

#### 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 four 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. Estimates of the trust fund operations during the long-range period expressed in dollar amounts will be published by the Office of the Actuary, shortly after the issuance of this report.

##### *TOTAL POPULATION*

Projections were made of the population in the Social Security coverage area by age, sex, and marital status as of July 1 of each year 1985 through 2060. The projections started with the United States population, including armed forces overseas, on July 1, 1984, as estimated by the Bureau of the Census, based on the 1980 Census, and adjusted for births, deaths, and net immigration during 1980-84. This population estimate was adjusted for net census undercount and increased by the estimated populations in the geographic areas covered by the OASDI program but not included in the U.S. population. The population was then projected using assumed rates of birth and death and assumed levels of net immigration.

Historically, fertility rates in the U.S. 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 childbearing period. The total fertility rate decreased from 3.3 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 been about 1.8 children per woman.

These variations in fertility rates have resulted from changes in social attitudes, economic conditions, and the use of birth-control methods. Future fertility rates may exceed the present low level, because such a low level has never been experienced in the U.S. for a long period, and because such a level is well below that needed to maintain the size of the population, in the absence of increased net immigration. The recent historical and projected trends in certain population characteristics, however, 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 2.3, 2.0, and 1.6 children per woman were selected for alternatives I, II-A and II-B, and III, respectively. For each alternative, the total fertility rate is assumed to reach its ultimate level in 2010. 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 2.3 to 1.6, with an intermediate assumption of 1.9. The ultimate assumption of the Bureau of the Census for the intermediate total fertility rate is lower than that used for this report, but such ultimate rate is not assumed to be reached until 2050. In fact, annual total fertility rates for the intermediate assumption by the Bureau of the Census are higher than those adopted for this report until well after 2000.<sup>1</sup> A rate of 2.1 would ultimately result in a nearly constant population if net immigration were zero and if death rates were constant at levels close to current U.S. experience.

Historically, death rates in the U.S. have steadily declined. The age-sex-adjusted death rate—which is the crude rate that would occur in the enumerated total population as of April 1, 1970, if that population were to experience the death rates by age and sex for the selected year—declined at an average rate of 1.3 percent per year between 1900 and 1984. These reductions in death rates have resulted from many factors, including increased medical knowledge, increased 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 sex and cause of death were selected for 2010 and later. The intermediate set, which is used for both alternatives II-A and II-B, is considered most likely to be realized. The average annual percentage reductions used for alternative I are smaller than those for alternatives II-A and II-B, while those used for alternative III are greater. Between 1984 and 2010, these reductions in central death rates for alternatives II-A and II-B are assumed to change gradually from the average annual reductions by age, sex, and cause of death observed between 1968 and 1982, to the ultimate annual percentage reductions by sex and cause of death assumed for 2010 and later. Alternative I reductions are assumed to change gradually from 50 percent of the average annual reductions observed between 1968 and 1982, while alternative III reductions are assumed to change gradually from 150 percent of the average annual reductions observed between 1968 and 1982. The age-sex-adjusted death rate (for all causes combined) declined at an average rate of 2.0 percent per year between 1968 and 1982.

After adjustment for changes in the age-sex distribution of the population, death rates were projected to decline at an average annual rate of about 0.3 percent, 0.6 percent, and 1.2 percent between 1984 and 2060 for alternatives I, II-A and II-B, and III, respectively.

Net immigration is assumed to be 700,000, 500,000, and 300,000 persons per year for alternatives I, II-A and II-B, and III, respectively. The assumed net immigration is not intended to include aliens who may enter the U.S. illegally. For alternatives I, II-A, and II-B, however, numbers of refugees are assumed to be admitted periodically, over and above the annual immigration permitted by present law. Those illegal aliens who were enumerated in the 1980 Census were automatically included in the starting population.

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<sup>1</sup>U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 952, "Projections of the Population of the United States By Age, Sex, and Race: 1983-2080," U.S. Government Printing Office, Washington, D.C., May 1984.

Table A1 shows the projected population by broad age group, for the four alternatives. 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 1945-2060

