	1.1
Greece	75.3	76.0	77.1	77.8	78.0	78.4	78.4	78.5	78.6	77.8	78.6	79.7	79.9	79.7	80.3	80.4	80.7	80.8	80.7	81.4	81.5	81.1	81.5	81.4	81.9	81.7	81.7	1.3
India	53.8	55.8	57.9	60.3	60.8	61.3	61.7	62.1	62.5	60.3	62.5	64.5	64.9	65.4	65.8	66.3	66.7	67.2	67.6	68.0	68.3	68.7	68.9	69.2	69.5	69.7	69.7	3.4
Ireland	72.9	73.4	74.9	75.6	75.9	76.1	76.3	76.2	76.6	75.6	76.6	79.0	79.3	79.7	80.2	80.3	80.8	80.8	80.9	81.0	81.4	81.5	81.7	82.2	82.3	82.8	82.8	2.5
Italy	74.0	75.6	77.1	78.3	78.6	78.9	79.1	79.5	79.9	78.3	79.9	80.9	81.4	81.5	81.6	81.7	82.1	82.3	82.3	82.8	83.2	82.6	83.3	83.0	83.4	83.6	83.6	1.9
Japan	76.1	77.6	78.9	79.6	80.3	80.5	80.6	80.5	81.2	79.6	81.2	82.0	82.4	82.6	82.7	83.0	82.9	82.7	83.2	83.4	83.7	83.9	84.1	84.2	84.3	84.4	84.4	1.4
Mexico	67.2	69.5	70.5	72.3	72.7	73.1	73.5	74.0	74.7	72.3	74.7	75.2	75.5	75.3	75.1	74.9	74.8	74.9	75.0	75.0	74.9	74.7	74.8	74.9	75.0	75.1	75.1	0.2
Netherlands	75.9	76.5	77.0	77.6	77.6	78.0	78.0	77.9	78.2	77.6	78.2	79.5	79.9	80.3	80.5	80.8	81.0	81.3	81.2	81.4	81.8	81.6	81.6	81.8	81.9	82.2	82.2	1.4
New Zealand	73.2	74.0	75.5	76.8	77.1	77.4	77.7	78.1	78.4	76.8	78.4	79.8	80.1	80.3	80.5	80.7	80.8	81.0	81.2	81.4	81.5	81.7	81.7	81.9	81.8	82.1	82.1	1.4
Norway	75.9	76.1	76.7	77.9	78.3	78.3	78.5	78.4	78.8	77.9	78.8	80.3	80.6	80.6	80.8	81.0	81.2	81.4	81.5	81.8	82.2	82.4	82.5	82.7	82.8	83.0	83.0	2.0
Portugal	71.4	73.0	74.1	75.4	75.3	75.8	76.0	76.3	76.9	75.4	76.9	78.2	79.0	79.2	79.5	79.7	80.0	80.6	80.5	80.8	81.2	81.2	81.2	81.5	81.4	81.8	81.8	2.1
Spain	75.4	76.4	77.0	78.1	78.3	78.8	78.9	78.8	79.3	78.1	79.3	80.3	81.1	81.2	81.5	81.9	82.4	82.6	82.5	83.2	83.3	82.9	83.4	83.4	83.5	83.9	83.9	2.0
Sweden	75.9	76.8	77.7	79.0	79.2	79.4	79.5	79.6	79.7	79.0	79.7	80.7	81.0	81.1	81.3	81.5	81.6	81.9	81.8	82.0	82.3	82.3	82.4	82.5	82.6	83.2	83.2	1.7
Switzerland	75.7	77.0	77.5	78.7	79.1	79.3	79.6	79.8	79.9	78.7	79.9	81.4	81.7	82.0	82.2	82.3	82.6	82.8	82.8	82.9	83.3	83.0	83.7	83.6	83.8	84.0	84.0	1.7
United Kingdom	73.2	74.7	75.7	76.7	76.9	77.2	77.3	77.5	77.9	76.7	77.9	79.2	79.5	79.7	79.8	80.4	80.6	81.0	81.0	81.1	81.4	81.0	81.2	81.3	81.3	81.4	81.4	1.0
United States	73.6	74.6	75.3	75.7	76.0	76.3	76.5	76.5	76.6	75.7	76.6	77.3	77.6	77.8	77.9	78.3	78.5	78.5	78.6	78.6	78.6	78.5	78.4	78.4	78.6	78.7	78.7	0.4

Source: United States: Social Security Administration Office of the Chief Actuary calculations based on data from the National Center for Health Statistics, Census Bureau, and the Centers for Medicare and Medicaid Services
Other countries: Organisation for Economic Co-operation and Development website at: https://data.oecd.org/healthstat/life-expectancy-at-birth.htm

