APPENDIX A.—ASSUMPTIONS AND METHODS UNDERLYING THE ACTUARIAL ESTIMATES

This appendix describes the assumptions and methods which underlie the actuarial estimates in this report. Unless specifically stated otherwise, the assumptions and methods were used for each of the three alternatives and for both the short-range and long-range periods. Some of the economic and demographic assumptions which vary by alternative are summarized in the section entitled "Actuarial Estimates." Further details about the assumptions, methods, and actuarial estimates are contained in Actuarial Studies published by the Office of the Actuary, Social Security Administration, and are available upon request.

TOTAL POPULATION

Projections were made of the population in the Social Security coverage area by age, sex, and marital status as of January 1 of each year 1990 through 2080. The projections started with an estimate of the United States population, including armed forces overseas, as of January 1, 1989, based on data from the Bureau of the Census. This population estimate was adjusted for net census undercount and increased for other U.S. citizens living abroad and for populations in the geographic areas covered by the OASDI program but not included in the U.S. population. This population was then projected using assumed rates of birth, death, marriage, and divorce and assumed levels of net immigration.

Historically, fertility rates in the United States have fluctuated widely. The total fertility rate is defined to be the average number of children that would be born to a woman in her lifetime if she were to experience the birth rates by age observed in, or assumed for, the selected year, and if she were to survive the entire child-bearing period. The total fertility rate decreased from 3.3 children per woman after World War I to 2.1 during the Great Depression, rose to 3.7 in 1957, and then fell to 1.7 in 1976. Since then, it has risen to a level currently estimated at 2.0.

These variations in fertility rates have resulted from changes in many factors, including social attitudes, economic conditions, and the use of birth-control methods. Future fertility rates may be expected to remain close to recent levels. The recent historical and projected trends in certain population characteristics are consistent with a continued relatively low fertility rate. These trends include the rising percentages of women who have never married, of women who are divorced, and of young women who are in the labor force. Based on consideration of these factors, ultimate total fertility rates of 2.2, 1.9, and 1.6 children per woman were selected for alternatives I, II, and III, respectively. For each alternative, the total fertility rate is assumed to reach its ultimate level in 2015. These ultimate values can be compared to those used by the Bureau of the Census for its latest series of population projections. Those fertility rates range from 2.2 to 1.5, with an intermediate assumption of 1.8.[1] A rate of 2.1 would ultimately result in a nearly constant population if net immigration were zero and if death rates were constant.

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[1]U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 1018, "Projections of the Population of the United States By Age, Sex, and Race: 1988-2080," U.S. Government Printing Office, Washington, D.C., January 1989.

Historically, death rates in the United Sates have declined steadily. The age-sex-adjusted death rate—which is calculated here as the crude rate that would occur in the enumerated total population as of April 1, 1980, if that population were to experience the death rates by age and sex for the selected year—declined at an average rate of 1.2 percent per year between 1900 and 1988. These reductions in death rates have resulted from many factors, including increased medical knowledge and availability of health-care services and improvements in personal health-care practices such as diet and exercise. Based on consideration of the likelihood of continued progress in these and other areas, three alternative sets of ultimate annual percentage reductions in central death rates by age, sex, and cause of death were selected for 2015 and later. The intermediate set, which is used for alternative II, is considered to be the one closest to average expectations. The average annual percentage reductions used for alternative I are smaller than those for alternative II, while those used for alternative III are greater. Between 1990 and 2015, the reductions in central death rates for alternative II are assumed to change gradually from the average annual reductions by age, sex, and cause of death observed between 1968 and 1987, to the ultimate annual percentage reductions by age, sex, and cause of death assumed for 2015 and later. Alternative I reductions are assumed to change gradually from 50 percent of the average annual reductions observed between 1968 and 1987, while alternative III reductions are assumed to change gradually from 150 percent of the average annual reductions observed between 1968 and 1987. The age-sex-adjusted death rate (for all causes combined) declined at an average rate of 1.6 percent per year between 1968 and 1987.

After adjustment for changes in the age-sex distribution of the population, the resulting death rates were projected to decline at an average annual rate of about 0.3 percent, 0.6 percent, and 0.9 percent between 1990 and 2065 for alternatives I, II, and III, respectively.

For 1989, the net legal immigration is assumed to be 480,000 persons per year and, consistent with the estimates of other-than-legal immigration made by the Bureau of the Census since the 1980 Census, net other-than-legal immigration is assumed to be 200,000 persons per year. For calendar years 1990 and 1991, net immigration is assumed to be 800,000, 600,000, and 450,000 persons per year for alternatives I, II, and III, respectively. Of these net numbers of immigrants, 450,000, 400,000, and 350,000, respectively, are assumed to be legal, and the remainders are assumed to be other-than-legal. Because of legislative changes which increase the limits on the number of legal immigrants beginning in 1992, net immigration for the remainder of the projection period is assumed to be 1,000,000, 750,000, and 600,000 persons per year for alternatives I, II, and III, respectively. Of these net numbers of immigrants, 650,000, 550,000, and 500,000, respectively, are assumed to be legal, and the remainders are assumed to be other-than-legal.

Table A1 shows the projected population as of July 1 by broad age group, for the three alternatives. Also shown are tabulated aged dependency ratios (see table footnotes for definitions). Because eligibility for many types of OASDI benefits depends on marital status, the

population was projected by marital status, as well as by age and sex. Marriage and divorce rates were based on recent data from the National Center for Health Statistics.

TABLE A1.—SOCIAL SECURITY AREA POPULATION AS OF JULY 1 AND DEPENDENCY RATIOS, BY ALTERNATIVE AND BROAD AGE GROUP, CALENDAR YEARS 1950-2065

Calendar year	Population (in thousands)				Dependency ratio	
	Under 20	20-64	65 and over	Total	Aged[1]	Total[2]
Past experience:						
1950	53,895	92,739	12,752	159,386	0.138	0.719
1960	72,989	99,842	17,250	190,081	.173	.904
1970	80,885	113,073	20,892	214,850	.185	.900
1975	78,787	122,639	23,228	224,653	.189	.832
1980	74,929	134,199	26,125	235,252	.195	.753
1985	73,176	144,967	29,023	247,166	.200	.705
Alternative I:						
1990	74,891	152,791	31,991	259,672	.209	.700
1995	78,859	160,472	34,224	273,554	.213	.705
2000	82,172	169,272	35,122	286,566	.207	.693
2005	84,165	178,782	36,101	299,047	.202	.673
2010	85,984	187,058	38,727	311,769	.207	.667
2015	88,310	192,489	44,161	324,960	.229	.688
2020	91,853	195,223	50,967	338,042	.261	.732
2025	95,548	196,250	58,530	350,329	.298	.785
2030	98,707	198,592	64,308	361,606	.324	.821
2035	101,336	204,026	66,738	372,100	.327	.824
2040	104,057	211,111	67,059	382,227	.318	.811
2045	107,255	218,121	66,991	392,367	.307	.799
2050	110,733	224,110	67,979	402,823	.303	.797
2055	114,127	229,760	69,935	413,823	.304	.801
2060	117,308	235,663	72,529	425,501	.308	.806
2065	120,443	242,691	74,650	437,784	.308	.804
Alternative II:						
1990	74,854	152,723	31,995	259,573	.209	.700
1995	78,113	159,460	34,402	271,975	.216	.706
2000	80,083	167,123	35,682	282,889	.214	.693
2005	80,137	175,523	37,133	292,793	.212	.668
2010	79,365	182,757	40,219	302,341	.220	.654
2015	78,606	186,827	46,100	311,533	.247	.667
2020	79,033	187,576	53,377	319,985	.285	.706
2025	79,754	186,039	61,480	327,273	.330	.759
2030	80,022	185,237	67,841	333,099	.366	.798
2035	79,865	186,878	70,791	337,533	.379	.806
2040	79,691	189,612	71,546	340,849	.377	.798
2045	79,742	191,836	71,809	343,387	.374	.790
2050	80,011	192,478	73,007	345,495	.379	.795
2055	80,263	192,129	75,092	347,484	.391	.809
2060	80,363	191,611	77,590	349,563	.405	.824
2065	80,373	192,136	79,235	351,744	.412	.831
Alternative III:						
1990	74,828	152,677	32,000	259,505	.210	.700
1995	77,502	158,876	34,589	270,967	.218	.706
2000	78,263	165,747	36,240	280,250	.219	.691
2005	76,528	173,068	38,136	287,732	.220	.663
2010	73,368	179,518	41,692	294,579	.232	.641
2015	69,853	182,753	48,081	300,687	.263	.645
2020	67,637	182,156	55,933	305,726	.307	.678
2025	65,981	178,735	64,736	309,452	.362	.731
2030	64,098	175,479	71,929	311,506	.410	.775
2035	62,037	174,013	75,797	311,846	.436	.792
2040	59,999	173,101	77,538	310,638	.448	.795
2045	58,083	171,308	78,775	308,166	.460	.799
2050	56,434	167,521	80,840	304,795	.483	.819
2055	54,926	162,311	83,655	300,892	.515	.854
2060	53,425	156,798	86,533	296,756	.552	.893
2065	51,917	152,551	88,046	292,514	.577	.917