Calendar year	Population (in thousands)			Total	Dependency ratio	
	Under 20	20-64	65 and over		Aged <sup>1</sup>	Total <sup>2</sup>
<b>Past experience:</b>						
1945	47,265	80,416	10,698	138,379	0.133	0.721
1950	53,754	92,419	12,706	158,879	.137	.719
1955	63,636	96,805	14,954	175,395	.154	.812
1960	73,529	99,232	17,094	189,855	.172	.913
1965	80,375	104,666	19,052	204,093	.182	.950
1970	81,066	113,243	20,741	215,050	.183	.899
1975	78,753	122,903	23,241	224,898	.189	.830
1980	74,984	134,341	25,972	235,297	.193	.751
1985	73,030	145,001	28,882	246,913	.199	.703
<b>Alternative I:</b>						
1990	74,540	152,783	31,896	259,219	.209	.697
1995	77,266	159,712	33,984	270,962	.213	.697
2000	79,909	167,223	34,884	282,016	.209	.686
2005	81,673	175,447	35,940	293,060	.205	.670
2010	84,037	181,858	38,842	304,737	.214	.676
2015	87,453	185,008	44,242	316,703	.239	.712
2020	91,381	185,865	50,932	328,177	.274	.766
2025	95,035	185,799	58,092	338,926	.313	.824
2030	98,008	187,495	63,605	349,108	.339	.862
2035	100,879	192,616	65,551	359,047	.340	.864
2040	104,313	199,120	65,526	368,958	.329	.853
2045	108,169	205,844	64,999	379,012	.316	.841
2050	112,024	211,870	65,593	389,487	.310	.838
2055	115,648	218,186	66,914	400,749	.307	.837
2060	119,199	225,397	68,446	413,042	.304	.833
<b>Alternatives II-A and II-B:</b>						
1990	73,872	152,174	32,016	258,062	.210	.696
1995	75,314	158,521	34,479	268,314	.218	.693
2000	76,139	165,456	35,884	277,479	.217	.677
2005	75,530	173,084	37,424	286,039	.216	.653
2010	75,121	178,524	40,762	294,407	.228	.649
2015	75,737	180,017	46,603	302,357	.259	.680
2020	76,907	178,644	53,773	309,324	.301	.732
2025	77,783	175,802	61,467	315,052	.350	.792
2030	78,041	174,043	67,544	319,628	.388	.836
2035	78,109	175,142	70,017	323,268	.400	.846
2040	78,503	177,187	70,436	326,126	.398	.841
2045	79,211	178,937	70,219	328,367	.392	.835
2050	79,912	179,350	71,016	330,279	.396	.842
2055	80,396	179,661	72,183	332,240	.402	.849
2060	80,743	180,763	73,050	334,557	.404	.851
<b>Alternative III:</b>						
1990	73,062	151,562	32,131	256,755	.212	.694
1995	72,846	157,310	34,940	265,096	.222	.685
2000	71,314	163,632	36,809	271,755	.225	.661
2005	67,655	170,643	38,859	277,157	.228	.624
2010	63,838	174,982	42,776	281,596	.244	.609
2015	61,228	174,488	49,315	285,030	.283	.634
2020	59,429	170,405	57,333	287,167	.336	.685
2025	57,542	164,158	66,043	287,744	.402	.753
2030	55,310	158,198	73,281	286,790	.463	.813
2035	52,969	154,510	76,948	284,427	.498	.841
2040	50,855	151,377	78,517	280,748	.519	.855
2045	49,094	147,510	79,291	275,895	.538	.870
2050	47,489	141,736	80,924	270,149	.571	.906
2055	45,851	135,714	82,345	263,910	.607	.945
2060	44,181	130,778	82,613	257,572	.632	.970

<sup>1</sup>Population aged 65 and over, divided by population aged 20-64.

<sup>2</sup>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 Federal civilian employment that will result from the 1983 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, and the state of the economy. All of these factors vary by alternative. For men, the projected age-adjusted labor force participation rate for alternative I for 2060 is 1.1 percentage points higher than the 1985 level of 76.8 percent, while the rates for alternatives II-A, II-B, and III are 0.6, 1.1, and 2.8 percentage points lower, respectively. For women, the projected age-adjusted labor force participation rates increase for all of the alternatives. The projected rates for 2060 are 5.9, 4.9, 3.2, and 2.4 percentage points, respectively, above the 1985 level of 54.5 percent.

The total age-sex-adjusted unemployment rate averaged 5.8 percent for the 30 years 1956-85 and 7.2 percent for the 10 years 1976-85. The ultimate total age-sex-adjusted unemployment rate is assumed to be 5.0, 5.5, 6.0, and 7.0 percent for alternatives I, II-A, II-B, and III, respectively. For alternatives I, II-A, and II-B, the unemployment rate is assumed to decline gradually, reaching its ultimate level by 2000. For alternative III, the unemployment rate is assumed to peak in 1988 and again in 1990, because of assumed recessions, and thereafter to decline gradually, reaching its ultimate level by 2000.

The projected age-adjusted coverage rate for men increases from its 1985 level of 74.2 percent to 77.4, 75.7, and 74.9 percent in 2060 on the basis of alternatives I, II-A, and II-B, respectively, while it declines to 72.7 percent on the basis of alternative III. For women, it increases from its 1985 level of 55.0 percent to 62.7, 61.5, 59.9, and 58.5 percent for alternatives I, II-A, II-B, 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. 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. 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. 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 real-earnings differentials are based on analysis of trends in productivity gains and the factors linking productivity gains with real-earnings differentials. For the 30 years 1955-84, annual increases in productivity for the total U.S. economy averaged 2.0 percent, the result of average annual increases of 2.7, 1.9, and 1.3 percent for the 10-year periods 1955-64, 1965-74, and 1975-84, respectively. Meanwhile, the real-earnings differential averaged 1.0 percentage point for the 30 years 1955-84, the result of average annual increases of 2.4 and 1.1 percentage points, and an average annual decrease of 0.5 percentage point, respectively, for the aforementioned 10-year periods. The change in the linkage between annual increases in productivity and the real-earnings differential averaged 1.0 percent for the 30 years 1955-84, and 1.8 percent for the 10 years 1975-84. 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, and the proportion of employee compensation paid as wages.

The ultimate annual increases in productivity for all sectors—wage-and-salary workers, self-employed persons, and the total economy—are assumed to be 2.7, 2.4, 2.1, and 1.8 percent for alternatives I, II-A, II-B, and III, respectively. The corresponding ultimate annual declines in the linkage for wage and salary workers are assumed to be 0.2, 0.4, 0.6, and 0.8 percent. The resulting ultimate real-wage differentials are 2.5, 2.0, 1.5, and 1.0 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.

For alternative II-A, the CPI is assumed to increase ultimately at an annual rate of 3.0 percent. For alternative II-B, the CPI is assumed to increase ultimately at an annual rate of 4.0 percent, which is somewhat lower than the average annual increase of 4.7 percent experienced between 1955 and 1985. The ultimate increases in the average annual CPI for alternatives I and III of 2.0 percent and 5.0 percent, respectively, were chosen to include a reasonable range of possible values. 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 4.5, 5.0, 5.5, and 6.0 percent, for alternatives I, II-A, II-B, and III, respectively. These were obtained, for each alternative, by adding the assumed annual percentage increase in the CPI to the 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 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. 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 tips and multiple-employer "excess wages," and which did apply, before 1984, to net earnings from self-employment. For 1984 and later, the amounts of earnings for employees, employers, and the self-employed were projected separately. 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.

