

## APPENDIX A.—ASSUMPTIONS AND METHODS UNDERLYING THE MEDIUM-RANGE AND LONG-RANGE ESTIMATES

This appendix describes the assumptions and methods which underlie the medium-range and long-range estimates in this report. Unless specifically stated otherwise, the assumptions and methods were used for each of the four alternatives. 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 1984 through 2060. The projections started with the U.S. population, including armed forces overseas, on July 1, 1983, as estimated by the Bureau of the Census, based on the 1980 Census, and adjusted for births, deaths, and net immigration during 1980-83. This population estimate was adjusted for net census undercount and was 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.

The past variations in fertility rates have resulted from changes in social attitudes, economic conditions, and the availability and 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 United States for a long period of time, 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, 2.0, and 1.6 children per woman were selected for alternatives I, II-A, II-B, and III, respectively. For each alternative, the total fertility rate is assumed to reach its ultimate level in 2009. 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.<sup>1</sup> A rate of 2.1 would ultimately result in a nearly constant population if net immigration were equal to zero and if death rates were constant at levels close to current U.S. experience.

Historically, death rates in the United States 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 1983. The past 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 2009 and later. Of these three sets of assumptions, 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 1983 and 2009, 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 1981, to the ultimate annual percentage reductions by sex and cause of death assumed for 2009 and later. Alternative I reductions are assumed to change gradually from 50 percent of the average annual reductions observed between 1968 and 1981, while alternative III reductions are assumed to change gradually from 150 percent of the average annual reductions observed between 1968 and 1981, reaching the assumed ultimate percentage reductions in 2009 in each case.

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 1983 and 2060 for alternative I, alternatives II-A and II-B, and alternative III, respectively.

Net immigration is assumed to be 700,000, 500,000, and 300,000 persons per year for alternative I, alternatives II-A and II-B, and alternative III, respectively. The assumed net immigration does not include aliens who may enter the United States illegally, largely because no reliable estimate of their number exists. For alternatives I, II-A, and II-B, however, numbers of refugees are assumed to be admitted periodically, over and above the annual quotas provided in present law. Those illegal aliens who were enumerated in the 1980 Census were automatically included in the starting population.

Table A1 shows the projected population by broad age group, for each of the four alternatives. Because eligibility for many categories of

<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.

OASDI benefits depends on marital status, the population was projected by marital status, as well as by age and sex. Marriage rates 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 1960-2060

Calendar year	Population (in thousands)				Dependency ratio	
	Under 20	20-64	65 and over	Total	Aged <sup>1</sup>	Total <sup>2</sup>
<b>Past experience:</b>						
1960.....	73,108	98,689	17,147	188,944	0.174	0.915
1965.....	79,959	104,121	18,952	203,032	.162	.850
1970.....	80,738	112,613	20,684	214,035	.164	.901
1975.....	78,586	122,705	23,192	224,483	.169	.829
1980.....	74,934	134,850	26,100	235,884	.194	.749
<b>Alternative I:</b>						
1985.....	72,877	145,862	29,071	247,810	.199	.699
1990.....	74,212	153,502	32,208	259,922	.210	.683
1995.....	77,045	160,224	34,325	271,594	.214	.695
2000.....	79,741	167,740	35,235	282,716	.216	.685
2005.....	81,664	175,864	36,389	293,917	.207	.671
2010.....	84,410	181,942	39,274	305,626	.216	.680
2015.....	87,806	184,645	44,919	317,370	.243	.719
2020.....	91,558	185,573	51,510	328,641	.278	.771
2025.....	95,007	185,478	58,809	339,294	.317	.829
2030.....	97,940	187,284	64,249	349,473	.343	.868
2035.....	100,981	192,355	66,056	359,392	.331	.856
2040.....	104,487	198,910	65,827	369,224	.318	.844
2045.....	108,271	205,591	65,304	379,166	.311	.841
2050.....	112,003	211,644	65,911	389,558	.307	.837
2055.....	115,568	218,214	67,020	400,802	.304	.832
2060.....	119,144	225,446	68,503	413,093		
<b>Alternatives II-A and II-B:</b>						
1985.....	72,728	145,614	29,082	247,424	.200	.699
1990.....	73,169	152,660	32,448	258,277	.213	.692
1995.....	74,413	158,802	35,015	268,230	.220	.689
2000.....	74,969	165,728	36,445	277,142	.220	.672
2005.....	74,234	173,228	38,063	285,525	.220	.648
2010.....	74,226	178,091	41,362	293,679	.232	.649
2015.....	74,979	178,819	47,438	301,236	.265	.685
2020.....	76,051	177,210	54,484	307,745	.307	.737
2025.....	76,723	174,065	62,291	313,079	.358	.799
2030.....	76,872	172,213	68,280	317,365	.396	.843
2035.....	77,024	173,124	70,589	320,747	.408	.853
2040.....	77,522	174,997	70,791	323,310	.405	.848
2045.....	78,225	176,436	70,557	325,218	.400	.843
2050.....	78,830	176,638	71,340	326,808	.404	.850
2055.....	79,230	177,221	72,074	328,525	.407	.854
2060.....	79,569	178,449	72,633	330,651	.407	.853
<b>Alternative III:</b>						
1985.....	72,572	145,365	29,092	247,029	.200	.699
1990.....	71,860	151,811	32,875	256,346	.215	.689
1995.....	71,016	157,345	35,851	264,012	.227	.678
2000.....	68,805	163,645	37,573	270,023	.230	.650
2005.....	64,710	170,499	39,726	274,935	.233	.613
2010.....	61,416	173,909	43,629	278,954	.251	.604
2015.....	59,217	172,208	50,435	281,861	.293	.637
2020.....	57,489	167,486	58,342	283,317	.348	.692
2025.....	55,457	160,618	67,181	283,256	.418	.764
2030.....	53,106	154,338	74,354	281,798	.482	.826
2035.....	50,822	150,301	77,892	279,015	.518	.856
2040.....	48,908	146,759	79,248	274,915	.540	.873
2045.....	47,270	142,320	80,020	269,610	.562	.894
2050.....	45,660	136,126	81,634	263,420	.600	.935
2055.....	43,884	130,546	82,291	256,821	.630	.967
2060.....	42,338	126,016	81,853	250,207	.650	.986