[1]Population aged 65 and over, divided by population aged 20-64.

[2]Sum of population aged 65 and over, and population under age 20, divided by population aged 20-64.

Note: Totals do not necessarily equal the sums of rounded components.

COVERED POPULATION

The number of covered workers in a year is defined as the number of persons who, at any time during the year, have OASDI taxable earnings. Projections of the numbers of covered workers were made by applying projected coverage rates to the projected Social Security area population. The coverage rates—i.e., the number of covered workers in the year, as a percentage of the population as of July 1—were determined by age and sex using projected labor force participation rates and unemployment rates, and their historical relationships to coverage rates. In addition, the coverage rates were adjusted to reflect the increase in coverage of (1) State and local government employment that will result from the enactment of the Omnibus Budget Reconciliation Act of 1990 and (2) Federal civilian employment that will result from the 1983 Social Security Amendments.

Labor force participation rates were projected by age and sex, taking into account projections of the percentage of the population that is married, the percentage of the population that is disabled, the number of children in the population, the level of retirement benefits, and the state of the economy. All of these factors vary by alternative. For men, the projected age-adjusted labor force participation rates for the year 2065 for alternatives I, II, and III are 1.8, 2.3, and 2.7 percentage points lower, respectively, than the 1990 level of 76.6 percent. For women, the projected age-adjusted labor force participation rates increase for alternatives I and II and decrease for alternative III. The projected rates for 2065 are 2.6, 1.0, and -0.6 percentage points, respectively, different from the 1990 level of 57.6 percent.

The total age-sex-adjusted unemployment rate averaged 5.9 percent for the last 30 years 1961-90 and 7.0 percent for the last 10 years 1981-90. The ultimate total age-sex-adjusted unemployment rate is assumed to be 5.0, 6.0, and 7.0 percent for alternatives I, II, and III, respectively. Because the unemployment rate depends on the state of the economy, cyclical trends are reflected in the short-range period. Unemployment levels off to the assumed ultimate rate by the year 2000, for each of the three alternatives.

The projected age-adjusted coverage rate for men decreases from its 1990 level of 75.2 percent to 73.7, 72.9, and 72.2 percent in 2065 on the basis of alternatives I, II, and III, respectively. For women, it changes from its 1990 level of 59.3 percent to 61.8, 60.0, and 58.3 percent for alternatives I, II, and III, respectively.

AVERAGE EARNINGS AND INFLATION

Future increases in average earnings and in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W, hereinafter denoted as "CPI") will directly affect the OASDI program. Increases in the CPI directly affect the automatic cost-of-living benefit increases, while inflation in general affects the nominal levels of average earnings, GNP, and taxable payroll. Average earnings in covered employment for each year have a direct effect on the size of the taxable payroll and on the future level of average benefits. In addition, increases in average wages in the U.S. economy directly affect the indexation, under the

automatic-adjustment provisions in the law, of the benefit formulas, the contribution and benefit base, the exempt amounts under the retirement earnings test, the amount of earnings required for a quarter of coverage, and under certain circumstances, the automatic cost-of-living benefit increases.

Increases in average earnings were projected in two components—average earnings of wage-and-salary workers, usually referred to as average wages (and shown in table 10 of this report), and average net earnings of self-employed persons. Each of these was subdivided into increases in real average earnings and increases in the CPI. For simplicity, real-earnings increases are expressed in the form of real-earnings differentials—i.e., the percentage increase in average nominal earnings, minus the percentage increase in the CPI.

The assumed ultimate increases in average real earnings are based on analysis of trends in productivity gains and the factors linking productivity gains with increases in average real earnings. For the 30 years 1960-89, annual increases in productivity for the total U.S. economy averaged 1.6 percent, the result of average annual increases of 2.4, 1.5, and 0.9 percent for the 10-year periods 1960-69, 1970-79 and 1980-89, respectively. Meanwhile, the average annual rate of change in average real earnings was an increase of 0.8 percent for the 30 years 1960-89, the result of average annual increases of 2.3, -0.2, and 0.2 percent, respectively, for the aforementioned 10-year periods. The change in the linkage between annual increases in productivity and real earnings averaged 0.8 percent for the 30 years 1960-89, and 0.1, 1.7, and 0.7 percent, respectively, for the aforementioned 10-year periods. The change in the linkage reflects changes in such factors as the average number of hours worked per year, the extent to which workers share in the value of production, the proportion of employee compensation paid as wages, and price adjustment due to the ratio of the GNP price deflator index to the CPI.

The ultimate annual increases in productivity for all sectors—wage-and-salary workers, self-employed persons, and the total economy—are assumed to be 1.9, 1.5, and 1.2 percent for alternatives I, II, and III, respectively. The corresponding ultimate annual rates of change in the linkage for wage-and-salary workers are assumed to be declines of 0.2, 0.4, and 0.6 percent for alternatives I, II, and III, respectively. This linkage is made up of assumed annual decreases of 0.1, 0.2, and 0.3 percent in average hours worked per year, and 0.1, 0.2, and 0.3 percent annual declines in wages as a share of compensation, for alternatives I, II, and III, respectively. No ultimate change is assumed for the historically relatively stable ratio of employee compensation to GNP. The resulting ultimate real-wage differentials are 1.7, 1.1, and 0.6 percent. Ultimate annual declines in the linkage for self-employed persons are smaller because the proportion of reported compensation that is considered earnings remains constant. As a result, ultimate real-earnings differentials for the self-employed are assumed to be higher than for wage-and-salary workers. The corresponding ultimate real-earnings differentials for wage-and-salary workers and self-employed persons, combined, are slightly higher than those assumed for wage-and-salary workers only.

Historically, the CPI has increased, on average, by 4.2 percent for the last 39 years from 1951 to 1990, 5.0 percent for the last 30 years from 1960 to 1990, 6.2 percent for the last 20 years from 1970 to 1990, and 4.5 percent for the last 10 years from 1980 to 1990. The 6.2 percent increase from 1970 to 1990 reflects sharp increases in oil prices and their subsequent effect on the overall economy. The ultimate average annual CPI increases of 3.0, 4.0, and 5.0 percent for alternatives I, II, III, respectively, were chosen to include a reasonable range of possible future experiences. Ultimate annual increases in the GNP price deflator are assumed to be the same, for each alternative, as for the CPI.

The ultimate increases in average annual wages in covered employment are assumed to be 4.7, 5.1, and 5.6 percent, for alternatives I, II, and III, respectively. These were obtained, for each alternative, by adding the assumed annual percentage increase in the CPI to the assumed real-wage differential. Ultimate increases in average wages and earnings for the U.S. economy are very similar to those assumed for average wages in covered employment.