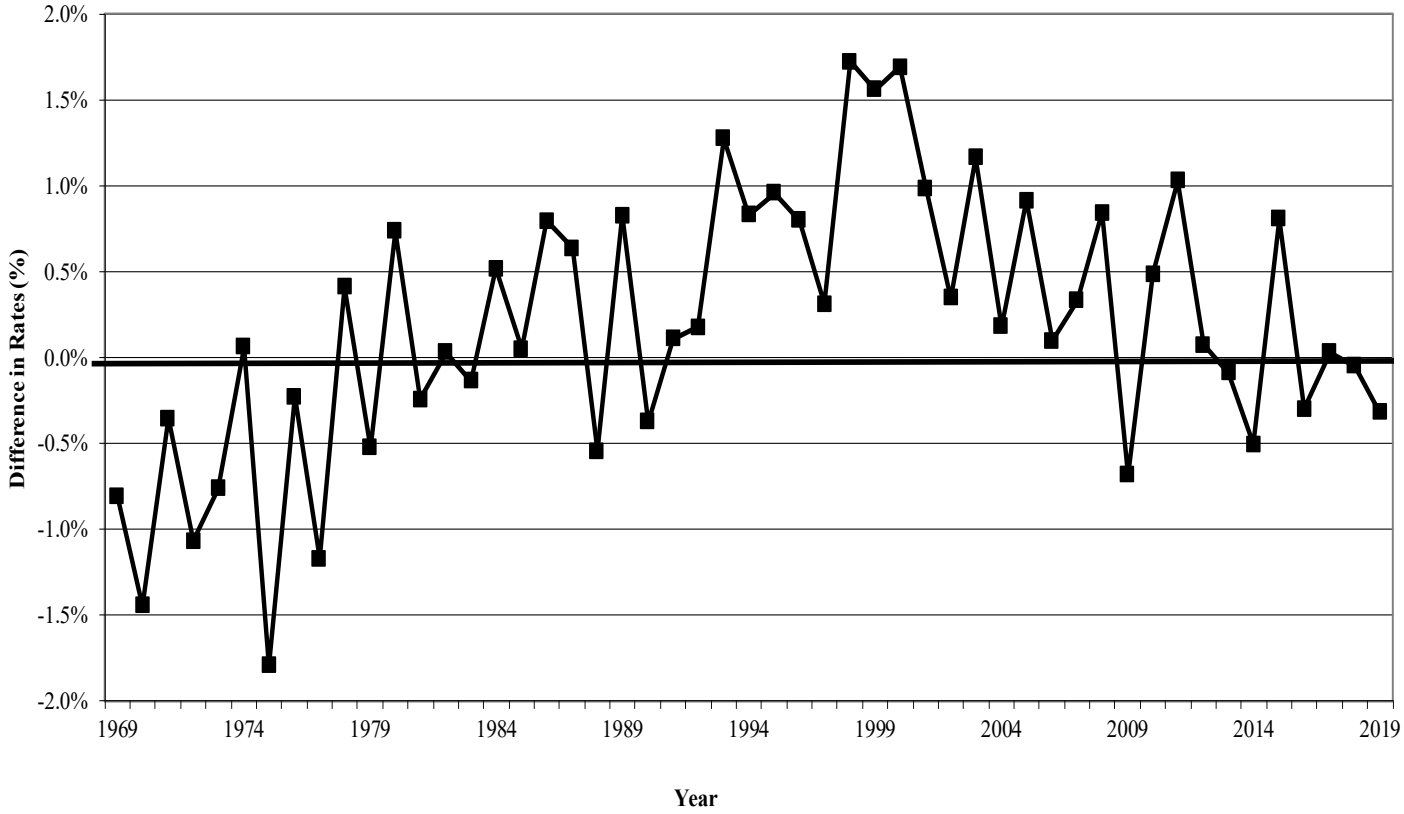
Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 2.1: Historical United States Age-Sex-Adjusted Central Death Rates from 1900-2019



Social Security Administration
Office of the Chief Actuary
June 2, 2022

Chart 2.2: Difference Between Male and Female Annual Percent Reduction in Age-Adjusted Death Rates for Population 65+
(based on Medicare data)



Social Security Administration
Office of the Chief Actuary
June 2, 2022

3. IMMIGRATION

ASSUMPTIONS FOR THE 2022 TRUSTEES REPORT
OFFICE OF THE CHIEF ACTUARY, SSA

TABLE OF CONTENTS PAGE

3.1 Summary

For the 2022 Trustees Report, the ultimate immigration assumptions remain unchanged from those used in the 2021 Trustees Report. Table 3.1 displays the annual immigration levels assumed for the 2022 Trustees Report as well as those assumed for the 2021 Trustees Report. Updated LPR immigration data result in a decrease (worsening) in the long-range OASDI actuarial balance of about 0.01 percent of taxable payroll. Furthermore, the revised path of the LPR new arrival immigration to not decrease as much in 2020 and 2021 and to have the make-up in 2023 and 2024 instead of 2023 – 2025 results in a decrease (worsening) in the long-range OASDI actuarial balance of about 0.01 percent of taxable payroll.

The annual number of immigrants attaining LPR status has averaged around 1.1 million persons per year since 2005. Based on this experience and the belief that the number of future immigrants attaining LPR status in the category of *immediate relatives of U.S. citizens* will remain close to recent levels, the Trustees' intermediate ultimate assumption is 1.05 million new LPRs per year for the 2022 Trustees Report. The Trustees made no change to the assumption that legal emigration out of the Social Security area will be 25 percent of the number of immigrants attaining LPR status, or 262,500 per year, ultimately.

There were no changes to the other-than-LPR immigration model for the 2022 Trustees Report. The model projects the annual other-than-LPR immigration flows in three main components: (1) the other-than-LPR immigrants entering the Social Security area each year, (2) those who leave the stock of other-than-LPR immigrants and move outside the Social Security area, and (3) the other-than-LPR immigrants who adjust status to become LPRs, thereby leaving other-than-LPR status. The net other-than-LPR immigration is equal to the gross level of other-than-LPR immigration, less other-than-LPR emigration out of the Social Security area, and less those who adjust status to become LPRs.