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 types of insured status under the OASDI program: fully, currently, and disability. Fully insured status is required of an aged worker for eligibility to a primary retirement benefit and for the eligibility of the 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, based on past and projected coverage rates, the requirement for fully insured status, and their historical relationships to fully insured rates. 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 the fully insured population that is 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.

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 in the same equations that related total coverage rates to the percentage of the population that is fully insured.

#### *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.

The numbers of retired-worker beneficiaries were projected as a percentage of the aged fully insured population. The percentages for ages 70 and over are assumed to be 100 (because the retirement earnings test and delayed retirement credit do not apply after age 70), after allowing for some insured widow(er)s who are assumed to receive widow(er) benefits (see below). In the short-range period, the retired-worker beneficiaries were developed by applying award rates to the population which is insured but not yet retired, and by applying termination rates to the retired workers already receiving benefits. For 1990, the retired-worker beneficiaries as a percentage of the fully insured population for ages 65 through 69 are assumed to increase, reflecting the change effective then in benefit withholding under the retirement earnings test. The percentages for ages 62 through 69 are assumed to change for two reasons. They were adjusted upward at a decreasing rate until 2000, thus continuing the trend toward earlier retirement. They were also adjusted, however, in the long-range period, for each year of birth, as a function of the ratio of the monthly benefit amount payable at each age of entitlement to the amount payable at entitlement age 70. 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 two adjustments is to increase the percentages at ages 62 through 69 into the 1990s and then to decrease the percentages. Ultimate percentages are assumed to be reached in 2030.

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 spouse is not insured, (2) the spouse is not earning enough to have his or her benefits withheld, (3) the wage earner is 62 or over, (4) the wage earner is insured, (5) the wage earner is receiving benefits, and (6) a residual factor including the probability that the spouse is not eligible to receive a significant governmental pension based on earnings in noncovered employment.

In addition, the same factors were applied to the numbers of divorced persons aged 62 and over in the population, with two differences. First, an additional factor is required to reflect the probability that the person's former wage-earner spouse is still alive (otherwise, he or she may be entitled to a divorced widow(er)'s benefit). Second, factor (5) was not applied because, effective for January 1985, divorced persons generally need not wait to receive benefits until their former wage-earner spouses are 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 then was used to project the number of children of retired-worker beneficiaries. In the long-range period, two factors were applied to the numbers of children, representing the probabilities that their mothers or fathers are both alive and that at least one parent is insured and receiving retired-worker benefits. The numbers of disabled children aged 18 and over of retired-worker beneficiaries were projected as a percentage of the adult population.

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 minor-child beneficiaries, 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. Three 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 fully insured, and (3) the widow(er)'s benefits are not withheld under the retirement earnings test or because of eligibility for a governmental 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 an additional factor representing the probability that the person's former wage-earner spouse is deceased.

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 probability that the deceased spouse was insured.

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 number of minor-child survivor beneficiaries was projected by applying one factor, representing the probability that the mother or father was insured at death. The numbers of disabled children aged 18 and over of deceased workers were projected as a percentage of the adult population.

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 minor-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 wives, widows, husbands, and widowers. Residual payments to other beneficiaries were not taken into account, because of the negligible cost involved.

TABLE A2.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1945-2060  
[in thousands]