TAXABLE PAYROLL AND TAXES

The taxable payroll for any period is that amount which, when multiplied by the combined employee-employer tax rate, yields the total amount of taxes paid by employees, employers, and the self-employed for work during the period. The taxable payroll is important not just in estimating OASDI income, but also in determining income and cost rates, and actuarial balances. These terms are defined in the introduction to the section entitled "Actuarial Estimates."

In practice, the taxable payroll is calculated as a weighted average of the earnings on which employees, employers, and self-employed persons make contributions to the OASDI program. The weighting takes into account the lower tax rates, as compared to the combined employee-employer rate, which apply to multiple-employer "excess wages," and which did apply, before 1984, to net earnings from self-employment and, before 1988, to tips. For 1983 and later, taxable payroll also includes deemed wage credits for military service. Estimates of taxable earnings for employees, employers, and the self-employed were developed from corresponding estimates of earnings in the U.S. economy, by means of factors which adjust for various differences in these measures. The factors adjust total U.S. earnings by removing earnings from noncovered employment, adding earnings from various outlying areas which are covered by Social Security but are not included in published "U.S." data, and removing earnings above the taxable earnings base.

For the 1991 report, an increase in the ratio of taxable earnings to earnings in OASDI covered employment for 1989, along with the assumption that this ratio will decline slightly over the next decade, result in an increase in the projected level of taxable payroll.

Estimates of taxes collected were developed from the corresponding estimates of taxable earnings by applying the employee, employer, or self-employed tax rate, and by taking into account the lag time from the incurrence of tax liability to the collection of taxes.

INSURED POPULATION

There are three basic types of insured status under the OASDI program: fully insured, currently insured, and disability insured. Fully insured status is required of an aged worker for eligibility to a primary retirement benefit and for the eligibility of that worker's spouse and children to auxiliary benefits. Fully insured status is also required of a deceased worker for the eligibility of the worker's survivors to benefits (with the exception of child survivors and parents of eligible child survivors, in which cases the deceased worker is required to have had either currently insured status or fully insured status). Disability insured status, which is more restrictive than fully insured status, is required of a disabled worker for eligibility to a primary disability benefit and for the eligibility of the worker's spouse and children to auxiliary benefits.

Projections of the percentage of the population that is fully insured were made by age and sex, from estimated distributions of workers by accumulated quarters of coverage based on past and projected coverage rates and amounts of earnings required for quarters of coverage. Currently insured status was disregarded for purposes of these estimates, because the number of cases in which eligibility for benefits is based solely on currently insured status is relatively small. Projections of the percentage of fully insured persons who are also disability insured were made by age and sex based on past and projected coverage rates, the requirement for disability insured status, and their historical relationships. Finally, the fully insured and disability insured populations were developed from the projected total population by applying the appropriate percentages.

Under this procedure, the percentage of the Social Security area population aged 62 and over that is fully insured is projected to increase from 75.8 on January 1, 1990, to 90.8, 90.7, and 90.4 on January 1, 2066, based on alternatives I, II, and III, respectively. The increase for females is projected to be much greater than the increase for males. Based on alternative II, for example, the percentage for males is projected to increase only slightly during this period from 92.0 to 92.6, while that for females is projected to increase more substantially from 64.2 to 89.2.

The fully insured population by age and sex was further subdivided by marital status, by using the variation in labor force participation rates by marital status to estimate the variation in coverage rates by marital status. These coverage rates were then used to estimate the variation in the fully insured rates by marital status.

OLD-AGE AND SURVIVORS INSURANCE BENEFICIARIES

The numbers of OASI beneficiaries were projected for each type of benefit separately, by the sex of the worker on whose earnings the benefits are based, and by the age of the beneficiary. For selected types of benefits, the numbers of beneficiaries were also projected by marital status.

In the short-range period, the numbers of retired-worker beneficiaries were developed by applying award rates to the numbers of persons who are insured but not yet retired, and by applying termination rates to the numbers of persons already receiving retired-worker benefits. In the long

range, the numbers of retired-worker beneficiaries who are not converted from disabled-worker beneficiaries were projected as a percentage of the aged fully insured population less those persons entitled to disability or widow(er)'s benefits (i.e., the exposed population). The percentages for ages 70 and over were assumed to be 100, because the retirement earnings test and delayed retirement credit do not apply after age 70. The percentages for ages 62 through 69 were adjusted in accordance with observed short-range trends and, for each year of attainment of age 62, as a function of the ratio of the monthly benefit amount payable at each age of entitlement to the amount payable at age-70 entitlement. This resulted in a gradual downward adjustment as the increases in the delayed retirement credit become effective and, beginning in 2000, during the years in which the normal retirement age is scheduled to increase. The net effect of these adjustments is to decrease the percentages to ultimate values, which are reached in 2030. The numbers of retired-worker beneficiaries who are converted from disabled-worker beneficiaries were calculated separately in a manner consistent with the calculation of disabled-worker beneficiaries.

The numbers of aged-spouse beneficiaries were estimated from the population projected by age and sex. The benefits of aged-spouse beneficiaries are based on the earnings records of their husbands or wives, who are referred to as "wage earners." In the short-range period, a regression equation was used to project the number of aged-spouse beneficiaries, as a proportion of the aged female or male population not receiving retired-worker or aged-widow(er) benefits. In the long-range period, aged-spouse beneficiaries were estimated from the population projected by age, sex, and marital status. To the numbers of spouses aged 62 and over in the population, a series of factors were applied, representing the probabilities that the spouse and the wage earner meet all of the conditions of eligibility—i.e., the probabilities that (1) the wage earner is 62 or over, (2) the wage earner is insured, (3) the wage earner is receiving benefits, (4) the spouse is not receiving a benefit for the care of an entitled child, (5) the spouse is not insured, (6) the spouse is not eligible to receive a significant government pension based on earnings in noncovered employment, and (7) a residual factor.

In addition, the same factors were applied to the numbers of divorced persons aged 62 and over in the population, with three differences. First, an additional factor is required to reflect the probability that the person's former wage-earner spouse is still alive (otherwise, the person may be entitled to a divorced widow(er)'s benefit). Second, a factor is required to reflect the probability that the marriage to the wage-earner spouse was at least 10 years in duration. Third, factor (3) was not applied because, effective for January 1985, a divorced person generally need not wait to receive benefits until the former wage-earner spouse is receiving benefits.

The projected numbers of children under age 18, and students aged 18, who are eligible for benefits as children of retired-worker beneficiaries, were based on the projected numbers of children in the population. In the short-range period, a factor was applied, representing the probability that both parents are alive. A regression equation was then

used to project the number of children of retired-worker beneficiaries. In the long-range period, entitled children were projected separately by sex of the wage-earner parent. To the numbers of children in the population, factors were applied representing the probabilities that the parent is alive, aged 62 or over, insured, and receiving a retired-worker benefit. Another factor was applied representing the probability that the child is not entitled to a benefit based on the other parent's earnings. For children aged 18, a factor was applied representing the probability that the child is attending a secondary school. The numbers of disabled children aged 18 and over of retired-worker beneficiaries were projected from the adult population in a similar manner, with the inclusion of a factor representing the probability of being disabled since childhood.

In the short-range period, the numbers of young-spouse beneficiaries were projected as a proportion of the projected numbers of child beneficiaries who are either under age 16 or disabled. In the long-range period, young-spouse beneficiaries were projected as a proportion of the projected numbers of child beneficiaries of retired workers, taking into account projected changes in average family size.