<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. In addition, recent trends in the labor force participation rates that cannot be fully explained by the above factors (such as much of the recent increase in the rate for women) were assumed to continue through 2005. All of these factors vary by alternative. For men, the projected age-adjusted labor force participation rates for alternatives I, II-A, and II-B for 2060 are, respectively, 2.3, 0.8, and 0.2 percentage points higher than the 1984 level of 76.9 percent, while the rate for alternative III is 1.5 percentage points lower. For women, the projected age-adjusted labor force participation rates increase for all of the alternatives. The projected rates for 2060 are 7.3, 6.2, 4.5, and 3.7 percentage points, respectively, above the 1984 level of 53.6 percent.

The total age-sex-adjusted unemployment rate averaged 5.7 percent for the 30 years 1955-84 and 7.3 percent for the 10 years 1975-84. 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 in 1995. For alternative III, the unemployment rate is assumed to peak in 1986 and again in 1989, because of assumed recessions, and thereafter to decline gradually, reaching its ultimate level in 1995.

The projected age-adjusted coverage rate for men increases from its 1984 level of 73.2 percent to 78.7, 76.9, 76.1, and 74.1 percent in 2060 on the basis of alternatives I, II-A, II-B, and III, respectively. Correspondingly, for women, it increases from its 1984 level of 54.1 percent to 65.1, 63.8, 61.9, and 60.6 percent, 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) will directly affect the OASDI program. Average earnings in covered employment for each year have a direct affect 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—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 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 0.4 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 1.7 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 are assumed to be 2.67, 2.35, 2.05, and 1.75 percent for alternatives I, II-A, II-B, and III, respectively. The corresponding ultimate annual declines in the linkage are assumed to be 0.2, 0.4, 0.6, and 0.8 percent. The resulting ultimate real-earnings differentials are 2.5, 2.0, 1.5, and 1.0 percent.

For alternative II-A, the CPI-W is assumed to increase ultimately at an annual rate of 3.0 percent. For alternative II-B, the CPI-W is assumed to increase ultimately at an annual rate of 4.0 percent, which is somewhat lower than the average annual increase of 4.6 percent experienced between 1954 and 1984. The ultimate increases in the average annual CPI-W 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-W.

The ultimate increases in average annual earnings 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-W to the assumed real-earnings differential. Ultimate increases in average wages and earnings for the U.S. economy are very similar to those assumed for average earnings in covered employment.

#### *TAXABLE PAYROLL*

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 cost rate, income rate, and actuarial balance. 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.

The cost of the OASDI program can also be expressed as a percentage of the Gross National Product (GNP). Such percentages (which are shown in table 31) are based on the estimated cost rates and on the estimated ratios of taxable payroll to GNP, which are presented in table A2. Projections of GNP were made for the first several years based on assumed quarterly changes in real GNP and in the GNP price deflator. Thereafter, projections of GNP were made in relation to the estimated amounts of earnings in the U.S. economy, and thus, indirectly, in relation to assumed increases in productivity. These projections were based on projected or assumed changes in the size of the employed labor force, the level of average earnings, the ratio of earnings to worker compensation, and the ratio of worker compensation to GNP.