Calendar year	Retired workers and auxiliaries			Survivors				Total
	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	
<b>Past experience:</b>								
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	1,550	36	14,157
1965	11,101	2,614	461	2,371	472	1,817	35	19,128
1970	13,349	2,668	546	3,227	523	2,161	29	23,564
1975	16,588	2,867	643	3,889	582	2,206	21	27,732
1980	19,562	3,016	639	4,411	562	1,883	15	30,907
1985	22,432	3,069	457	4,863	372	1,917	10	33,120
<b>Alternative I:</b>								
1986	22,982	3,088	453	4,925	367	1,905	9	33,728
1987	23,488	3,105	448	4,985	363	1,877	8	34,274
1988	23,976	3,121	442	5,046	359	1,839	7	34,790
1989	24,428	3,137	438	5,099	356	1,807	7	35,273
1990	25,021	3,166	439	5,157	358	1,800	6	35,947
1995	26,963	3,219	475	5,422	376	1,901	5	38,361
2000	27,953	3,008	471	5,040	346	1,857	4	38,679
2005	29,541	2,709	528	4,968	340	1,911	4	40,000
2010	32,880	2,470	607	4,887	333	1,949	4	43,131
2015	38,403	2,378	689	4,838	329	1,967	4	48,638
2020	45,113	2,413	756	4,875	333	2,059	3	53,552
2025	51,185	2,477	804	5,005	341	2,123	3	61,938
2030	55,572	2,468	810	5,182	349	2,172	3	66,555
2035	57,659	2,420	818	5,363	355	2,213	3	68,831
2040	57,744	2,297	815	5,472	361	2,258	4	68,950
2045	57,673	2,244	844	5,529	368	2,309	4	68,971
2050	58,306	2,256	877	5,524	377	2,366	3	69,709
2055	59,521	2,315	910	5,496	387	2,424	3	71,059
2060	60,928	2,388	934	5,504	396	2,479	3	72,633
<b>Alternative II-A:</b>								
1986	23,003	3,089	452	4,925	366	1,900	9	33,745
1987	23,538	3,108	447	4,985	361	1,867	8	34,313
1988	24,060	3,126	442	5,045	356	1,822	7	34,858
1989	24,554	3,143	437	5,098	351	1,782	7	35,372
1990	25,195	3,173	438	5,155	351	1,767	6	36,085
1995	27,477	3,236	473	5,413	357	1,805	5	38,765
2000	28,743	3,133	469	5,060	316	1,679	4	39,404
2005	30,856	2,885	516	5,012	298	1,642	4	41,013
2010	34,272	2,674	577	4,953	283	1,607	4	44,370
2015	40,123	2,593	637	4,908	276	1,591	4	50,132
2020	47,227	2,636	683	4,929	273	1,589	4	57,341
2025	53,677	2,709	711	5,034	272	1,591	4	63,997
2030	58,563	2,711	708	5,203	270	1,586	4	69,045
2035	61,144	2,670	707	5,392	266	1,574	4	71,757
2040	61,638	2,545	693	5,524	262	1,560	4	72,225
2045	61,811	2,483	705	5,604	258	1,547	4	72,413
2050	62,536	2,489	721	5,608	256	1,536	4	73,150
2055	63,506	2,532	731	5,580	254	1,524	4	74,112
2060	64,290	2,578	733	5,511	252	1,511	4	74,879
<b>Alternative II-B:</b>								
1986	23,003	3,089	452	4,925	366	1,900	9	33,745
1987	23,537	3,108	447	4,985	361	1,867	8	34,313
1988	24,059	3,126	442	5,045	356	1,822	7	34,857
1989	24,553	3,143	437	5,098	351	1,782	7	35,371
1990	25,193	3,173	438	5,155	351	1,767	6	36,083
1995	27,464	3,236	473	5,413	357	1,805	5	38,752
2000	28,706	3,151	469	5,067	316	1,677	4	39,389
2005	30,596	2,913	515	5,026	298	1,640	4	40,990
2010	34,187	2,711	577	4,972	283	1,604	4	44,338
2015	40,023	2,633	637	4,931	275	1,588	4	50,091
2020	47,110	2,680	682	4,956	272	1,586	4	57,290
2025	53,540	2,760	710	5,064	272	1,587	4	63,936
2030	58,403	2,770	707	5,235	269	1,583	4	68,972
2035	60,962	2,738	705	5,428	265	1,571	4	71,674
2040	61,434	2,621	691	5,585	261	1,556	4	72,134
2045	61,588	2,567	704	5,650	258	1,543	4	72,314
2050	62,291	2,581	719	5,660	256	1,532	4	73,043
2055	63,240	2,630	729	5,618	254	1,520	4	73,997
2060	64,009	2,681	731	5,573	251	1,507	4	74,757

TABLE A2.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1945-2060 (Cont.)  
[In thousands]

Calendar year	Retired workers and auxiliaries			Survivors				Total
	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	
Alternative III:								
1986 .....	23,023	3,090	452	4,925	365	1,895	9	33,760
1987 .....	23,583	3,110	447	4,985	359	1,857	8	34,349
1988 .....	24,139	3,130	441	5,044	352	1,806	7	34,919
1989 .....	24,671	3,148	437	5,096	347	1,759	7	35,463
1990 .....	25,358	3,179	437	5,152	345	1,734	6	36,211
1995 .....	27,942	3,250	471	5,403	339	1,716	5	39,124
2000 .....	29,429	3,272	463	5,080	289	1,512	4	40,048
2005 .....	31,650	3,100	494	5,057	258	1,389	4	41,952
2010 .....	35,600	2,961	535	5,024	235	1,280	4	45,640
2015 .....	41,975	2,915	573	4,985	218	1,200	5	51,871
2020 .....	49,769	2,999	596	4,991	206	1,137	5	59,701
2025 .....	56,988	3,114	605	5,063	194	1,081	5	67,050
2030 .....	62,884	3,167	595	5,209	182	1,032	5	73,075
2035 .....	66,549	3,176	584	5,393	169	978	5	76,853
2040 .....	68,075	3,082	560	5,541	156	922	6	78,342
2045 .....	69,095	3,037	556	5,642	144	868	6	79,348
2050 .....	70,434	3,060	552	5,669	135	817	6	80,673
2055 .....	71,490	3,097	541	5,615	125	767	6	81,643
2060 .....	71,728	3,115	524	5,514	117	720	6	81,724

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 31,655 as of December 31, 1985, and is estimated to be less 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, 1985, by adding new entitlements, and subtracting terminations. The starting number of entitled disabled-worker beneficiaries was estimated by age, sex, and duration of entitlement. The numbers of new entitlements during each year were projected by applying assumed disability incidence rates. In the short-range period, an age-sex-adjusted rate was applied to the total age-sex-adjusted disability insured population. 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). The numbers of terminations were projected by applying assumed termination rates to the disabled-worker population. In the short-range period, overall termination rates 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 and increased during 1983-85, are assumed to continue increasing from 1985 through 2005, when they reach ultimate levels which, for alternatives II-A and II-B, are about 34 percent for males and 44 percent for females higher than the corresponding average rates for 1981-84. This produces age-adjusted rates in 2005 of 5.2 per thousand for males and 3.5 per

thousand for females, and an age-sex-adjusted rate of 4.5 per thousand. These adjusted rates are approximately the same as those used in the two prior reports. For the other alternatives, the disability incidence rates are assumed to follow patterns through time similar to the one for alternatives II-A and II-B. For alternative I, the ultimate levels are assumed to be higher by about 12 percent for males and about 20 percent for females than the average for 1981-84. For alternative III, the ultimate levels are assumed to be higher by about 61 percent for males and 73 percent for females.