The model projects these annual other-than-LPR immigrant flows, and further projects the stock of other-than-LPR immigrants in three specific categories: (1) those who have temporary legal status ("nonimmigrants"), (2) those who never had legal status ("never-authorized"), and (3) those who originally entered legally as nonimmigrants but overstayed their visas ("visa-overstayers").

Using this model of other-than-LPR immigration, the level of net other-than-LPR immigration, under the intermediate alternative, is projected to be about 553,000 persons for 2030, 468,000 persons for 2050, and 429,000 persons for 2090. The average level of net other-than-LPR immigration during the 75-year projection period is approximately 489,000 persons per year. The following table presents the annual net immigration levels for the intermediate alternative.

Annual Net Immigration: Alternative II Levels for the 2022 Trustees Report			
Year	LPR	Other-than-LPR	Total
2021	699,000	259,000	958,000
2022	788,000	653,000	1,440,000
2023	965,000	1,143,000	2,107,000
2024	965,000	1,117,000	2,081,000
2025	788,000	586,000	1,374,000
2030	788,000	553,000	1,341,000
2040	788,000	500,000	1,288,000
2050	788,000	468,000	1,256,000
2060	788,000	453,000	1,240,000
2070	788,000	441,000	1,228,000
2080	788,000	433,000	1,221,000
2090	788,000	429,000	1,217,000
2100	788,000	428,000	1,215,000

Notes: Components may not sum to totals because of rounding.
Levels rounded to the nearest 1,000.

The COVID-19 pandemic started affecting immigration levels in 2020, and the Trustees assume that it will continue to affect immigration through 2024. The assumptions for the 2022 Trustees Report include decreases in immigration levels due to restrictions that were placed on both immigrant and nonimmigrant entry into the United States because of the pandemic. They also include the expectation that immigration levels will exceed those that would have been assumed in the absence of the pandemic for years 2023 and 2024. This increase for 2023-24 reflects the assumption that those people who had planned to immigrate in 2020 or 2021, but were unable to enter due to COVID-related reasons, will delay their immigration to 2023-24 instead. For all years after 2024, the Trustees assume that immigration levels will return to the assumed ultimate levels.

3.2 Lawful Permanent Resident (LPR) Immigration

The term LPR immigration refers to the number of persons granted authorization to live and work in the United States on a permanent basis. Hereafter, these individuals are referred to as *lawful permanent residents* (LPRs). Many individuals are admitted to the country legally but on a temporary basis. These individuals are included as a portion of the other-than-LPR immigrants and are discussed in the following sections of this memorandum.

There are two ways immigrants attain LPR status:

1) New-arrival LPRs are persons who file an application to become an LPR with the Department of State while living outside of the United States and become an LPR upon entry.

2) Adjustments of Status[1] are persons who are already living in the United States as temporary workers, students, or unauthorized immigrants and apply for and receive an adjustment of status to an LPR.

LPR immigration has been a very important element in the growth of the United States population. For the period 1870 through 1930, the population averaged about 13 percent foreign born. The Census Bureau estimates that the percentage of the civilian non-institutionalized population that is foreign born declined to a low of about 5 percent in the 1970 Census, rose to about 8 percent in the 1990 Census, and was estimated to be approximately 13.7 percent in the 2019 American Community Survey.

Data on the number of LPR immigrants admitted to the U.S., including U.S. possessions and territories and Armed Service posts abroad, are obtained from the Office of Immigration Statistics (OIS), a component of the Department of Homeland Security (DHS). LPR immigration averaged nearly one million persons per year for the period 1904 through 1914. LPR immigration decreased greatly during World War I and following the adoption of quotas based on national origin in 1921. The economic depression in the 1930s caused an additional, but temporary, decrease that resulted in more emigration than immigration. Annual LPR immigration increased after World War II to around 200,000 to 300,000 persons and stayed at that level through the 1950s and into the 1960s. With the Immigration Act of 1965 and other related changes, annual LPR immigration increased to about 400,000 and remained fairly stable until 1977. Between 1977 and 1990, LPR immigration (excluding aliens admitted under the Immigration Reform and Control Act of 1986 [IRCA]) averaged approximately 580,000 per year. This increase was due to the increase in the numbers of relatives admitted and to the large numbers of refugees and political asylees admitted during this period. Table 3.2 lists LPR immigration for fiscal years 1966 through 1991, reflecting the immigration categories established in the 1965 Act.

The Immigration Act of 1990, which took effect in fiscal year 1992, restructured the immigration categories and substantially increased the number of immigrants that may legally enter the United States each year. For fiscal years 1995 and later, the 1990 law specified an annual limit that could range between 421,000 and 675,000 for certain categories of immigrants. These categories and their limits include those admitted based on family-sponsored preference (226,000 to 480,000), employment-based preference (140,000), and diversity (55,000). Other categories of immigrants, such as refugees, are subject to separate limits. The Real ID Act of 2005 eliminated the numerical limit on asylees and no numerical limitation exists for immediate relatives of U.S. citizens. For each of the numerically limited categories, the limits may be adjusted annually based on unused amounts from prior years or other categories. Table 3.3 displays these unadjusted limits and the adjusted limits for each fiscal year from 1995 through 2019.