The ratio of taxable payroll to GNP has risen since 1960, in part because of ad hoc increases in the contribution and benefit base. The increase in the ratio for 1983 is largely the result of reflecting in the taxable payroll the special lump-sum transfers made in that year, representing contributions on deemed wage credits granted for military service in 1957-83. The ratio was projected to increase generally for several years for each alternative (as compared to the value shown for 1982), because of the expanded coverage resulting from the 1983 amendments. The long-range trend, however, was projected to be downward, because of a continuation of increases in the ratio of nonwage employee compensation—i.e., fringe benefits—to total compensation. The ratio of wages to total employee compensation is assumed to decline ultimately by 0.1, 0.2, 0.3, and 0.4 percent per year for alternatives I, II-A, II-B, and III, respectively. This ratio declined at average annual rates of 0.43 percent for the 30 years 1955-84, and 0.48 percent for the 10 years 1975-84.

TABLE A2.—RATIO OF TAXABLE PAYROLL TO GNP BY ALTERNATIVE, CALENDAR YEARS 1960-2060

Calendar year	Past experience			
1960 .....	0.402			
1965 .....	.350			
1970 .....	.407			
1975 .....	.419			
1980 .....	.436			
1981 .....	.429			
1982 .....	.434			
1983 .....	.447			
	Projected, by alternative			
	I	II-A	II-B	III
1984 .....	437	436	435	433
1985 .....	439	438	438	437
1990 .....	438	437	435	425
1995 .....	441	437	434	428
2000 .....	442	436	431	424
2005 .....	443	435	428	419
2010 .....	443	433	424	413
2015 .....	442	429	418	406
2020 .....	439	425	412	398
2025 .....	437	421	407	390
2030 .....	435	417	401	383
2035 .....	433	413	395	376
2040 .....	431	409	390	369
2045 .....	429	405	384	362
2050 .....	427	402	379	355
2055 .....	425	398	373	349
2060 .....	423	394	368	342

#### 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 developed from historical trends relating the two. 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, in a manner consistent with the division of the total population by marital status. Married men are assumed to be more likely to be fully insured than are widowers who, in turn, are assumed to be

more likely to be fully insured than are single and divorced men. By contrast, single and divorced women are assumed to be more likely to be fully insured than are widows who, in turn, are assumed to be more likely to be fully insured than are married women. The relative difference between a widowed woman's probability of being fully insured and a married woman's is assumed to decrease through time, reflecting the projected large increase in labor force participation among married women.

*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. For 1990, the percentages for ages 65 through 69 are assumed to increase, reflecting the change effective then in withholding under the retirement earnings test. The percentages for ages 62 through 69 were projected 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. Thus, the percentages were projected to decline gradually as the increases in the delayed retirement credit become effective, and to decline more rapidly, beginning in 2000, during the years in which the normal retirement age is scheduled to increase. Ultimate percentages are assumed to be reached in 2030.

The numbers of aged-spouse beneficiaries were estimated from the population projected by age, sex, and marital status. The benefits of aged-spouse beneficiaries are based on the earnings records of their husbands or wives, who are referred to as "wage earners." 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 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 with mothers or fathers who are aged 62 and over. To these numbers of children, two factors were applied, representing the probabilities that their mothers or fathers are both insured and receiving benefits. The numbers of disabled children aged 18 and over were projected as a percentage of the adult population. The numbers of young-spouse beneficiaries were estimated 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 estimated 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.

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. To these numbers of children, one factor was applied, representing the probability that the mother or father was insured at death. The numbers of disabled children aged 18 and over were projected as a percentage of the adult population. The numbers of mother and father survivor beneficiaries were projected from the numbers of minor-child beneficiaries, taking into account projected changes in average family size.

The numbers of parent survivor beneficiaries were projected as a function of the uninsured population aged 62 and over.

Table A3 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 residual benefits consisting of the excesses of any potential auxiliary benefits over their retired-worker benefits. Estimates of the number 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 A3.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF JUNE 30 BY ALTERNATIVE, CALENDAR YEARS 1960-2060  
[In thousands]