The numbers of aged-widow(er) beneficiaries were projected from the population by age and sex. In the short-range period, a regression equation projected the number of aged-widow(er) beneficiaries, as a proportion of the aged female or male population not receiving retired-worker or aged-spouse benefits. In the long-range period, aged-widow(er) beneficiaries were projected from the population by age, sex, and marital status. Four factors were applied to the numbers of widow(er)s in the population aged 60 and over. These factors represent the probabilities that (1) the deceased wage earner was fully insured at death, (2) the widow(er) is not receiving a benefit for the care of an entitled child, (3) the widow(er) is not fully insured, and (4) the widow(er)'s benefits are not withheld because of receipt of a significant government pension based on earnings in noncovered employment. In addition, some insured widow(er)s who had not applied for their retired-worker benefits are assumed to receive widow(er) benefits. Also, the same factors were applied to the numbers of divorced persons aged 60 and over in the population, with additional factors representing the probability that the person's former wage-earner spouse is deceased and that the marriage was at least 10 years in duration.

In the short-range period, the numbers of disabled-widow(er) beneficiaries were estimated as a proportion of the female or male population aged 50-64. In the long-range period, the numbers were projected for each age 50 through 64 as a percentage of the widowed and divorced populations, adjusted for the insured status of the deceased spouse and the prevalence of disability.

The projected numbers of children under age 18, and students aged 18, who are eligible for benefits as survivors of deceased workers, were based on the projected numbers of children in the population whose mothers or fathers are deceased. In the short-range period, a regression equation was used to project the number of minor-child-survivor beneficiaries as a percentage of such orphaned children. In the long-range period, the numbers of child-survivor beneficiaries were projected

in a manner analogous to that for child beneficiaries of retired workers, with the factor representing the probability that the parent is aged 62 or over being replaced by a factor that represented the probability that the parent is deceased.

In the short-range period, the numbers of mother-and-father-survivor beneficiaries were projected from the numbers of child-survivor beneficiaries who are either under age 16 or disabled. In the long-range period, mother-and-father-survivor beneficiaries were estimated from the numbers of child-survivor beneficiaries, taking into account projected changes in average family size.

The numbers of parent-survivor beneficiaries were projected based on the historical pattern of the numbers of such beneficiaries.

Table A2 shows the projected numbers of beneficiaries under the OASI program. Included among the beneficiaries who receive retired-worker benefits are some persons who also receive a residual benefit consisting of the excess of an auxiliary benefit over their retired-worker benefit. Estimates of the numbers of such residual payments were made separately for spouses and widow(er)s.

TABLE A2.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1945-2065
[In thousands]

	Retired workers and auxiliaries			Survivors				
Calendar year	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	Total
Past experience:								
1945	518	159	13	94	121	377	6	1,288
1950	1,771	508	46	314	169	653	15	3,477
1955	4,474	1,192	122	701	292	1,154	25	7,961
1960	8,061	2,269	268	1,544	401	1,577	36	14,157
1965	11,101	2,614	461	2,371	472	2,074	35	19,128
1970	13,349	2,668	546	3,227	523	2,688	29	23,030
1975	16,588	2,867	643	3,889	582	2,919	21	27,509
1980	19,562	3,016	639	4,411	562	2,610	15	30,814
1985	22,432	3,069	457	4,863	372	1,917	10	33,120
1986	22,987	3,088	450	4,931	350	1,875	9	33,690
1987	23,440	3,090	440	4,984	329	1,836	8	34,126
1988	23,858	3,086	432	5,029	318	1,810	7	34,539
1989	24,327	3,093	423	5,071	312	1,780	6	35,012
1990	24,838	3,101	422	5,111	304	1,776	6	35,559
Alternative I:								
1995	26,321	3,158	480	5,379	307	1,822	4	37,471
2000	27,384	3,134	515	5,506	313	1,919	3	38,774
2005	28,921	2,898	567	5,632	289	1,979	3	40,289
2010	32,185	2,649	632	5,829	279	2,004	3	43,581
2015	37,862	2,455	713	5,992	263	2,018	3	49,305
2020	44,762	2,340	791	6,141	253	2,052	3	56,342
2025	51,017	2,282	850	6,299	256	2,110	3	62,817
2030	55,573	2,188	895	6,352	262	2,173	3	67,444
2035	57,978	2,093	934	6,314	266	2,223	3	69,810
2040	58,505	1,993	956	6,228	269	2,262	3	70,216
2045	58,878	1,952	984	6,155	272	2,301	3	70,545
2050	59,936	1,965	1,018	6,098	277	2,347	3	71,645
2055	61,875	2,033	1,066	6,078	283	2,396	3	73,734
2060	64,048	2,100	1,108	6,101	288	2,444	3	76,093
2065	65,983	2,152	1,141	6,173	293	2,488	3	78,232
Alternative II:								
1995	26,475	3,171	478	5,403	308	1,827	4	37,666
2000	27,843	3,171	508	5,578	313	1,914	3	39,329
2005	29,729	3,020	565	5,641	303	1,922	3	41,183
2010	33,328	2,816	623	5,829	287	1,856	3	44,741
2015	39,351	2,658	692	5,986	272	1,784	3	50,746
2020	46,644	2,570	752	6,126	267	1,746	3	58,109
2025	53,323	2,530	789	6,280	269	1,738	3	64,933
2030	58,383	2,448	811	6,349	268	1,739	3	70,001
2035	61,272	2,356	828	6,354	265	1,736	3	72,815
2040	62,213	2,253	827	6,331	259	1,722	3	73,607
2045	62,848	2,213	828	6,323	254	1,704	3	74,172
2050	64,060	2,239	835	6,316	250	1,688	3	75,391
2055	66,036	2,334	856	6,306	246	1,672	3	77,453

TABLE A2.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1945-2065 (Cont.)
[In thousands]

Calendar year	Retired workers and auxiliaries			Survivors				Total
	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	
Alternative II: (Cont.)								
2060	68,030	2,421	872	6,290	243	1,655	3	79,513
2065	69,491	2,472	878	6,295	239	1,637	3	81,015
Alternative III:								
1995	26,636	3,185	475	5,429	306	1,814	4	37,848
2000	28,286	3,210	502	5,653	314	1,914	3	39,882
2005	30,497	3,143	562	5,653	337	1,941	3	42,135
2010	34,424	2,992	611	5,842	310	1,794	3	45,976
2015	40,827	2,884	669	6,001	273	1,600	3	52,256
2020	48,593	2,833	713	6,134	250	1,461	3	59,987
2025	55,820	2,833	729	6,274	241	1,390	3	67,289
2030	61,621	2,789	730	6,331	232	1,351	3	73,057
2035	65,369	2,726	728	6,344	222	1,321	3	76,713
2040	67,227	2,646	708	6,348	209	1,280	3	78,422
2045	68,706	2,636	689	6,368	196	1,233	3	79,832
2050	70,673	2,699	677	6,370	185	1,187	3	81,794
2055	73,226	2,846	680	6,331	175	1,141	3	84,402
2060	75,506	2,971	678	6,239	166	1,096	3	86,659
2065	76,850	3,032	668	6,151	157	1,051	3	87,912

Note: The numbers of beneficiaries do not include certain uninsured persons, most of whom both attained age 72 before 1968 and have fewer than 3 quarters of coverage, in which cases the costs are reimbursed by the general fund of the Treasury. The number of such uninsured persons was 7,433 as of December 31, 1990, and is estimated to be fewer than 500 by the turn of the century. Totals do not necessarily equal the sums of rounded components.

DISABILITY INSURANCE BENEFICIARIES

The numbers of DI beneficiaries were projected for each type of benefit separately, by the sex of the worker on whose earnings the benefits are based, and the age of the beneficiary. The numbers of disabled-worker beneficiaries were projected from the estimated numbers of such beneficiaries entitled on December 31, 1989, by adding new entitlements and subtracting terminations. The starting numbers of entitled disabled-worker beneficiaries were estimated by age, sex, and duration of entitlement, from the tabulated number of disabled-worker beneficiaries in current-payment status on December 31, 1989. The numbers of new entitlements during each year were projected by applying assumed disability incidence rates. In the short-range period, an age-adjusted rate was applied to the total age-adjusted disability insured population for each sex. In the long-range period, incidence rates by age and sex were applied to the projected disability insured population (excluding those already entitled to disabled-worker benefits) to obtain new entitlements. The numbers of terminations were projected by applying assumed termination rates to the disabled-worker population. In the short-range period, overall termination rates for each sex were projected based on recent experience and on expected changes in the administration of the DI program. In the long-range period, the numbers of terminations were projected by applying assumed death and recovery rates, by age, sex, and duration of entitlement, to the entitled disabled-worker population, and adding the number of disabled-worker beneficiaries automatically converted to retired-worker beneficiaries at the normal retirement age (currently, age 65).