The overall termination rates were projected quarterly in the short-range period. For alternatives II-A and II-B, the rates were projected to increase from the relatively low levels of 1984-85, 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 alternatives II-A and II-B, they reach levels in 2060 approximately 30 percent lower 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 1985 levels until 1990, when they attain ultimate levels about 15 percent higher than those of the same period, thereby allowing for the estimated effect of the periodic reviews required by provisions of law first enacted in 1980, and amended in 1983 and 1984.

For alternative I, the death rates in 2060 are assumed to be roughly 10 percent lower 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 2060 are assumed to be about 50 percent lower than those experienced during 1977-80, and recovery rates are assumed to be equal to 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 and sex of each parent. To these numbers of children were applied factors representing the probability that either of their parents is 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 spouse beneficiaries were projected by applying quarterly award and termination rates. Awards to young-spouse beneficiaries were based on the numbers of awards to

child beneficiaries who are either under age 16 or disabled. Awards to aged-spouse beneficiaries 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 1960-2060  
[In thousands]

Calendar year	Disabled workers	Auxiliaries		Total
		Wife-husband	Child	
<b>Past experience:</b>				
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
<b>Alternative I:</b>				
1986 .....	2,670	304	966	3,938
1987 .....	2,659	302	954	3,914
1988 .....	2,644	300	932	3,870
1989 .....	2,637	299	917	3,853
1990 .....	2,636	300	908	3,843
1995 .....	2,729	318	928	3,974
2000 .....	3,252	336	1,091	4,679
2005 .....	3,869	357	1,154	5,380
2010 .....	4,555	381	1,205	6,141
2015 .....	4,964	399	1,246	6,610
2020 .....	5,148	415	1,291	6,854
2025 .....	5,472	432	1,347	7,251
2030 .....	5,357	431	1,384	7,171
2035 .....	5,257	433	1,416	7,106
2040 .....	5,312	438	1,455	7,205
2045 .....	5,591	458	1,509	7,558
2050 .....	5,797	477	1,566	7,840
2055 .....	5,945	493	1,623	8,061
2060 .....	6,078	507	1,677	8,262
<b>Alternative II-A:</b>				
1986 .....	2,695	309	974	3,978
1987 .....	2,716	310	974	4,000
1988 .....	2,733	312	962	4,006
1989 .....	2,756	315	957	4,028
1990 .....	2,786	319	957	4,061
1995 .....	3,012	351	1,016	4,380
2000 .....	3,624	374	1,194	5,192
2005 .....	4,494	410	1,285	6,189
2010 .....	5,450	447	1,343	7,240
2015 .....	6,027	472	1,373	7,872
2020 .....	6,288	491	1,399	8,178
2025 .....	6,690	510	1,435	8,636
2030 .....	6,534	503	1,452	8,489
2035 .....	6,387	498	1,457	8,342
2040 .....	6,412	495	1,464	8,372
2045 .....	6,694	510	1,483	8,687
2050 .....	6,833	522	1,504	8,859
2055 .....	6,838	526	1,523	8,887
2060 .....	6,817	527	1,537	8,881

TABLE A3.—DI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF DECEMBER 31 BY ALTERNATIVE, CALENDAR YEARS 1960-2060 (Cont.)  
(In thousands)

Calendar year	Disabled workers	Auxiliaries		Total
		Wife-husband	Child	
<b>Alternative II-B:</b>				
1986	2,695	309	974	3,978
1987	2,715	310	974	3,999
1988	2,732	312	961	4,004
1989	2,754	314	955	4,024
1990	2,783	318	956	4,057
1995	3,009	351	1,015	4,374
2000	3,618	374	1,193	5,185
2005	4,486	410	1,283	6,179
2010	5,435	447	1,341	7,223
2015	6,007	472	1,370	7,849
2020	6,263	490	1,396	8,149
2025	6,659	509	1,432	8,600
2030	6,501	502	1,446	8,451
2035	6,353	497	1,453	8,303
2040	6,377	494	1,460	8,332
2045	6,656	509	1,479	8,645
2050	6,794	520	1,500	8,814
2055	6,799	525	1,518	8,842
2060	6,778	526	1,532	8,837
<b>Alternative III:</b>				
1986	2,724	313	987	4,025
1987	2,776	318	997	4,091
1988	2,822	323	994	4,140
1989	2,875	330	998	4,202
1990	2,934	337	1,007	4,278
1995	3,294	383	1,105	4,781
2000	4,052	415	1,295	5,762
2005	5,222	465	1,394	7,080
2010	6,496	512	1,432	8,440
2015	7,270	541	1,423	9,235
2020	7,618	560	1,407	9,585
2025	8,099	577	1,403	10,080
2030	7,879	559	1,383	9,822
2035	7,654	541	1,346	9,541
2040	7,610	524	1,305	9,439
2045	7,839	529	1,273	9,640
2050	7,802	526	1,242	9,570
2055	7,495	509	1,209	9,212
2060	7,154	489	1,173	8,817

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 for the OASI program and on an annual basis for the DI program. 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 the number of such payments, which was projected on the basis of the assumed death rates, the projected fully insured population, the estimated percentage of the fully insured population that would qualify for benefits, and the amount of the lump-sum death payment, which is \$255.

#### *ADMINISTRATIVE EXPENSES*

The projection of administrative expenses through 1995 was based on assumed increases in average wages, increases in the CPI, and increases in the number of beneficiaries. For years after 1995, administrative expenses are assumed to increase with the numbers of beneficiaries and with average earnings in covered employment, taking into account assumed increases in productivity.