Calendar year	Retired workers and auxiliaries			Survivors				Total
	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	
<b>Past experience:</b>								
1960	7,813	2,224	260	1,471	388	1,549	35	13,740
1965	10,843	2,601	429	2,228	472	1,900	36	18,509
1970	13,066	2,851	535	3,151	514	2,673	29	22,618
1975	16,210	2,836	633	3,823	568	2,905	22	26,998
1976	16,789	2,867	638	3,939	576	2,911	21	27,740
1977	17,380	2,899	670	4,042	573	2,843	19	28,428
1978	17,924	2,942	662	4,147	569	2,739	17	29,062
1979	18,590	2,966	651	4,260	567	2,739	17	29,789
1980	19,167	2,987	633	4,354	560	2,688	15	30,385
1981	19,792	3,010	639	4,446	549	2,624	14	31,074
1982	20,392	3,019	522	4,540	520	2,201	13	31,207
1983	21,060	3,051	491	4,632	494	2,083	12	31,833
1984	21,588	3,033	479	4,722	387	2,030	11	32,251
<b>Alternative I:</b>								
1985	22,096	3,042	468	4,809	381	1,975	10	32,781
1990	24,610	3,144	451	5,148	388	1,863	7	35,610
1995	26,296	3,466	411	4,876	358	1,813	14	37,254
2000	27,312	3,385	427	4,836	356	1,866	15	38,197
2005	28,777	3,257	472	4,755	352	1,837	15	39,565
2010	32,104	3,253	554	4,654	345	2,002	16	42,929
2015	37,554	3,421	636	4,568	345	2,066	16	48,606
2020	44,069	3,708	711	4,556	347	2,134	16	55,541
2025	50,285	3,984	757	4,609	357	2,189	15	62,207
2030	54,780	4,069	760	4,696	370	2,249	16	66,940
2035	56,747	4,003	763	4,773	380	2,289	16	68,982
2040	56,827	3,788	759	4,796	389	2,354	17	68,930
2045	56,890	3,674	792	4,773	397	2,415	17	68,959
2050	57,568	3,634	819	4,713	409	2,480	17	69,640
2055	58,703	3,707	847	4,647	421	2,543	16	70,885
2060	60,094	3,816	869	4,609	433	2,604	15	72,441
<b>Alternative II-A:</b>								
1985	22,122	3,042	468	4,810	381	1,972	10	32,805
1990	24,942	3,179	450	5,149	378	1,816	7	35,921
1995	26,815	3,583	408	4,879	334	1,687	14	37,721
2000	28,223	3,547	418	4,858	318	1,649	16	39,029
2005	30,030	3,470	447	4,804	299	1,622	17	40,689
2010	33,671	3,498	507	4,729	284	1,607	18	44,314
2015	39,457	3,688	563	4,656	276	1,603	18	50,261
2020	46,352	4,000	612	4,638	271	1,605	18	57,496
2025	53,002	4,309	639	4,675	270	1,606	18	64,519
2030	57,974	4,424	633	4,752	271	1,598	19	69,672
2035	60,395	4,375	627	4,835	269	1,587	20	72,107
2040	60,840	4,159	613	4,879	265	1,576	21	72,353
2045	61,156	4,033	629	4,880	261	1,567	21	72,547
2050	61,902	3,975	639	4,832	260	1,559	21	73,189
2055	62,643	4,008	645	4,748	259	1,549	21	73,874
2060	63,202	4,060	645	4,655	258	1,537	20	74,376
<b>Alternative II-B:</b>								
1985	22,122	3,042	468	4,810	381	1,972	10	32,805
1990	24,941	3,180	450	5,149	378	1,816	7	35,921
1995	26,811	3,586	408	4,880	334	1,686	14	37,719
2000	28,204	3,557	418	4,863	318	1,648	16	39,023
2005	29,985	3,493	446	4,816	299	1,620	17	40,676
2010	33,594	3,534	507	4,750	284	1,604	18	44,291
2015	39,349	3,735	563	4,688	276	1,599	18	50,228
2020	46,209	4,059	611	4,682	270	1,601	19	57,452
2025	52,818	4,385	638	4,732	270	1,601	19	64,462
2030	57,746	4,518	632	4,822	271	1,593	19	69,603
2035	60,128	4,484	626	4,919	269	1,582	20	72,028
2040	60,540	4,278	611	4,978	265	1,571	21	72,264
2045	60,823	4,162	627	4,994	260	1,561	22	72,450
2050	61,534	4,116	637	4,959	260	1,553	22	73,082
2055	62,248	4,157	643	4,886	259	1,543	22	73,759
2060	62,787	4,215	643	4,802	257	1,530	21	74,256

TABLE A3.—OASI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF JUNE 30 BY ALTERNATIVE, CALENDAR YEARS 1960-2060 (Cont.)  
[In thousands]

Calendar year	Retired workers and auxiliaries			Survivors				Total
	Worker	Wife-husband	Child	Widow-widower	Mother-father	Child	Parent	
<b>Alternative III:</b>								
1985 .....	22,147	3,042	468	4,811	381	1,970	10	32,829
1990 .....	25,251	3,215	448	5,150	370	1,770	7	36,211
1995 .....	27,287	3,877	403	4,879	313	1,567	15	38,142
2000 .....	29,044	3,715	404	4,876	283	1,446	17	39,785
2005 .....	31,210	3,720	410	4,853	250	1,323	20	41,784
2010 .....	35,264	3,828	445	4,812	224	1,232	20	45,825
2015 .....	41,598	4,082	475	4,763	208	1,166	22	52,312
2020 .....	49,174	4,471	498	4,752	194	1,110	22	60,222
2025 .....	56,660	4,878	507	4,776	183	1,056	23	68,083
2030 .....	62,611	5,095	493	4,841	174	1,004	24	74,242
2035 .....	66,069	5,131	477	4,927	163	950	26	77,743
2040 .....	67,504	4,964	454	4,998	150	897	28	78,896
2045 .....	68,692	4,862	454	5,034	139	847	29	80,057
2050 .....	70,014	4,812	447	5,026	131	800	30	81,261
2055 .....	70,588	4,804	435	4,951	124	754	31	81,685
2060 .....	70,254	4,778	417	4,815	117	709	30	81,121