The disability incidence rates, which declined during 1975-82, increased during 1983-85, remained steady during 1986-89, and resumed the increasing trend in 1990, are assumed to continue gradually increasing. The specific ultimate levels assumed are determined in two stages.

First, under an assumption of a constant normal retirement age of 65, the incidence rates are projected to increase through 2010. These levels, for alternative II, are higher by about 18 percent for males and 20 percent for females than the average rates for 1984-86. This produces age-adjusted rates in 2010 of 5.5 per thousand for males and 3.8 per thousand for females, and an age-sex-adjusted rate of 4.8 per thousand. Next, because of the increase in the normal retirement age, further increases are projected in incidence rates at ages over 60. These combined projected increases cause the total gross incidence rate to increase from the current 1989 levels of 4.7 per thousand for males and 3.2 per thousand for females to 7.2 per thousand for males and 5.3 per thousand for females in the year 2026 when the normal retirement age has reached its ultimate level of 67.

For the other alternatives, the disability incidence rates are assumed to follow patterns through time similar to the one for alternative II. For alternative I, the stage one levels are assumed to be roughly the same as those experienced during the last 5 years. The 2026 total gross inc idence rates are assumed to be 6.1 per thousand for males and 4.3 per thousand for females. For alternative III, the stage one levels are assumed to be higher by about 38 percent for males and 43 percent for females. This level is approximately 80 percent of the rate experienced in 1974, when incidence rates attained their highest level. The 2026 total gross incidence rates are assumed to be 8.3 per thousand for males and 6.2 per thousand for females.

The overall termination rates were projected quarterly in the short-range period. For alternative II, the rates were projected to increase from the relatively low levels of 1984-90, to levels comparable to the average experienced over the last decade. For alternative III, the termination rates increase more slowly and to lower levels, whereas for alternative I the termination rates increase more quickly and to higher levels.

In the long-range period, the death and recovery rates were projected by age, sex, and duration of entitlement. For all alternatives, the death rates are assumed to decline steadily throughout the 75-year projection period. For alternative II, they reach levels in 2065 approximately 30 percent lower for males and approximately 20 percent lower for females than those experienced by disabled-worker beneficiaries during 1977-80, the most recent period for which detailed data exist. The recovery rates are assumed to increase from 1989 levels until 1995, when they attain ultimate levels about 12 percent higher than those experienced during the period 1977-80, thereby allowing for the estimated effect of the periodic reviews required by provisions of law first enacted in 1980, and amended in 1983, 1984, and 1990.

For alternative I, the death rates in 2065 are assumed to be roughly 20 percent lower for males and approximately 10 percent lower for females than those experienced by disabled-worker beneficiaries during 1977-80, and the recovery rates are assumed to increase to levels 30 percent higher than those of the same period. For alternative III, the death rates in 2065 are assumed to be about 45 percent lower for males and approximately 35 percent lower for females than those experienced

during 1977-80, and recovery rates are assumed to be 5 percent lower than those experienced during 1977-80.

In the short-range period, the projected numbers of children under age 18, students aged 18, and disabled children aged 18 and over, who are eligible for benefits as children of disabled-worker beneficiaries, were projected by applying quarterly award and termination rates. Awards to the three categories of child beneficiaries were based on the numbers of awards to disabled-worker beneficiaries.

In the long-range period, the projected numbers of minor child and student beneficiaries were based on the projected numbers of children in the population by age. To these numbers of children were applied factors representing the probability that either of their parents is insured and disabled. The numbers of disabled children aged 18 and over were projected as a function of the numbers of disabled-worker beneficiaries and the size of the adult population.

In the short-range period, the numbers of young-spouse beneficiaries were projected by applying quarterly award and termination rates, where awards were based on the numbers of awards to child beneficiaries who are either under age 16 or disabled. The numbers of aged-spouse beneficiaries were also projected by applying quarterly award and termination rates, where awards were based on the number of awards to disabled-worker beneficiaries.

In the long-range period, the numbers of young-spouse beneficiaries were projected as a proportion of the projected numbers of child beneficiaries who are either under age 16 or disabled, taking into account projected changes in family size. The numbers of aged-spouse beneficiaries were projected as a proportion of the numbers of disabled-worker beneficiaries, based on recent experience and allowing for projected changes in marriage rates.

Table A3 shows the projected numbers of beneficiaries under the DI program.

TABLE A3.—DI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1960-2065
[In thousands]

Calendar year	Disabled workers	Auxiliaries		Total
		Wife-husband	Child	
Past experience:				
1960	455	77	155	687
1965	988	193	558	1,739
1970	1,493	283	889	2,665
1975	2,489	453	1,411	4,352
1980	2,859	462	1,358	4,678
1985	2,656	306	945	3,907
1986	2,727	301	965	3,993
1987	2,786	291	968	4,045
1988	2,830	281	963	4,074
1989	2,895	271	962	4,129
1990	3,011	266	989	4,266
Alternative I:				
1995	3,200	236	1,016	4,452
2000	3,505	235	1,072	4,812
2005	4,123	65	1,187	5,374
2010	4,872	75	1,219	6,166
2015	5,328	80	1,239	6,648
2020	5,566	84	1,275	6,925
2025	5,848	89	1,336	7,273
2030	5,903	89	1,398	7,390
2035	5,883	90	1,448	7,421
2040	5,999	92	1,491	7,583

TABLE A3.—DI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1960-2065 (Cont.)
[In thousands]

Calendar year	Disabled workers	Auxiliaries		Total
		Wife-husband	Child	
Alternative I: (Cont.)				
2045	6,345	97	1,538	7,981
2050	6,609	101	1,591	8,301
2055	6,837	105	1,649	8,591
2060	6,965	107	1,706	8,779
2065	7,147	110	1,762	9,019
Alternative II:				
1995	3,440	256	1,093	4,789
2000	4,025	273	1,231	5,529
2005	4,688	73	1,351	6,112
2010	5,634	86	1,377	7,097
2015	6,217	93	1,373	7,683
2020	6,506	97	1,375	7,978
2025	6,820	103	1,401	8,324
2030	6,851	103	1,431	8,385
2035	6,793	103	1,455	8,351
2040	6,891	105	1,466	8,462
2045	7,244	111	1,474	8,828
2050	7,464	114	1,483	9,061
2055	7,591	116	1,498	9,205
2060	7,534	115	1,511	9,159
2065	7,526	115	1,522	9,163
Alternative III:				
1995	3,680	276	1,169	5,125
2000	4,681	325	1,438	6,444
2005	5,370	84	1,545	6,999
2010	6,563	100	1,560	8,223
2015	7,320	109	1,517	8,946
2020	7,702	114	1,474	9,290
2025	8,084	120	1,457	9,661
2030	8,117	121	1,449	9,686
2035	8,049	121	1,445	9,614
2040	8,155	123	1,423	9,701
2045	8,534	129	1,391	10,054
2050	8,697	132	1,359	10,187
2055	8,683	131	1,332	10,147
2060	8,369	127	1,305	9,801
2065	8,111	123	1,280	9,514

Note: Totals do not necessarily equal the sums of rounded components.

AVERAGE BENEFITS

Average benefits were projected by type of benefit based on recent historical averages, projected average Primary Insurance Amounts (PIAs), and projected ratios of average benefits to average PIAs. Average PIAs were calculated from projected distributions of beneficiaries by duration from year of award, average awarded PIAs, and increases thereto since the year of award, because of automatic benefit increases, recomputations to reflect additional covered earnings, and other factors. Average awarded PIAs were calculated from projected earnings histories, which were developed from the actual earnings histories associated with a sample of awards made in 1983.