The annual level of total LPR immigration and the levels by category can vary considerably from year to year as shown in table 3.4. For fiscal years 1998 and 1999, annual LPR immigration was

[1] DHS also considers refugees and asylees to be adjustments of status, but for the purposes of the immigration model, these categories are treated as new arrivals.

about 650,000, the lowest level since the 1990 Act went into effect. This drop is attributed to a backlog in the process caused mainly by the longer time required to process the affidavit of support and the shifting of responsibilities from the Department of State to DHS. LPR immigration was 841,000 in 2000 and over 1,000,000 in 2001 and 2002. These levels in 2000 through 2002 were significantly above the low levels in 1998 and 1999, mainly due to the efforts to reduce the backlog of pending immigration applications. In 2003, LPR immigration declined to a level of 704,000 due to a slowdown in processing because of increased security checks. Since then, the level has increased dramatically and peaked at a level of 1,266,000 persons in 2006 before declining about 17 percent to 1,052,000 in 2007. However, the decline in 2007 is attributed to an unanticipated spike in naturalization applications that temporarily shifted resources away from processing immigration applications. In 2008, the level increased slightly from the 2007 level, to 1,107,000. In 2009, there was another slight increase, to 1,131,000. From 2010 through 2013, total LPR immigration declined from 1,043,000 in 2010 to 991,000 in 2013. Total LPR immigration then increased over the next three years to 1,184,000 in 2016, and then decreased to 1,032,000 in 2019.

Historically, the adjustment of status category has been a substantial portion of all new LPRs. For years 2000 through 2005, approximately 50 percent of all new LPRs were people who had already been in the country as temporary workers, foreign students, or unauthorized immigrants and who filed an application for adjustment to LPR status. Since then, however, the percentage has decreased to an average of approximately 40 percent. Thus, the Trustees assume slightly over 40 percent of future individuals becoming LPRs will be adjustments of status from the other-than-LPR immigrant population.

As noted above, the Trustees assume that the COVID-19 pandemic will affect LPR immigration through 2024, although not by as much as was expected in the 2021 Trustees Report. As shown in table 3.1, the assumed LPR immigration levels for 2021 in the 2022 Trustees Report are higher than those in the 2021 Trustees Report, but still lower than would have been assumed in the absence of the pandemic. LPR immigration levels in 2023 and 2024 are assumed to be higher than would have been assumed in the in the absence of the pandemic, fully making up for the lower levels in 2020 and 2021. This is in contrast to the 2021 TR, when the Trustees had assumed that LPR immigration levels in 2023 through 2025 would be higher than would have been assumed in the absence of the pandemic, fully making up for the lower levels in 2020 and 2021.

For the intermediate alternative, the Trustees assume that the future LPR immigration levels will average approximately 1,050,000 persons per year, consistent with recent historical levels.

It is possible that future global economic conditions assumed under the high-cost alternative and/or less favorable attitudes toward immigration could result in generally lower immigration. Therefore, the Trustees assume an ultimate level of 850,000 LPR immigrants per year for the high-cost alternative. On the other hand, the possibility of a significant increase in the number of immediate relatives admitted and the uncertainty of the number of asylees permits the possibility of annual LPR immigration substantially higher than 1,050,000 persons per year. Therefore, the ultimate level for the low-cost alternative is 1,250,000 persons per year.

3.3 Legal Emigration

Statistics on emigration are sparse and most analysis is based largely on estimates. Research done by the Census Bureau, the OIS, and other experts suggests that annual emigration may generally be in the range of 20 to 40 percent of annual LPR immigration. Expected emigration from the Social Security area should be less than emigration from the United States, especially at the older ages. This is primarily because most individuals who leave the United States having achieved fully insured status are still eligible to receive OASDI benefits and thus are still considered to be in the Social Security area population. For the 2022 Trustees Report, the assumed ratios of emigration to immigration are 20, 25, and 30 percent for the low-cost, intermediate, and high-cost alternatives, respectively. The same ratios of emigration to immigration were assumed for the 2021 Trustees Report.

3.4 Net LPR Immigration

Combining the levels of LPR immigration with the ratios for legal emigration yields ultimate levels of net LPR immigration of 1,000,000, 787,500, and 595,000 per year for the low-cost, intermediate, and high-cost alternatives, respectively.

3.5 Other-than-LPR Immigration and Emigration

The term "other-than-LPR immigration" refers to persons entering the United States in a manner other than lawfully admitted for permanent residence. This population consists of three components:

1) Nonimmigrants: foreign nationals who enter the U.S. with authorization to stay for a temporary period of time and for a specific purpose, such as students and exchange visitors, temporary workers, and diplomats and other representatives.

2) Never-authorized: those who are unauthorized on entry and were never previously legally authorized to be residing in the United States.

3) Visa-overstayers: those who at one point had temporary legal authorization to be residing in the United States but have overstayed their visas.

The stock of the other-than-LPR immigrant population is included in the starting year population level for the Trustees' projections, in accordance with the official policy of the Census Bureau to enumerate all persons residing in the U.S., as well as to provide a basis for estimating the total labor force in the United States and total births in the Social Security area.

During the 1990s, there was rapid growth in the size of the other-than-LPR immigrant population. In a joint project, the OIS and the Census Bureau examined the size of the unauthorized immigrant population between October 1988 and October 1992. In 1988 there were over 4 million unauthorized immigrants residing in the United States. Not counting those who would be subsequently legalized under the Immigration Reform and Control Act of 1986 (IRCA), it is estimated that there were 2.2 million unauthorized immigrants in the population as

of October 1988. At the time of the 1990 Census, 2.6 million persons were estimated to be unauthorized, again excluding those who would subsequently be legalized under the IRCA. (The total unauthorized population in 1990 was roughly 5.3 million.) Subsequent estimates suggest an increase to 3.4 million for October 1992 and approximately 5.0 million for October 1996. The rapid rise in the other-than-LPR immigrant population between 1990 and 1996 reflected the continued inflow of other-than-LPR immigrants combined with a decreased number leaving this status, due to the reduced stock of other-than-LPR immigrants that resulted from the IRCA.