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 45,098 as of June 30, 1984, 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 workers entitled to Disability Insurance benefits were projected from the estimated numbers of such beneficiaries on December 31, 1984, 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, by age and sex, to the projected disability insured population (excluding those already entitled to disabled-worker benefits). The numbers of terminations during each year were projected by applying assumed death and recovery rates, by age, sex, and duration of entitlement, to the 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 1983-84, are assumed to continue increasing from 1984 through 2000, at which time they reach ultimate levels which, for alternatives II-A and II-B, are about 25 percent higher than the corresponding average rates for 1979-83. For the other alternatives, the disability incidence rates follow patterns similar to the one for alternatives II-A and II-B. For alternative I, the ultimate levels are assumed to be about the same as the average for 1979-83, and, for alternative III, about 50 percent higher.

The death and recovery rates were projected by age, sex, and duration of entitlement. For alternatives II-A and II-B, the death rates are assumed to decline steadily throughout the 75-year projection period, reaching levels in 2060 approximately 21 percent lower than those experienced by disabled-worker beneficiaries during 1977-80. The recovery rates are assumed to remain constant at 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 are assumed to remain constant at levels equal to those experienced by disabled-worker beneficiaries during 1977-80, and the recovery rates are assumed to remain constant at levels 30 percent higher than those of the same period. For alternative III, the reductions in death rates are assumed to be double those for alternatives II-A and II-B; the death rates in 2060 are about 42 percent lower than those experienced during 1977-80. The alternative III recovery rates are assumed to be equal to those experienced during 1977-80.

The projected numbers of children under age 18, and students aged 18, who are eligible for benefits as children of disabled-worker 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.

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 A4 shows the projected numbers of beneficiaries under the DI program.

TABLE A4.—DI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF JUNE 30 BY ALTERNATIVE, CALENDAR YEARS 1960-2060  
[In thousands]

Calendar year	Disabled workers	Auxiliaries		Total
		Wives and husbands	Children	
<b>Past experience:</b>				
1960	371	56	94	522
1965	944	187	518	1,648
1970	1,436	271	861	2,568
1975	2,363	429	1,333	4,125
1976	2,602	468	1,462	4,533
1977	2,755	482	1,496	4,733
1978	2,858	491	1,512	4,861
1979	2,877	483	1,466	4,826
1980	2,863	468	1,403	4,734
1981	2,835	450	1,350	4,636
1982	2,713	399	1,071	4,184
1983	2,591	357	944	3,893
1984	2,567	305	917	3,789
<b>Alternative I:</b>				
1985	2,631	308	918	3,857
1990	2,630	308	866	3,804
1995	2,637	288	920	3,846
2000	2,942	303	998	4,243
2005	3,496	325	1,080	4,901
2010	4,121	347	1,149	5,618
2015	4,486	360	1,200	6,046
2020	4,668	374	1,246	6,288
2025	4,878	389	1,294	6,561
2030	4,770	386	1,327	6,483
2035	4,679	387	1,359	6,425
2040	4,743	392	1,400	6,535
2045	4,981	411	1,452	6,845
2050	5,133	426	1,505	7,064
2055	5,261	440	1,557	7,259
2060	5,391	453	1,608	7,451

TABLE A4.—DI BENEFICIARIES WITH MONTHLY BENEFITS IN CURRENT-PAYMENT STATUS AS OF JUNE 30 BY ALTERNATIVE, CALENDAR YEARS 1960-2060 (Cont.)  
[in thousands]