For several types of benefits—retired-worker, aged-spouse, and aged-widow(er) benefits—the percentage of the PIA that is payable depends on the age at initial entitlement to benefits. Projected ratios of average benefits to average PIAs for these types of benefits were based on projections of age distributions at initial entitlement.

BENEFIT PAYMENTS

For each type of benefit, benefit payments were calculated as the product of a number of beneficiaries and a corresponding average monthly benefit. In the short-range period, benefit payments were calculated on a quarterly basis. In the long-range period, all benefit payments were calculated on an annual basis, using the number of beneficiaries on December 31. These amounts were adjusted to include retroactive payments to newly awarded beneficiaries, and other amounts not reflected in the regular monthly benefit payments.

Lump-sum death payments were calculated as the product of (1) the number of such payments, which was projected on the basis of the assumed death rates, the projected fully insured population, and the estimated percentage of the fully insured population that would qualify for benefits, and (2) the amount of the lump-sum death payment, which is $255 (unindexed in future years).

ADMINISTRATIVE EXPENSES

The projection of administrative expenses through 2000 was based on assumed increases in average wages, increases in the CPI, and increases in the number of beneficiaries. For years after 2000, administrative expenses are assumed to increase because of increases in the numbers of beneficiaries and increases in average wages which will more than offset assumed improvements in administrative productivity.

RAILROAD RETIREMENT FINANCIAL INTERCHANGE

Railroad workers are covered under a separate multi-tiered plan, the first tier being very similar to OASDI coverage. An annual financial interchange between the Railroad Retirement fund and the OASI and DI funds is made reflecting the difference between the amount of OASDI benefits that would be paid to railroad workers and their families if railroad employment had been covered under the OASDI program and the amount of OASDI payroll tax that would be received from railroad workers if they were covered directly under the OASDI program.

The effect of the financial interchange with the Railroad Retirement program was evaluated on the basis of trends similar to those used in estimating the cost of OASDI benefits. The resulting effect was annual short-range costs of about $3-5 billion and a long-range summarized cost of 0.03 percent of taxable payroll to the OASDI program.

BENEFITS TO UNINSURED PERSONS

The law provides for special monthly cash payments to certain uninsured persons who attained age 72 before 1968 or who have 3 quarters of coverage for each year after 1966 and before the year of attainment of age 72. The numbers of such uninsured persons were projected based on an extrapolation of the historical survival rate of the members of that group. The benefit payable to these uninsured persons is a fixed amount which increases by the percentage benefit increase applicable to regular OASDI benefits. These payments are made from

the OASI Trust Fund, which is then reimbursed from the general fund of the Treasury for the costs (including administrative expenses and interest) associated with providing payments to those persons with fewer than 3 quarters of coverage. The nonreimbursable payments are assumed to be insignificant after 2000. Neither the reimbursable payments nor the associated reimbursements are reflected in the cost rates or the income rates. These amounts are reflected, however, in tables which show trust fund operations.

MILITARY-SERVICE TRANSFERS

As a result of the 1983 amendments, the OASI and DI Trust Funds received lump-sum payments, in May 1983, for the cost (including administrative expenses) of providing additional benefit payments resulting from noncontributory wage credits for military service performed prior to 1957. Adjustments to the payments were made in 1985 and 1990, and additional adjustments will be made in 1995 and every fifth year thereafter. The adjustments for 1995 were estimated based on the change in interest rates since the determination of the adjustments in 1990. No adjustments after 1995 would be due unless actual interest rates are different from those assumed, or changes are made in the methods used to determine the military-service transfers.

INCOME FROM TAXATION OF BENEFITS

The OASI and DI Trust Funds are credited with the additional income taxes attributable to the partial taxation of OASDI benefit payments. For the short-range period, income to the trust funds from such taxation was estimated by applying the following two factors to total OASI and DI benefit payments: (1) the percentage of benefit payments that is taxable, and (2) the average tax rate applicable to those benefits. For the long-range period, income to the trust funds from such taxation was projected by applying factors representing the ratio of such income to total OASDI benefit payments under varying levels of income thresholds. Because the thresholds are constant in the law, their values in relation to future income and benefit levels decline. These factors were projected based on the results of a model developed by the Office of Tax Analysis, Department of the Treasury, relating OASDI benefit payments to total personal income for a sample of recent tax returns.

APPENDIX B.—SENSITIVITY ANALYSIS

This appendix presents estimates which illustrate the sensitivity of the long-range estimates to changes in selected individual assumptions. The estimates based on the three alternative sets of assumptions (see section VI) illustrate variations that result from different combinations of assumptions. In the sensitivity analysis presented in this appendix, the intermediate alternative II is used as the reference point, and one assumption at a time within that alternative is varied. Similar variations in the selected assumptions within the other alternatives would result in similar relative variations in the long-range estimates.

Each table that follows shows the effects of changing the particular assumption under consideration on the OASDI summarized income rates, summarized cost rates, and actuarial balances (as defined earlier in this report) for 25-year, 50-year, and 75-year valuation periods. Because the income rate varies only slightly with changes in assumptions, it is not considered in the discussion of the tables. The change in each of the actuarial balances is approximately equal to the change in the corresponding cost rate, but in the opposite direction.

TOTAL FERTILITY RATE

Table B1 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about the ultimate total fertility rate. These assumptions are that the ultimate total fertility rate will be 1.6 children per woman (as assumed for alternative III), 1.9 (as assumed for alternative II), and 2.2 (as assumed for alternative I). The rate is assumed to change gradually from its current level and to reach the various ultimate values in 2015.

TABLE B1.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS FERTILITY ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Ultimate total fertility rate[1]		
	1.6	1.9	2.2
Summarized income rate:			
25-year: 1991-2015	13.14	13.14	13.14
50-year: 1991-2040	13.10	13.10	13.09
75-year: 1991-2065	13.14	13.11	13.08
Summarized cost rate:			
25-year: 1991-2015	11.64	11.67	11.70
50-year: 1991-2040	13.41	13.30	13.20
75-year: 1991-2065	14.67	14.19	13.74
Balance:			
25-year: 1991-2015	+ 1.50	+ 1.47	+ 1.44
50-year: 1991-2040	−.31	−.21	−.11
75-year: 1991-2065	−1.53	−1.08	−.66

[1]The total fertility rate for any year is the average number of children who would be born to a woman in her lifetime if she were to experience the birth rates by age observed in, or assumed for, the selected year, and if she were to survive the entire child-bearing period. The ultimate total fertility rate is assumed to be reached in 2015.

For the 25-year period, the cost rate for the three fertility assumptions varies by only 0.06 percent of taxable payroll. In contrast, the 75-year cost rate varies over a wide range, decreasing from 14.67 to 13.74 percent, as the assumed ultimate total fertility rate increases from 1.6 to 2.2. Similarly, while the 25-year actuarial balance varies by only 0.06 percent of taxable payroll, the 75-year actuarial balance varies over a much wider range, from −1.53 to −0.66 percent.

During the 25-year period, changes in fertility affect the working population only slightly and result in relatively minor changes in the number of child beneficiaries. Hence, the program cost is affected only slightly. For the 75-year long-range period, however, changes in fertility have a relatively greater impact on the labor force than on the beneficiary population. As a result, an increase in fertility significantly reduces the cost rate. Each increase of 0.1 in the ultimate total fertility rate increases the long-range actuarial balance by about 0.15 percent of taxable payroll.

DEATH RATES

Table B2 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about future reductions in death rates. The analysis was developed by varying the percentage decrease assumed to occur during 1991-2065 in the age-sex-adjusted death rate. The decreases assumed for this period are about 18 percent (as assumed for alternative I), 35 percent (as assumed for alternative II), and 51 percent (as assumed for alternative III).