The 2000 Census gave evidence that other-than-LPR immigration since 1990 had been consistently underestimated. In producing intercensal estimates of the U.S. population between the 1990 and 2000 Census, the Census Bureau estimated the average level of annual net other-than-LPR immigration to be approximately 550,000. For 2000, DHS estimated a total other-than-LPR stock of 9.9 million. Based on DHS estimates, the total other-than-LPR stock was 12.2 million in 2005, then increased to 14.1 million in 2008, and then decreased to 13.3 million by 2012. Using DHS methods, the 2020 total other-than-LPR stock is estimated to be 14.7 million.

The other-than-LPR immigration model makes explicit estimates of the following categories:

- The annual numbers of new-arrival other-than-LPR immigrants who enter as never-authorized and who enter legally as nonimmigrants;
- The annual number of non-immigrants who become visa-overstayers;
- The annual numbers of other-than-LPR emigrants (those leaving the Social Security area) who were never-authorized, nonimmigrants, or visa-overstayers; and
- The annual numbers of adjustments of status who were never-authorized, nonimmigrants, or visa-overstayers.

As noted above, the Trustees assume that the COVID-19 pandemic, which began affecting immigration in 2020, will continue to affect other-than-LPR immigration through 2024, although not by as much as was expected in the 2021 Trustees Report. As shown in table 3.1, the assumed other-than-LPR immigration levels for 2021 in the 2022 Trustees Report are higher than those in the 2021 Trustees Report, but still lower than would have been assumed in the absence of the pandemic. Other-than-LPR immigration levels in 2023 and 2024 are assumed to be higher than would have been assumed in the in the absence of the pandemic, fully making up for the lower levels in 2020 and 2021.

For the 2022 Trustees Report, the Trustees assume no change to the ultimate number of new other-than-LPR immigrants per year. The Trustees assume an ultimate level of 1,350,000 per year, for all years, under the intermediate projections. This assumption is unchanged from the 2021 Trustees Report. It is possible that the ultimate level will be higher than 1,350,000 in the future, as other-than-LPR immigrants already in the U.S. may help family members or additional other-than-LPR immigrants enter the country and the demand for other-than-LPR immigrant labor in the economy may increase. Thus, the Trustees assume an ultimate level of 1,850,000 per year under the low-cost (high-immigration) scenario. Due to the possibility that the government will be increasingly willing to pursue deportation of unauthorized immigrants, to withhold services from them, and to crack down on those who employ them, the Trustees assume an ultimate level of 850,000 under the high-cost (low-immigration) scenario.

The level of annual other-than-LPR emigration is projected to rise throughout the 75-year projection period from its current level of about 241,000 in 2021. As the stock of the other-than-LPR immigrant population rises, more emigration is likely to occur. Thus, other-than-LPR emigration is estimated as a function of the population exposed. Rates of emigration by age and sex have been developed for the never-authorized, the nonimmigrants, and the overstayers based on the number of exits from each of these categories estimated to have occurred during the period 2008 through 2010. Ideally, these rates would be developed by age, sex, and duration of stay in the country. Unfortunately, at this time, data are too sparse to develop accurate estimates of the current stock by duration of stay. However, as in the 2021 Trustees Report, the Trustees assume continuing higher rates of emigration for recent entrants.

Applying the method described above results in increasing levels of other-than-LPR emigration[2] throughout the projection period. Under the intermediate alternative, the gross emigration rate (number of other-than-LPR emigrants divided by the midyear other-than-LPR population) is about 1.6 percent in 2021 and reaches a maximum of about 1.8 percent in 2026. Subsequently, it declines to about 1.3 percent at the end of the 75-year projection period.

3.6 Recommendations of Previous Technical Panels and Other Projections

The total net levels of immigration recommended by the 2007, 2011, and 2019 Technical Panels appointed by the Social Security Advisory Board are higher than the levels assumed for the 2022 Trustees Report. However, the levels recommended by the 2015 Technical Panel are generally similar to the levels assumed for the 2022 Trustees Report.

The 2007 Technical Panel recommended setting total net immigration equal to 1.35 million for 2007, with increases of 1.0 percent per year for the first 25 years of the projection period and increases of 0.5 percent per year thereafter. This would have resulted in a total net immigration flow of nearly 2.2 million by the end of the 75-year projection period. [3]

The 2011 Technical Panel recommended setting total net immigration equal to 0.32 percent of the total population for all years after 2025. This would have resulted in a total net immigration flow of nearly 1.63 million by the end of the projection period.

The 2015 Technical Panel recommended setting total net immigration to equal the average between that assumed in the 2015 Trustees Report and that projected by the Census Bureau, while maintaining the proportion of net LPR and net other-than-LPR the same as assumed in the

[2] As the population begins to mature, higher numbers of other-than-LPR immigrants in the population and thus higher levels of emigration are expected, particularly at ages 35 and over. The current other-than-LPR immigrant population is centered very heavily at the younger ages. This concentration at the younger ages is likely due to (1) the relatively high levels of other-than-LPR immigration that began in the late 1990s (individuals entering at relatively young ages) and (2) the effects of the IRCA legislation in the late 1980s (which legalized largely older individuals due to required substantial durations of residence in the country). Therefore, the population of other-than-LPR immigrants is relatively young, with short durations of stay in the country.