Calendar year	Disabled workers	Auxiliaries		Total
		Wives and husbands	Children	
<b>Alternative II-A:</b>				
1985	2,645	310	923	3,878
1990	2,795	330	919	4,046
1995	3,067	338	1,063	4,467
2000	3,582	369	1,183	5,145
2005	4,385	402	1,275	6,070
2010	5,250	431	1,332	7,013
2015	5,751	446	1,383	7,560
2020	5,998	462	1,387	7,846
2025	6,263	477	1,413	8,154
2030	6,103	468	1,422	7,993
2035	5,957	461	1,424	7,842
2040	5,993	459	1,432	7,884
2045	6,231	474	1,451	8,155
2050	6,295	481	1,468	8,244
2055	6,281	484	1,483	8,248
2060	6,324	491	1,520	8,335
<b>Alternative II-B:</b>				
1985	2,845	310	923	3,878
1990	2,795	330	919	4,043
1995	3,066	338	1,063	4,466
2000	3,589	369	1,183	5,142
2005	4,388	402	1,275	6,065
2010	5,241	431	1,332	7,004
2015	5,738	446	1,362	7,547
2020	5,981	462	1,386	7,828
2025	6,242	477	1,412	8,131
2030	6,079	468	1,421	7,967
2035	5,932	461	1,423	7,815
2040	5,966	458	1,430	7,855
2045	6,201	474	1,449	8,124
2050	6,265	481	1,466	8,213
2055	6,251	484	1,481	8,216
2060	6,294	491	1,518	8,303
<b>Alternative III:</b>				
1985	2,654	312	928	3,893
1990	2,965	350	970	4,285
1995	3,509	388	1,198	5,095
2000	4,281	433	1,337	6,031
2005	5,315	470	1,394	7,179
2010	6,408	500	1,398	8,306
2015	7,046	512	1,377	8,934
2020	7,348	523	1,354	9,225
2025	7,654	534	1,336	9,524
2030	7,416	513	1,302	9,230
2035	7,181	492	1,256	8,928
2040	7,139	475	1,213	8,827
2045	7,297	481	1,180	8,958
2050	7,135	472	1,147	8,754
2055	6,793	453	1,111	8,358
2060	6,508	434	1,075	8,017

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 1979.

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, annual benefit payments were calculated as the product of (1) the number of beneficiaries on June 30, and (2) twelve times the corresponding average monthly benefit. These amounts were adjusted to include retroactive payments to newly awarded beneficiaries.

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 1994 was based on assumed increases in average wages, increases in the CPI, and increases in the number of beneficiaries. For years after 1994, 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 long-range cost to the OASDI program of 0.02 percent of taxable payroll.

*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. 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. Neither the payments nor the reimbursements are reflected in the cost rates or the income rates. These amounts are reflected, however, in tables which show trust fund operations.

### 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 average OASDI cost rates, total income rates, and balances. Because the income rates consist mostly of the contribution rates, which are specified in the law, the income rates themselves vary only slightly with changes in assumptions. Consequently, they are 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.

#### TOTAL FERTILITY RATE

Table B1 shows the estimated average OASDI cost rates, income 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 rates 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 rates are assumed to change gradually from their current levels and to reach their ultimate values in 2009.

TABLE B1.—ESTIMATED AVERAGE OASDI COST RATES, TOTAL INCOME 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 cost rate:</b>			
1985-2009 .....	10.59	10.62	10.64
2010-2034 .....	14.40	13.79	13.42
2035-2059 .....	18.55	15.64	13.99
1985-2059 .....	14.51	13.35	12.68
<b>Average total income rate:</b>			
1985-2009 .....	12.62	12.62	12.62
2010-2034 .....	13.04	13.01	12.99
2035-2059 .....	13.32	13.18	13.10
1985-2059 .....	12.99	12.94	12.90
<b>Balance:</b>			
1985-2009 .....	+2.03	+2.00	+1.98
2010-2034 .....	-1.36	-.78	-.42
2035-2059 .....	-5.22	-2.46	-.90
1985-2059 .....	-1.52	-.41	+.22

<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 2009.

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 14.51 to 12.68 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 -1.52 to +0.22 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 B2 shows the estimated average OASDI cost rates, income 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 1983-2060 in the age-sex-adjusted death rate. The decreases assumed for this period are about 22 percent (as assumed for alternative I), 38 percent (as assumed for alternatives II-A and II-B), and 59 percent (as assumed for alternative III).

TABLE B2.—ESTIMATED AVERAGE OASDI COST RATES, TOTAL INCOME 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>		
	22 percent	38 percent	59 percent
<b>Average cost rate:</b>			
1985-2009 .....	10.43	10.62	10.81
2010-2034 .....	13.16	13.79	14.63
2035-2059 .....	14.49	15.64	17.52
1985-2059 .....	12.69	13.35	14.32
<b>Average total income rate:</b>			
1985-2009 .....	12.61	12.62	12.63
2010-2034 .....	12.98	13.01	13.05
2035-2059 .....	13.12	13.18	13.27
1985-2059 .....	12.91	12.94	12.98
<b>Balance:</b>			
1985-2009 .....	+2.19	+2.00	+1.82
2010-2034 .....	-.18	-.78	-1.58
2035-2059 .....	-1.37	-2.46	-4.25
1985-2059 .....	+2.21	-.41	-1.34

<sup>1</sup>The measure of the reduction in death rates is the percentage decrease in the age-sex-adjusted death rate during 1983-2060.