TABLE B2.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS DEATH-RATE ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Reduction in death rates[1]		
	18 percent	35 percent	51 percent
Summarized income rate:			
25-year: 1991-2015	13.13	13.14	13.15
50-year: 1991-2040	13.08	13.10	13.12
75-year: 1991-2065	13.08	13.11	13.15
Summarized cost rate:			
25-year: 1991-2015	11.43	11.67	11.92
50-year: 1991-2040	12.83	13.30	13.81
75-year: 1991-2065	13.49	14.19	15.02
Balance:			
25-year: 1991-2015	+ 1.70	+ 1.47	+ 1.23
50-year: 1991-2040	+ .25	−.21	−.69
75-year: 1991-2065	−.41	−1.08	−1.88

[1]The measure of the reduction in death rates is the decrease in the age-sex-adjusted death rate during 1991-2065.

The variation in cost for the 25-year period is less pronounced than the variation for the 75-year period because the decreases in death rates are assumed to occur gradually and because of the specific changes in the age composition of the population that are projected to occur. The 25-year cost rate increases from 11.43 percent (for 18-percent lower ultimate death rates) to 11.92 percent (for 51-percent lower ultimate rates). The 75-year cost rate increases from 13.49 to 15.02 percent. The actuarial balance decreases from + 1.70 to + 1.23 percent for the 25-year period, and from −0.41 to −1.88 percent for the 75-year period.

Lower death rates cause both the income (as well as taxable payroll) and the outgo of the OASDI program to be higher than they would otherwise be. The relative increase in outgo, however, exceeds the relative increase in taxable payroll. For any given year, reductions in the death rates for people who have attained the normal retirement age (people whose death rates are the highest) increase the number of retired-worker beneficiaries (and, therefore, the amount of retirement benefits paid) without adding significantly to the number of covered

workers (and, therefore, to the taxable payroll). Although reductions for people aged 50 to normal retirement age do result in significant increases to the taxable payroll, those increases are not large enough to offset the sum of the additional retirement benefits mentioned above and the disability benefits paid to additional beneficiaries in this pre-retirement age group. At ages under 50, death rates are so low that even substantial reductions would not result in significant increases in the numbers of covered workers or beneficiaries. Consequently, if death rates for all ages are lowered by about the same relative amount, outgo increases at a rate greater than the rate of growth in payroll, thereby resulting in higher cost rates. Each additional 10-percentage-point reduction in the age-sex-adjusted death rate assumed to occur in 1991-2065, relative to the 35-percent reduction assumed for alternative II, decreases the long-range actuarial balance by about 0.40 percent of taxable payroll.

NET IMMIGRATION

Table B3 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about the magnitude of net immigration. These assumptions are that the annual net immigration will be 600,000 persons (as assumed for alternative III), 750,000 persons (as assumed for alternative II), and 1,000,000 persons (as assumed for alternative I).

TABLE B3.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS NET-IMMIGRATION ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Net immigration per year		
	600,000	750,000	1,000,000
Summarized income rate:			
25-year: 1991-2015	13.14	13.14	13.13
50-year: 1991-2040	13.10	13.10	13.09
75-year: 1991-2065	13.12	13.11	13.10
Summarized cost rate:			
25-year: 1991-2015	11.71	11.67	11.60
50-year: 1991-2040	13.38	13.30	13.18
75-year: 1991-2065	14.28	14.19	14.06
Balance:			
25-year: 1991-2015	+ 1.43	+ 1.47	+ 1.54
50-year: 1991-2040	−.28	−.21	−.09
75-year: 1991-2065	−1.16	−1.08	−.96

For all three periods, the cost rate decreases with increasing rates of net immigration. For the 25-year period, the cost rate decreases from 11.71 percent of taxable payroll (for annual net immigration of 600,000 persons) to 11.60 percent (for annual net immigration of 1,000,000 persons). For the 50-year period, it decreases from 13.38 percent to 13.18 percent, and for the 75-year period, it decreases from 14.28 percent to 14.06 percent. The actuarial balance increases from + 1.43 to + 1.54 percent for the 25-year period, from −0.28 to −0.09 for the 50-year period, and from −1.16 to −0.96 percent for the 75-year period.

The cost rate decreases with increasing rates of net immigration because immigration occurs at relatively young ages, thereby increasing the numbers of covered workers earlier than the numbers of beneficiaries. Each additional group of 100,000 immigrants relative to the 750,000 net immigration assumed for alternative II, increases the long-range actuarial balance by about 0.05 percent of taxable payroll.

REAL-WAGE DIFFERENTIAL

Table B4 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about the real-wage differential. These assumptions are that the ultimate real-wage differential will be 0.6 percentage point (as assumed for alternative III), 1.1 percentage points (as assumed for alternative II), and 1.7 percentage points (as assumed for alternative I). In each case, the ultimate annual increase in the CPI is assumed to be 4.0 percent (as assumed for alternative II), yielding ultimate percentage increases in average annual wages in covered employment of 4.6, 5.1, and 5.7 percent under alternatives III, II, and I, respectively.

TABLE B4.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS REAL-WAGE ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Ultimate percentage increase in wages-CPI[1]		
	4.6-4.0	5.1-4.0	5.7-4.0
Summarized income rate:			
25-year: 1991-2015	13.17	13.14	13.10
50-year: 1991-2040	13.14	13.10	13.05
75-year: 1991-2065	13.15	13.11	13.06
Summarized cost rate:			
25-year: 1991-2015	12.03	11.67	11.24
50-year: 1991-2040	13.81	13.30	12.71
75-year: 1991-2065	14.73	14.19	13.54
Balance:			
25-year: 1991-2015	+ 1.14	+ 1.47	+ 1.86
50-year: 1991-2040	−.67	−.21	+ .34
75-year: 1991-2065	−1.58	−1.08	−.48

[1] The first value in each pair is the assumed ultimate annual percentage increase in average wages in covered employment. The second value is the assumed ultimate annual percentage increase in the Consumer Price Index. The difference between the two values is the real-wage differential.

For the 25-year period, the cost rate decreases from 12.03 percent (for a real-wage differential of 0.6 percentage point) to 11.24 percent (for a differential of 1.7 percentage points). For the 50-year period, it decreases from 13.81 to 12.71 percent, and for the 75-year period it decreases from 14.73 to 13.54 percent. The actuarial balance increases from + 1.14 to + 1.86 percent for the 25-year period, from −0.67 to + .34 for the 50-year period, and from −1.58 to −0.48 percent for the 75-year period.

The cost rate decreases with increasing real-wage differentials, because the higher real-wage levels increase the taxable payroll, while benefit increases are not affected. Although the initial benefit levels are higher because of the higher wages, these increases are more than offset by the increases in the taxable payroll of future workers. Each 0.5-percentage-point increase in the assumed real-wage differential increases the long-range actuarial balance by about 0.50 percent of taxable payroll.

CONSUMER PRICE INDEX

Table B5 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about the rate of increase for the Consumer Price Index (CPI). These assumptions are that the ultimate annual increase in the CPI will be 3.0 percent (as assumed for alternative I), 4.0 percent (as assumed for alternative II), and 5.0 percent (as assumed for alternative III). In each case, the ultimate real-wage differential is assumed to be 1.1 percentage points (as assumed for alternative II), yielding ultimate percentage

increases in average annual wages in covered employment of 4.1, 5.1, and 6.1 percent under alternatives I, II, and III, respectively.

TABLE B5.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS CPI-INCREASE ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Ultimate percentage increase in wages-CPI[1]		
	4.1-3.0	5.1-4.0	6.1-5.0
Summarized income rate:			
25-year: 1991-2015	13.15	13.14	13.13
50-year: 1991-2040	13.11	13.10	13.09
75-year: 1991-2065	13.12	13.11	13.10
Summarized cost rate:			
25-year: 1991-2015	11.79	11.67	11.55
50-year: 1991-2040	13.49	13.30	13.12
75-year: 1991-2065	14.41	14.19	13.98
Balance:			
25-year: 1991-2015	+ 1.36	+ 1.47	+ 1.59
50-year: 1991-2040	−.38	−.21	−.04
75-year: 1991-2065	−1.29	−1.08	−.88

[1]The first value in each pair is the assumed ultimate annual percentage increase in average wages in covered employment. The second value is the assumed ultimate annual percentage increase in the Consumer Price Index.