[3] All results displayed in this section are based on that current year's Trustees Report model. For example, the result using the 2007 Technical Panel recommendation is based on the 2007 Trustees Report model.

2015 Trustees Report. This would have resulted in a total net immigration flow of nearly 1.32 million by the end of the projection period.

The 2019 Technical Panel did not recommend changing immigration assumptions for years through 2029. However, for years after 2029, the panel recommended setting immigration assumptions so that the following two ratios would stay constant throughout the remaining years of the 75-year projection period: (1) the ratio of total net immigration to the total midyear population and (2) the ratio of net LPR to net other-than-LPR. This would have resulted in a total net immigration flow of nearly 1.86 million by the end of the projection period.

These increases in the levels of total net immigration recommended by some of the panels reflect a number of factors. One factor is that each panel includes the assumption of continuing changes in immigration law to allow more immigrants as the population increases. Historically, the Trustees, as well as other Federal Government entities, have assumed that future immigration will be consistent with current law and that changes based on potential future legislation should not be reflected until enactment. Reflecting the possibility of future changes in immigration law is not unreasonable if there is a conviction that such changes are truly expected to occur and this change in the basis for projecting is fully disclosed. On the other hand, presuming such changes could result in the peculiar situation where the Trustees would need to change assumptions in the future because immigration law had *not* been modified. On balance, the Trustees have retained the practice of reflecting changes in the immigration law only upon enactment. Another factor is the potential number of immigrants entering the U.S. The Trustees recognize that birth rates have dropped in several countries that supply significant numbers of immigrants to the U.S. Most of those countries, particularly Mexico, have seen drops in birth rates since 1990 and will likely average less emigration in the future.

In their 2021 projections, the Congressional Budget Office (CBO) projects total net immigration of 1.1 million people, on average per year, for the period 2041-50.[4] Comparing with the Census Bureau, the middle series of the 2017 National Population Projections results in total net immigration of 1.1 million people throughout most of the projection.[5] The Trustees' assumptions for the intermediate alternative of the 2022 Trustees Report result in total net immigration of 1.3 million people in 2040.

[4] See https://www.cbo.gov/system/files/2021-03/56977-LTBO-2021.pdf.
[5] See table 1 at https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html.

Table 3.1: Annual Immigration Assumptions[1] for the Social Security Area Population

(All values rounded to the nearest 1,000)

Values Used for 2021 Trustees Report					
Alternative	Year	Gross LPR	Net LPR	Gross Other-than-LPR	Net Other-than-LPR
Low Cost:	2021	860,000	688,000	1,350,000	541,000
	2022	1,250,000	1,000,000	1,850,000	1,030,000
	2023	1,510,000	1,208,000	2,260,000	1,417,000
	2024	1,510,000	1,208,000	2,260,000	1,385,000
	2025	1,510,000	1,208,000	2,260,000	1,355,000
	2030	1,250,000	1,000,000	1,850,000	872,000
	2040	1,250,000	1,000,000	1,850,000	771,000
	2050	1,250,000	1,000,000	1,850,000	704,000
	2060	1,250,000	1,000,000	1,850,000	669,000
	2070	1,250,000	1,000,000	1,850,000	647,000
	2080	1,250,000	1,000,000	1,850,000	636,000
	2090	1,250,000	1,000,000	1,850,000	631,000
	2100	1,250,000	1,000,000	1,850,000	629,000
Intermediate:	2021	660,000	495,000	880,000	185,000
	2022	1,050,000	788,000	1,350,000	652,000
	2023	1,310,000	983,000	1,750,000	1,039,000
	2024	1,310,000	983,000	1,750,000	1,016,000
	2025	1,310,000	983,000	1,750,000	994,000
	2030	1,050,000	788,000	1,350,000	551,000
	2040	1,050,000	788,000	1,350,000	501,000
	2050	1,050,000	788,000	1,350,000	468,000
	2060	1,050,000	788,000	1,350,000	453,000
	2070	1,050,000	788,000	1,350,000	441,000
	2080	1,050,000	788,000	1,350,000	434,000
	2090	1,050,000	788,000	1,350,000	431,000
	2100	1,050,000	788,000	1,350,000	429,000
High Cost:	2021	460,000	322,000	490,000	-95,000
	2022	850,000	595,000	850,000	269,000
	2023	1,110,000	777,000	1,210,000	625,000
	2024	1,110,000	777,000	1,210,000	612,000
	2025	1,110,000	777,000	1,210,000	599,000
	2030	850,000	595,000	850,000	229,000
	2040	850,000	595,000	850,000	229,000
	2050	850,000	595,000	850,000	232,000
	2060	850,000	595,000	850,000	237,000
	2070	850,000	595,000	850,000	238,000
	2080	850,000	595,000	850,000	237,000
	2090	850,000	595,000	850,000	236,000
	2100	850,000	595,000	850,000	235,000