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 10.43 percent (for 22-percent lower ultimate death rates) to 10.81 percent (for 59-percent lower ultimate rates). The long-range cost rate increases from 12.69 to 14.32 percent. The actuarial balance decreases from +2.19 to +1.82 percent for the medium-range period, and from +0.21 to -1.34 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, will increase more rapidly than the income for 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 20-49, death rates are so low that even substantial reductions would not result in significant increases in the numbers of covered workers or beneficiaries. Lower death rates at ages below 20 have relatively little long-term effect on the relationship between outgo and taxable payroll. 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 1983-2060, relative to the 38-percent reduction assumed for alternative II-B, decreases the long-range actuarial balance by about 0.40 percent of taxable payroll.

#### DISABILITY INCIDENCE RATES

Table B3 shows the estimated average OASDI cost rates, income 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 the same as the average of the corresponding annual rates experienced during 1979-83 (as assumed for alternative I), about 25 percent higher than the 1979-83 experience (as assumed for alternatives II-A and II-B), and about 50 percent higher 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 2000.

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

Calendar years	Increase in disability incidence rates <sup>1</sup>		
	None	25 percent	50 percent
<b>Average cost rate:</b>			
1985-2009 .....	10.48	10.62	10.76
2010-2034 .....	13.49	13.79	14.10
2035-2059 .....	15.32	15.64	15.94
1985-2059 .....	13.09	13.35	13.60
<b>Average total income rate:</b>			
1985-2009 .....	12.61	12.62	12.62
2010-2034 .....	13.00	13.01	13.03
2035-2059 .....	13.16	13.18	13.19
1985-2059 .....	12.93	12.94	12.95
<b>Balance:</b>			
1985-2009 .....	+2.14	+2.00	+1.86
2010-2034 .....	-.49	-.78	-1.07
2035-2059 .....	-2.16	-2.46	-2.75
1985-2059 .....	-.17	-.41	-.65

<sup>1</sup>The increase in disability incidence rates is based on the ratio of the ultimate annual age-sex-adjusted incidence rate (reached in 2000) to the average of the corresponding annual rates experienced during 1979-83.

For the medium-range period, the average cost rate increases with increasing disability incidence rates from 10.48 percent (for no increase) to 10.76 percent (for a 50-percent increase). For the long-range period, it increases from 13.09 to 13.60 percent. The actuarial balance decreases from +2.14 to +1.86 percent for the medium-range period, and from -0.17 to -0.65 percent for the long-range period. Each 10-percent increase

in the assumed ultimate disability incidence rates decreases the long-range actuarial balance by about 0.10 percent of taxable payroll.

*DISABILITY TERMINATION RATES*

Table B4 shows the estimated average OASDI cost rates, income rates, and balances, on the basis of alternative II-B with various assumptions about future disability termination rates.

For alternative I, death-termination rates by age and sex are assumed to be the same, throughout the long-range projection period, as the corresponding annual rates experienced during 1977-80. For the other alternatives, such rates are assumed to decline throughout the 75-year projection period. At the end of that period, they reach levels that, in comparison with the corresponding annual rates experienced during 1977-80, are about 21 percent lower for alternatives II-A and II-B, and about 42 percent lower for alternative III.

For alternative III, recovery-termination rates by age and sex are assumed to be about the same, throughout the long-range projection period, as the corresponding rates experienced during 1977-80. For alternatives II-A and II-B, such rates are assumed to be about 15 percent higher than those experienced in 1977-80; for alternative I, they are about 30 percent higher than the base-period rates. Recovery-termination rates for alternatives II-A and II-B are 15 percent higher than the rates experienced during 1977-80, in order to reflect the effects of the periodic reviews required by provisions of law first enacted in 1980, and amended in 1983 and 1984.

TABLE B4.—ESTIMATED AVERAGE OASDI COST RATES, TOTAL INCOME 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 cost rate:</b>			
1985-2009.....	10.59	10.62	10.65
2010-2034.....	13.72	13.79	13.88
2035-2059.....	15.53	15.64	15.75
1985-2059.....	13.28	13.35	13.43
<b>Average total income rate:</b>			
1985-2009.....	12.62	12.62	12.62
2010-2034.....	13.01	13.01	13.02
2035-2059.....	13.17	13.18	13.18
1985-2059.....	12.93	12.94	12.94
<b>Balance:</b>			
1985-2009.....	+2.03	+2.00	+1.97
2010-2034.....	-.71	-.78	-.86
2035-2059.....	-2.35	-2.46	-2.57
1985-2059.....	-.35	-.41	-.49

For the medium-range period, the average cost rate increases with decreasing disability termination rates from 10.59 percent (for the relatively high rates assumed for alternative I) to 10.65 percent (for the relatively low rates assumed for alternative III). For the long-range period, it increases from 13.28 to 13.43 percent. The actuarial balance decreases from +2.03 to +1.97 percent for the medium-range period, and from -0.35 to -0.49 percent for the long-range period.