#### *RAILROAD RETIREMENT FINANCIAL INTERCHANGE*

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 an average annual short-range cost of about \$3 billion and an average annual long-range 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 1995. 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 additional adjustments will be made in 1990 and every fifth year

thereafter. The adjustments for 1990 were estimated based on the change in interest rates since the determination of the adjustments in 1985. No adjustments after 1990 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. 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 are taxable, and (2) the average tax rate applicable to those benefits. These factors were projected based on a model relating total income to OASDI benefit payments for a sample of beneficiaries.

## APPENDIX B.—SENSITIVITY ANALYSIS

This appendix presents estimates which illustrate the sensitivity of the medium-range and long-range estimates to changes in selected individual assumptions. Although the estimates based on the four alternative sets of assumptions illustrate the variations in the estimated actuarial balances resulting from different combinations of assumptions, they do not show the variations resulting from changes in any single assumption. In this sensitivity analysis, alternative II-B 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 actuarial balances.

Each table which follows shows the effects of changing the particular assumption under consideration on the OASDI average income rates, cost rates, and balances. Because the income rate consists mostly of the payroll-tax rate, which is specified in the law, the income rate itself varies only slightly with changes in assumptions. Consequently, it is not considered in the discussion of the tables. The change in each of the balances is approximately equal to the change in the corresponding cost rate—but in the opposite direction.

## CONSUMER PRICE INDEX

Table B1 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B 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 2.0 percent (as assumed for alternative I), 3.0 percent (as assumed for alternative II-A), 4.0 percent (as assumed for alternative II-B), 5.0 percent (as assumed for alternative III), and 6.0 percent. In each case, the ultimate real-wage differential is assumed to be 1.5 percentage points (as assumed for alternative II-B), yielding ultimate percentage increases in average annual wages in covered employment of 3.5, 4.5, 5.5, 6.5, and 7.5 percent, respectively.

TABLE B1.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES, BASED ON ALTERNATIVE II-B WITH VARIOUS CPI-INCREASE ASSUMPTIONS (As a percentage of taxable payroll)

Calendar years	Ultimate percentage increases in wages-CPI <sup>1</sup>				
	3.5-2.0	4.5-3.0	5.5-4.0	6.5-5.0	7.5-6.0
<b>Average income rate:</b>					
1986-2010.....	12.67	12.67	12.67	12.66	12.66
2011-2035.....	13.04	13.03	13.02	13.01	13.00
2036-2060.....	13.21	13.20	13.18	13.17	13.16
1986-2060.....	12.98	12.97	12.96	12.95	12.94
<b>Average cost rate:</b>					
1986-2010.....	10.77	10.66	10.54	10.43	10.32
2011-2035.....	14.39	14.15	13.91	13.68	13.45
2036-2060.....	16.29	16.01	15.74	15.48	15.22
1986-2060.....	13.82	13.61	13.40	13.20	13.00
<b>Balance:</b>					
1986-2010.....	+ 1.90	+ 2.01	+ 2.12	+ 2.23	+ 2.34
2011-2035.....	- 1.35	- 1.12	- .89	- .67	- .45
2036-2060.....	- 3.08	- 2.82	- 2.56	- 2.31	- 2.06
1986-2060.....	- .84	- .64	- .44	- .25	- .06

<sup>1</sup>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 both the medium-range and long-range periods, the average cost rate decreases with greater assumed rates of increase in the CPI. For the

medium-range period, the average cost rate decreases from 10.77 percent (for CPI increases of 2.0 percent) to 10.32 percent (for CPI increases of 6.0 percent). For the long-range period, it decreases from 13.82 to 13.00 percent. The actuarial balance increases from +1.90 to +2.34 percent for the medium-range period, and from -0.84 to -0.06 percent for the long-range 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-WAGE DIFFERENTIAL

Table B2 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various real-wage assumptions. These assumptions are that the ultimate real-wage differential will be 1.0 percentage point (as assumed for alternative III), 1.5 percentage points (as assumed for alternative II-B), 2.0 percentage points (as assumed for alternative II-A), and 2.5 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-B), yielding ultimate percentage increases in average annual wages in covered employment of 5.0, 5.5, 6.0, and 6.5 percent, respectively.

TABLE B2.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES, BASED ON ALTERNATIVE II-B WITH VARIOUS REAL-WAGE ASSUMPTIONS  
(As a percentage of taxable payroll)

Calendar years	Ultimate percentage increase in wages-CPI <sup>1</sup>			
	5.0-4.0	5.5-4.0	6.0-4.0	6.5-4.0
<b>Average income rate:</b>				
1986-2010 .....	12.68	12.67	12.65	12.64
2011-2035 .....	13.06	13.02	12.98	12.95
2036-2060 .....	13.25	13.18	13.13	13.08
1986-2060 .....	13.00	12.96	12.92	12.89
<b>Average cost rate:</b>				
1986-2010 .....	10.90	10.54	10.20	9.88
2011-2035 .....	14.83	13.91	13.07	12.30
2036-2060 .....	16.95	15.74	14.65	13.66
1986-2060 .....	14.23	13.40	12.64	11.94
<b>Balance:</b>				
1986-2010 .....	+1.78	+2.12	+2.45	+2.76
2011-2035 .....	-1.77	-.89	-.09	+.65
2036-2060 .....	-3.71	-2.56	-1.52	-.58
1986-2060 .....	-1.23	-.44	+.26	+.95

<sup>1</sup>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 medium-range period, the average cost rate decreases from 10.90 percent (for a real-wage differential of 1.0 percentage point) to

9.88 percent (for a differential of 2.5 percentage points). For the long-range period, it decreases from 14.23 to 11.94 percent. The actuarial balance increases from +1.78 to +2.76 percent for the medium-range period, and from -1.23 to +0.95 percent for the long-range period.