For all three periods, the cost rate decreases with greater assumed rates of increase in the CPI. For the 25-year period, the cost rate decreases from 11.79 (for CPI increases of 3.0 percent) to 11.55 percent (for CPI increases of 5.0 percent). For the 50-year period, it decreases from 13.49 to 13.12 percent, and for the 75-year period, it decreases from 14.41 to 13.98 percent. The actuarial balance increases from + 1.36 to + 1.59 percent for the 25-year period, from −0.38 to −0.04 for the 50-year period, and from −1.29 to −0.88 percent for the 75-year period.

The patterns described above result primarily from the time lag between the effects of the CPI changes on taxable payroll and on benefit payments. When assuming a greater rate of increase in the CPI (in conjunction with a constant real-wage differential), the effect on taxable payroll of the implied greater rate of increase in average wages is experienced immediately, while the effect on benefits of the greater rate of increase in the CPI is experienced with a lag of about 1 year. In addition, the effect on benefits of the greater rate of increase in average wages is experienced no sooner than 2 years later. Thus, the higher taxable payrolls have a stronger effect than the higher benefits, thereby resulting in lower cost rates. The effect of each 1.0-percentage-point increase in the rate of change assumed for the CPI is an increase in the long-range actuarial balance of about 0.20 percent of taxable payroll.

REAL-INTEREST RATE

Table B6 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about the annual real-interest rate for special public-debt obligations issuable to the trust funds. These assumptions are that the ultimate annual real-interest rate will be 1.5 percent (as assumed for alternative III), 2.3 percent (as assumed for alternative II), and 3.0 percent (as assumed for alternative I). In each case, the ultimate annual increase in the CPI is assumed to be 4.0 percent (as assumed for alternative II), resulting in ultimate annual yields of 5.6, 6.4, and 7.1 percent under alternatives III, II, and I, respectively.

TABLE B6.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS REAL-INTEREST ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Ultimate annual real-interest rate		
	1.5 percent	2.3 percent	3.0 percent
Summarized income rate:			
25-year: 1991-2015	13.12	13.14	13.16
50-year: 1991-2040	13.08	13.10	13.11
75-year: 1991-2065	13.10	13.11	13.12
Summarized cost rate:			
25-year: 1991-2015	11.73	11.67	11.62
50-year: 1991-2040	13.60	13.30	13.06
75-year: 1991-2065	14.66	14.19	13.81
Balance:			
25-year: 1991-2015	+ 1.39	+ 1.47	+ 1.54
50-year: 1991-2040	−.52	−.21	+ .05
75-year: 1991-2065	−1.56	−1.08	−.69

For the 25-year period, the cost rate decreases slightly with increasing real-interest rates from 11.73 percent (for an ultimate real-interest rate of 1.5 percent) to 11.62 percent (for an ultimate real-interest rate of 3.0 percent). For the 50-year period, it decreases from 13.60 to 13.06 percent, and for the 75-year period, it decreases from 14.66 to 13.81 percent. The actuarial balance increases from + 1.39 to + 1.54 percent for the 25-year period, from −0.52 to + 0.05 percent for the 50-year period, and from −1.56 to −0.69 percent for the 75-year period. Each 0.5-percentage-point increase in the assumed real-interest rate increases the long-range actuarial balance by about 0.29 percent of taxable payroll.

DISABILITY INCIDENCE RATES

Table B7 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions concerning future disability incidence rates. These assumptions provide that the total gross annual incidence rates will increase gradually from the 1989 levels of 4.7 per thousand for males and 3.2 per thousand for females to levels, in 2026, of 6.1 per thousand for males and 4.3 per thousand for females (as assumed in alternative I), 7.2 per thousand for males and 5.3 per thousand for females (as assumed in alternative II), and 8.3 per thousand for males and 6.2 per thousand for females (as assumed in alternative III).

TABLE B7.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS DISABILITY INCIDENCE ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Disability incidence rates based on alternative—		
	I	II	III
Summarized income rate:			
25-year: 1991-2015	13.14	13.14	13.14
50-year: 1991-2040	13.09	13.10	13.10
75-year: 1991-2065	13.11	13.11	13.11
Summarized cost rate:			
25-year: 1991-2015	11.55	11.67	11.80
50-year: 1991-2040	13.14	13.30	13.48
75-year: 1991-2065	14.00	14.19	14.39
Balance:			
25-year: 1991-2015	+ 1.59	+ 1.47	+ 1.35
50-year: 1991-2040	−.04	−.21	−.38
75-year: 1991-2065	−.90	−1.08	−1.28

For the 25-year period, the cost rate increases with increasing disability incidence rates from 11.55 percent (for the relatively low rates assumed for alternative I) to 11.80 percent (for the relatively high rates assumed for alternative III). For the 50-year period, it increases from 13.14 to 13.48 percent, and for the 75-year period, it increases from 14.00 to 14.39 percent. The actuarial balance decreases from + 1.59 to + 1.35 percent for the 25-year period, from –0.04 to –0.38 percent for the 50-year period, and from –0.90 to –1.28 percent for the 75-year period.

DISABILITY TERMINATION RATES

Table B8 shows the estimated OASDI income rates, cost rates, and actuarial balances, on the basis of alternative II with various assumptions about future disability termination rates.

For all three alternatives, death-termination rates by age and sex are assumed to decline throughout the 75-year period. At the end of that period, they reach levels that, in comparison to the corresponding annual rates experienced during the base period, 1977-80, are lower by about 20 percent for males and 10 percent for females for alternative I, lower by about 30 percent for males and 20 percent for females for alternative II, and lower by about 45 percent for males and 35 percent for females for alternative III.

For all three alternatives, ultimate recovery-termination rates by age and sex are assumed to be attained in 1995. For alternative I, they are about 30 percent higher than the corresponding rates experienced during the base period. For alternative III, they are about 5 percent lower than the base-period rates. For alternative II, such rates are about 12 percent higher than those experienced in the base period, in order to reflect the effects of the additional periodic reviews that began in 1981.

TABLE B8.—ESTIMATED OASDI INCOME RATES, COST RATES, AND ACTUARIAL BALANCES, BASED ON ALTERNATIVE II WITH VARIOUS DISABILITY TERMINATION ASSUMPTIONS
[As a percentage of taxable payroll]

Calendar years	Disability termination rates based on alternative—		
	I	II	III
Summarized income rate:			
25-year: 1991-2015	13.14	13.14	13.14
50-year: 1991-2040	13.10	13.10	13.10
75-year: 1991-2065	13.11	13.11	13.11
Summarized cost rate:			
25-year: 1991-2015	11.64	11.67	11.71
50-year: 1991-2040	13.26	13.30	13.37
75-year: 1991-2065	14.14	14.19	14.27
Balance:			
25-year: 1991-2015	+ 1.50	+ 1.47	+ 1.43
50-year: 1991-2040	–.16	–.21	–.27
75-year: 1991-2065	–1.03	–1.08	–1.16

For the 25-year period, the cost rate increases with decreasing disability termination rates from 11.64 percent (for the relatively high rates assumed for alternative I) to 11.71 percent (for the relatively low rates assumed for alternative III). For the 50-year period, it increases from 13.26 to 13.37 percent, and for the 75-year period, it increases from 14.14 to 14.27 percent. The actuarial balance decreases from + 1.50 to + 1.43 percent for the 25-year period, from –0.16 to –0.27 percent for the 50-year period, and from –1.03 to –1.16 percent for the 75-year period.