Values Used for 2022 Trustees Report					
Alternative	Year	Gross LPR	Net LPR	Gross Other-than-LPR	Net Other-than-LPR
Low Cost:	2021	1,082,000	866,000	1,450,000	700,000
	2022	1,250,000	1,000,000	1,850,000	1,033,000
	2023	1,486,000	1,189,000	2,355,000	1,514,000
	2024	1,486,000	1,189,000	2,355,000	1,478,000
	2025	1,250,000	1,000,000	1,850,000	939,000
	2030	1,250,000	1,000,000	1,850,000	875,000
	2040	1,250,000	1,000,000	1,850,000	771,000
	2050	1,250,000	1,000,000	1,850,000	705,000
	2060	1,250,000	1,000,000	1,850,000	669,000
	2070	1,250,000	1,000,000	1,850,000	647,000
	2080	1,250,000	1,000,000	1,850,000	635,000
	2090	1,250,000	1,000,000	1,850,000	629,000
	2100	1,250,000	1,000,000	1,850,000	627,000
Intermediate:	2021	932,000	699,000	950,000	259,000
	2022	1,050,000	788,000	1,350,000	653,000
	2023	1,286,000	965,000	1,855,000	1,143,000
	2024	1,286,000	965,000	1,855,000	1,117,000
	2025	1,050,000	788,000	1,350,000	586,000
	2030	1,050,000	788,000	1,350,000	553,000
	2040	1,050,000	788,000	1,350,000	500,000
	2050	1,050,000	788,000	1,350,000	468,000
	2060	1,050,000	788,000	1,350,000	453,000
	2070	1,050,000	788,000	1,350,000	441,000
	2080	1,050,000	788,000	1,350,000	433,000
	2090	1,050,000	788,000	1,350,000	429,000
	2100	1,050,000	788,000	1,350,000	428,000
High Cost:	2021	732,000	512,000	500,000	-83,000
	2022	850,000	595,000	850,000	269,000
	2023	1,086,000	760,000	1,355,000	768,000
	2024	1,086,000	760,000	1,355,000	752,000
	2025	850,000	595,000	850,000	231,000
	2030	850,000	595,000	850,000	229,000
	2040	850,000	595,000	850,000	227,000
	2050	850,000	595,000	850,000	231,000
	2060	850,000	595,000	850,000	237,000
	2070	850,000	595,000	850,000	237,000
	2080	850,000	595,000	850,000	236,000
	2090	850,000	595,000	850,000	235,000
	2100	850,000	595,000	850,000	234,000

[1] This table contains basic assumptions along with key summary values that are derived from basic assumptions.

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 3.2: LPR Immigrants Admitted to the United States: Fiscal Years 1966-91

(in thousands)

Reflecting Categories Established in the 1965 Immigration Act

Fiscal Year	IRCA[1]	Total non IRCA	Numerically Limited[2]	Western Hemisphere[3]	Immediate Relatives of Citizens	Refugees & Asylees	Other Specially Legislated Immigrants[4]
1966	—	323	126	148	39	4	6
1967	—	362	153	125	47	30	7
1968	—	454	156	154	44	95	6
1969	—	359	291	—	60	1	7
1970	—	373	287	—	79	—	7
1971	—	370	281	—	81	—	8
1972	—	385	284	—	86	—	15
1973	—	400	283	—	101	—	16
1974	—	395	274	—	105	—	16
1975	—	386	282	—	92	—	13
1976	—	399	285	—	102	—	12
TQ 1976[5]	—	104	73	—	28	—	3
1977	—	462	277	—	106	68	12
1978	—	601	341	—	126	122	12
1979	—	460	279	—	138	32	11
1980	—	531	289	—	158	76	8
1981	—	597	330	—	152	107	7
1982	—	594	260	—	168	157	9
1983	—	560	269	—	178	103	10
1984	—	544	262	—	183	92	7
1985	—	570	264	—	204	95	6
1986	—	602	267	—	223	104	7
1987	—	602	271	—	219	92	20
1988	—	643	264	—	219	82	78
1989	479	612	280	—	218	84	30
1990	884	656	298	—	232	97	29
1991	1,133	704	294	—	237	139	34

[1] This category includes those aliens admitted under the Immigration Reform and Control Act of 1986.

[2] Legal limits on immigration visas were 170,000 per fiscal year before 1969, 290,000 per fiscal year for 1969 through 1979, 280,000 for fiscal year 1980, and 270,000 for fiscal years 1981 and later. Includes additional visas starting 1989.

[3] Natives of Western Hemisphere countries, their children and spouses, Act of October 3, 1965. This category became numerically limited to 120,000 starting fiscal year 1969.

[4] This category consists mainly of children born abroad to alien residents, ministers and their families, beginning 1971, spouses of U.S. citizens who entered as fiances and their children, and beginning 1988 Amerasians, special Cuban / Haitian entrants, and aliens in the U.S. since 1972.

[5] The transition quarter (TQ) for 1976 covers the 3-month period, July-September 1976. Fiscal years 1966 through 1976 end on June 30. Beginning with fiscal year 1977, the data for fiscal years end on September 30.

Source: Annual Reports of the Immigration and Naturalization Service, Department of Justice

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 3.3: LPR Immigration Limits for Fiscal Years Beginning in 1995