The average 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 0.75 percent of taxable payroll.

#### TOTAL FERTILITY RATE

Table B3 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various assumed ultimate total fertility rates. These assumptions are that the ultimate total fertility rate will be 1.6 children per woman (as assumed for alternative III), 2.0 (as assumed for alternatives II-A and II-B), and 2.3 (as assumed for alternative I). The rate is assumed to change gradually from its current level and to reach the various ultimate values in 2010.

TABLE B3.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES, BASED ON ALTERNATIVE II-B WITH VARIOUS FERTILITY ASSUMPTIONS  
(As a percentage of taxable payroll)

Calendar years	Ultimate total fertility rate <sup>1</sup>		
	1.6	2.0	2.3
<b>Average income rate:</b>			
1986-2010 .....	12.67	12.67	12.67
2011-2035 .....	13.05	13.02	13.00
2036-2060 .....	13.33	13.18	13.10
1986-2060 .....	13.02	12.96	12.92
<b>Average cost rate:</b>			
1986-2010 .....	10.51	10.54	10.56
2011-2035 .....	14.51	13.91	13.52
2036-2060 .....	18.64	15.74	14.08
1986-2060 .....	14.55	13.40	12.72
<b>Balance:</b>			
1986-2010 .....	+2.15	+2.12	+2.10
2011-2035 .....	-1.46	-89	-52
2036-2060 .....	-5.31	-2.56	-97
1986-2060 .....	-1.54	-44	+20

<sup>1</sup>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 2010.

For the first 25 years, the average cost rate for the three fertility assumptions varies by only 0.05 percent of taxable payroll. In contrast, the average long-range cost rate varies over a wide range, decreasing from 14.55 to 12.72 percent, as the assumed ultimate total fertility rate increases from 1.6 to 2.3. Similarly, while the medium-range actuarial balance varies by only 0.05 percent of taxable payroll, the long-range actuarial balance varies over a much wider range—from -1.54 to +0.20 percent.

During the medium-range 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, thereby resulting in significant changes in cost. Each increase of 0.1 in the ultimate total fertility rate increases the long-range actuarial balance by about 0.25 percent of taxable payroll.

#### DEATH RATES

Table B4 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various assumptions about future reductions in death rates. The analysis was developed by varying the percentage decrease assumed to occur during 1984-2060 in the age-sex-adjusted death rate. The decreases assumed for this period are about 23 percent (as assumed for alternative I), 39 percent (as assumed for alternatives II-A and II-B), and 60 percent (as assumed for alternative III).

TABLE B4.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES, BASED ON ALTERNATIVE II-B WITH VARIOUS DEATH-RATE ASSUMPTIONS  
(As a percentage of taxable payroll)

Calendar years	Reduction in death rates <sup>1</sup>		
	23 percent	39 percent	60 percent
<b>Average income rate:</b>			
1986-2010 .....	12.66	12.67	12.67
2011-2035 .....	12.99	13.02	13.06
2036-2060 .....	13.13	13.18	13.27
1986-2060 .....	12.93	12.96	13.00
<b>Average cost rate:</b>			
1986-2010 .....	10.38	10.54	10.70
2011-2035 .....	13.31	13.91	14.68
2036-2060 .....	14.63	15.74	17.52
1986-2060 .....	12.78	13.40	14.30
<b>Balance:</b>			
1986-2010 .....	+ 2.28	+ 2.12	+ 1.97
2011-2035 .....	- 32	- 89	-1.62
2036-2060 .....	-1.50	-2.56	-4.24
1986-2060 .....	+ .15	- .44	-1.30

<sup>1</sup>The measure of the reduction in death rates is the decrease in the age-sex-adjusted death rate during 1984-2060.

Because the decreases in death rates are assumed to occur gradually, the variation in program cost for the medium-range period is less pronounced than the variation for the long-range period. The medium-range cost rate increases from 10.38 percent (for 23-percent lower ultimate death rates) to 10.70 percent (for 60-percent lower ultimate rates). The long-range cost rate increases from 12.78 to 14.30 percent. The actuarial balance decreases from +2.28 to +1.97 percent for the medium-range period, and from +0.15 to -1.30 percent for the long-range period.

Lower death rates cause both the income and outgo of the OASDI program to be higher than they would otherwise be. The outgo, however, increases more rapidly than the income for both the medium- and long-range periods. Reductions in the death rates for people who have attained the normal retirement age (people whose death rates are the highest) extend the length of time that retirement benefits are paid. Although an increase in taxable payroll results from lower death rates at ages 50 through the normal retirement age, this is more than offset by the additional retirement and disability benefits which subsequently result. 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 by age are

lower by 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-percent reduction in the age-sex-adjusted death rate assumed to occur in 1984-2060, relative to the 39-percent reduction assumed for alternative II-B, decreases the long-range actuarial balance by about 0.40 percent of taxable payroll.

*NET IMMIGRATION*

Table B5 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various assumptions about the magnitude of net immigration. These assumptions are that the annual net immigration will be 300,000 persons (as assumed for alternative III), 500,000 persons (as assumed for alternatives II-A and II-B), 700,000 persons (as assumed for alternative I), and 1,000,000 persons.