**CONSUMER PRICE INDEX**

Table B5 shows the estimated average OASDI cost rates, income rates, and balances, on the basis of alternative II-B with various assumptions about the rate of increase for the 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-earnings differential is assumed to be 1.5 percentage points (as assumed for alternative II-B), yielding ultimate percentage increases in average annual earnings in covered employment of 3.5, 4.5, 5.5, 6.5, and 7.5 percent, respectively.

**TABLE B5.—ESTIMATED AVERAGE OASDI COST RATES, TOTAL INCOME 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 earnings-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 cost rate:</b>					
1985-2009.....	10.84	10.73	10.62	10.51	10.41
2010-2034.....	14.25	14.03	13.79	13.57	13.35
2035-2059.....	16.16	15.90	15.64	15.38	15.11
1985-2059.....	13.75	13.55	13.35	13.15	12.96
<b>Average total income rate:</b>					
1985-2009.....	12.63	12.62	12.62	12.62	12.61
2010-2034.....	13.03	13.02	13.01	13.00	12.99
2035-2059.....	13.20	13.19	13.18	13.17	13.15
1985-2059.....	12.95	12.95	12.94	12.93	12.92
<b>Balance:</b>					
1985-2009.....	+1.79	+1.90	+2.00	+2.10	+2.20
2010-2034.....	-1.22	-1.00	-.78	-.57	-.36
2035-2059.....	-2.96	-2.71	-2.46	-2.21	-1.96
1985-2059.....	-.80	-.61	-.41	-.23	-.04

<sup>1</sup>The first value in each pair is the assumed ultimate annual percentage increase in average earnings in covered employment. The second value is the assumed ultimate annual percentage increase in the CPI.

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, the average cost rate decreases from 10.84 percent (for CPI increases of 2.0 percent) to 10.41 percent (for CPI increases of 6.0 percent). For the long range, it decreases from 13.75 to 12.96 percent. The actuarial balance increases from +1.79 to +2.20 percent for the medium-range period, and from -0.80 to -0.04 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-earnings differential), the effect on taxable payroll of the implied greater rate of increase in average earnings 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 earnings is experienced no sooner than 2 years later. Thus, the higher taxable payrolls have a stronger effect than the higher benefits have, 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-EARNINGS DIFFERENTIAL**

Table B6 shows the estimated average OASDI cost rates, income rates, and balances, on the basis of alternative II-B with various real-earnings assumptions. These assumptions are that the ultimate real-earnings 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 earnings in covered employment of 5.0, 5.5, 6.0, and 6.5 percent, respectively.

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

Calendar years	Ultimate percentage increase in earnings-CPI <sup>1</sup>			
	5.0-4.0	5.5-4.0	6.0-4.0	6.5-4.0
<b>Average cost rate:</b>				
1985-2009 .....	10.99	10.62	10.27	9.94
2010-2034 .....	14.72	13.79	12.95	12.18
2035-2059 .....	16.82	15.64	14.57	13.60
1985-2059 .....	14.17	13.35	12.60	11.91
<b>Average total income rate:</b>				
1985-2009 .....	12.63	12.62	12.61	12.59
2010-2034 .....	13.05	13.01	12.97	12.94
2035-2059 .....	13.24	13.18	13.12	13.08
1985-2059 .....	12.97	12.94	12.90	12.87
<b>Balance:</b>				
1985-2009 .....	+1.64	+2.00	+2.34	+2.65
2010-2034 .....	-1.66	-.78	+.02	+.76
2035-2059 .....	-3.58	-2.46	-1.45	-.53
1985-2059 .....	-1.20	-.41	+.30	+.96

<sup>1</sup>The first value in each pair is the assumed ultimate annual percentage increase in average earnings in covered employment. The second value is the assumed ultimate annual percentage increase in the CPI. The difference between the two values is the real-earnings differential.

For the medium-range period, the average cost rate decreases from 10.99 percent (for a real-earnings differential of 1.0 percentage point) to 9.94 percent (for a differential of 2.5 percentage points). For the long-range period, it decreases from 14.17 to 11.91 percent. The actuarial balance increases from +1.64 to +2.65 percent for the medium-range period, and from -1.20 to +0.96 percent for the long-range period.

The average cost rate decreases with increasing real-earnings differentials, because the higher real-earnings levels increase the taxable payroll, while benefit increases are not affected. Although the initial benefit levels are higher because of the higher earnings, 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-earnings differential increases the long-range actuarial balance by about 0.70 percent of taxable payroll.