		Family Sponsored Preference	Immediate Relatives of U.S. Citizens	Employment Based	Diversity	Refugees	Asylees
Unadjusted Limit		226,000 to 480,000 [1]	Not Limited	140,000 [2]	55,000 [3]	Set Annually	Not Limited [4]
Limit For Fiscal Year	**1995**	253,721	Not Limited	146,503	55,000	111,000	10,000
	1996	311,819	Not Limited	140,000	55,000	90,000	10,000
	1997	226,000	Not Limited	140,000	55,000	78,000	10,000
	1998	226,000	Not Limited	140,000	55,000	83,000	10,000
	1999	226,000	Not Limited	160,906	55,000	91,000	10,000
	2000	294,601	Not Limited	142,299	55,000	90,000	10,000
	2001	226,000	Not Limited	192,074	55,000	80,000	10,000
	2002	226,000	Not Limited	142,632	55,000	70,000	10,000
	2003	226,000	Not Limited	171,532	55,000	70,000	10,000
	2004	226,000	Not Limited	204,422	55,000	70,000	10,000
	2005	226,000	Not Limited	148,449	55,000	70,000	Not Limited
	2006	226,000	Not Limited	143,949	55,000	70,000	Not Limited
	2007	226,000	Not Limited	147,148	55,000	70,000	Not Limited
	2008	226,000	Not Limited	162,704	55,000	80,000	Not Limited
	2009	226,000	Not Limited	140,000	55,000	80,000	Not Limited
	2010	226,000	Not Limited	150,657	55,000	80,000	Not Limited
	2011	226,000	Not Limited	140,000	55,000	80,000	Not Limited
	2012	226,000	Not Limited	144,951	55,000	76,000	Not Limited
	2013	226,000	Not Limited	158,466	55,000	70,000	Not Limited
	2014	226,000	Not Limited	150,241	55,000	70,000	Not Limited
	2015	226,000	Not Limited	144,796	55,000	70,000	Not Limited
	2016	226,000	Not Limited	140,338	55,000	85,000	Not Limited
	2017	226,000	Not Limited	140,000	55,000	50,000	Not Limited
	2018	226,000	Not Limited	140,292	55,000	45,000	Not Limited
	2019	226,000	Not Limited	141,918	55,000	30,000	Not Limited

[1] The family preference limit is given as a range because it is equal to the larger of: 226,000 or 480,000 minus the previous year's immediate relatives of U.S. citizens minus certain other small categories of children minus certain categories of aliens paroled into the U.S. in the second preceding fiscal year plus unused employment preferences from the previous year.

[2] The employment-based preference can be higher than 140,000 if certain other preferences go unused in the previous year.

[3] The Diversity category includes those immigrating through the Nicaraguan Adjustment and Central American Relief Act (NACARA).

[4] The REAL ID Act of 2005 eliminated the numerical limit for Asylees.

Sources:
1. Family sponsored, Employment based, and Diversity: Table A1 of
https://www.dhs.gov/sites/default/files/publications/immigration-statistics/yearbook/2019/lawful_permanent_residents_2019.pdf
2. Immediate Relatives: all "not limited" unless legislation changes
3. Refugees: Pages 2-3 of
https://www.dhs.gov/sites/default/files/publications/immigration-statistics/yearbook/2019/lawful_permanent_residents_2019.pdf
4. Asylees: Historical years: text on page 6 of
http://www.dhs.gov/xlibrary/assets/statistics/yearbook/2003/2003Yearbook.pdf

Social Security Administration
Office of the Chief Actuary
June 2, 2022

Table 3.4: LPR Immigrants Admitted to the United States: Fiscal Years Beginning in 1985

(in thousands)

Reflecting revised categories in the 1990 Immigration Act, Subject to limitation under the overall flexible cap

Fiscal Year	IRCA[1]	Total non IRCA[2]	Family Sponsored	Employment Based	Immediate Relatives	Refugees & Asylees	Diversity	Other Specially Legislated Immigrants
1985	—	570	213	53	204	95	—	4
1986	—	602	213	57	223	104	—	4
1987	—	602	212	58	219	92	3	19
1988	—	643	201	59	219	82	6	76
1989	479	612	217	58	218	84	7	28
1990	884	656	215	58	232	97	29	25
1991	1,133	704	216	60	237	139	22	30
1992	163	811	213	116	235	117	89	40
1993	17	880	227	147	255	127	89	35
1994	4	798	212	123	250	121	75	17
1995	3	716	238	85	220	115	48	10
1996	3	916	294	117	300	128	58	17
1997	1	798	213	90	321	112	49	12
1998	1	653	191	77	283	52	45	4
1999	—	645	217	57	258	43	48	24
2000	—	841	235	107	346	63	51	39
2001	—	1,059	232	179	440	108	42	59
2002	—	1,059	187	174	484	126	43	46
2003	—	704	159	82	331	45	46	41
2004	—	958	214	155	418	71	50	49
2005	—	1,122	213	247	436	143	46	37
2006	—	1,266	222	159	580	216	44	44
2007	—	1,052	195	162	495	136	42	23
2008	—	1,107	228	165	488	166	42	18
2009	—	1,131	212	141	536	177	48	17
2010	—	1,043	215	148	476	136	50	17
2011	—	1,062	235	139	453	168	50	16
2012	—	1,032	202	144	479	151	40	16
2013	—	991	210	161	439	120	46	14
2014	—	1,017	229	152	416	134	53	32
2015	—	1,051	214	144	465	152	48	28
2016	—	1,184	238	138	567	157	50	34
2017	—	1,127	232	138	517	146	52	43
2018	—	1,097	217	138	479	186	45	32
2019	—	1,032	204	139	506	107	43	32

[1] This category includes those aliens admitted under the Immigration Reform and Control Act of 1986.

[2] Comprehensive immigration legislation increased total immigration under an overall flexible cap of 675,000 immigrants beginning in fiscal year 1995, preceded by a 700,000 level during fiscal years 1992 through 1994.

Source: Table 6 of the 2019 Yearbook of Immigration Statistics from the Office of Immigration Statistics, Department of Homeland Security: https://www.dhs.gov/immigration-statistics/yearbook/2019

Social Security Administration
Office of the Chief Actuary
June 2, 2022