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

Calendar years	Net immigration per year			
	300,000	500,000	700,000	1,000,000
<b>Average income rate:</b>				
1986-2010 .....	12.67	12.67	12.66	12.66
2011-2035 .....	13.03	13.02	13.01	12.99
2036-2060 .....	13.20	13.18	13.17	13.15
1986-2060 .....	12.97	12.96	12.95	12.94
<b>Average cost rate:</b>				
1986-2010 .....	10.59	10.54	10.50	10.44
2011-2035 .....	14.19	13.91	13.65	13.30
2036-2060 .....	16.08	15.74	15.45	15.05
1986-2060 .....	13.62	13.40	13.20	12.93
<b>Balance:</b>				
1986-2010 .....	+2.08	+2.12	+2.16	+2.22
2011-2035 .....	-1.15	-.89	-.64	-.31
2036-2060 .....	-2.88	-2.56	-2.28	-1.90
1986-2060 .....	-.65	-.44	-.25	+.01

For both the medium-range and long-range periods, the average cost rate decreases with increasing rates of net immigration. For the medium-range period, the average cost rate decreases from 10.59 percent of taxable payroll (for annual net immigration of 300,000 persons) to 10.44 percent (for annual net immigration of 1,000,000 persons). For the long-range period, it decreases from 13.62 percent to 12.93 percent. The actuarial balance increases from +2.08 to +2.22 percent for the medium-range period, and from -0.65 to +0.01 percent for the long-range period.

The average 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 100,000 immigrants assumed to enter the country annually, relative to the 500,000 net immigration assumed for alternative II-B, increases the long-range actuarial balance by about 0.10 percent of taxable payroll.

**DISABILITY INCIDENCE RATES**

Table B6 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various assumptions about future disability incidence rates. These assumptions are that the ultimate annual age-sex-adjusted disability incidence rate will be about 12 percent higher for men and 20 percent higher for women than the average of the corresponding annual rates experienced during 1981-84 (as assumed for alternative I), about 34 percent higher for men and 44 percent higher for women than such experience (as assumed for alternatives II-A and II-B), and about 61 percent higher for men and 73 percent higher for women than such experience (as assumed for alternative III). The rates are assumed to change gradually from their current levels and to reach their ultimate values in 2005.

TABLE B6.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES,  
BASED ON ALTERNATIVE II-B WITH VARIOUS DISABILITY INCIDENCE ASSUMPTIONS  
(As a percentage of taxable payroll)

Calendar years	Disability incidence rates based on alternative—		
	I	II-A and II-B	III
<b>Average income rate:</b>			
1986-2010 .....	12.66	12.67	12.67
2011-2035 .....	13.01	13.02	13.03
2036-2060 .....	13.17	13.18	13.20
1986-2060 .....	12.95	12.96	12.97
<b>Average cost rate:</b>			
1986-2010 .....	10.46	10.54	10.64
2011-2035 .....	13.66	13.91	14.20
2036-2060 .....	15.47	15.74	16.07
1986-2060 .....	13.20	13.40	13.64
<b>Balance:</b>			
1986-2010 .....	+2.20	+2.12	+2.03
2011-2035 .....	-65	-89	-1.17
2036-2060 .....	-2.30	-2.56	-2.87
1986-2060 .....	-25	-44	-67

For the medium-range period, the average cost rate increases with increasing disability incidence rates from 10.46 percent (for the relatively low rates assumed for alternative I) to 10.64 percent (for the relatively high rates assumed for alternative III). For the long-range period, it increases from 13.20 to 13.64 percent. The actuarial balance decreases from +2.20 to +2.03 percent for the medium-range period, and from -0.25 to -0.67 percent for the long-range period.

**DISABILITY TERMINATION RATES**

Table B7 shows the estimated OASDI average income rates, cost rates, and balances, on the basis of alternative II-B with various assumptions about future disability termination rates.

For all four alternatives, death-termination rates by age and sex are assumed to decline throughout the 75-year projection 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 about 10 percent lower for alternative I, about 30 percent lower for alternatives II-A and II-B, and about 50 percent lower for alternative III.

For all four alternatives, ultimate recovery-termination rates by age and sex are assumed to be attained in 1990. For alternative I, they are about 30 percent higher than the corresponding rates experienced during the base period. For alternative III, they are about the same as the base-

period rates. For alternatives II-A and II-B, such rates are about 15 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 B7.—ESTIMATED OASDI AVERAGE INCOME RATES, COST RATES, AND BALANCES, BASED ON ALTERNATIVE II-B WITH VARIOUS DISABILITY TERMINATION ASSUMPTIONS  
[As a percentage of taxable payroll]

Calendar years	Disability termination rates based on alternative—		
	I	II-A and II-B	III
<b>Average income rate:</b>			
1986-2010 .....	12.67	12.67	12.67
2011-2035 .....	13.02	13.02	13.02
2036-2060 .....	13.18	13.18	13.19
1986-2060 .....	12.95	12.96	12.96
<b>Average cost rate:</b>			
1986-2010 .....	10.52	10.54	10.57
2011-2035 .....	13.85	13.91	13.98
2036-2060 .....	15.66	15.74	15.83
1986-2060 .....	13.34	13.40	13.46
<b>Balance:</b>			
1986-2010 .....	+2.15	+2.12	+2.10
2011-2035 .....	-.83	-.89	-.95
2036-2060 .....	-2.48	-2.56	-2.64
1986-2060 .....	-.39	-.44	-.50

For the medium-range period, the average cost rate increases with decreasing disability termination rates from 10.52 percent (for the relatively high rates assumed for alternative I) to 10.57 percent (for the relatively low rates assumed for alternative III). For the long-range period, it increases from 13.34 to 13.46 percent. The actuarial balance decreases from +2.15 to +2.10 percent for the medium-range period, and from -0.39 to -0.50 percent for the long-range period.