ACTUARIAL APPENDIX

DETAILED LONG-RANGE COST ESTIMATES

Two sets of estimates were presented in the previous report of the Board of Trustees, both based on high-employment assumptions (somewhat below conditions prevailing at the end of 1952). The low-cost and high-cost assumptions relate to the cost as a percent of payroll (i. e., total taxable earnings including those from self-employment) in the aggregate and not to the dollar costs. The two sets of cost assumptions are based on possible variations in fertility rates, mortality rates, retirement rates, remarriage rates, etc. Two additional estimates have been developed and are presented here—both based on low-employment assumptions (roughly, midway between the high-employment assumptions and the level prevailing just before the start of World War II).

In the following pages, summary figures are presented for all 4 estimates although detailed figures are given only for the 2 based on the high-employment assumptions (which appear somewhat more reasonable than the low-employment assumptions in the light of current conditions). In addition, further details for all cost estimates are given in Actuarial Study No. 36 of the Social Security Administration, Department of Health, Education, and Welfare (*Long-Range Cost Estimates for the Old-Age and Survivors Insurance System, 1953*).

The estimates are based on level earnings assumptions (slightly below the present level). If in the future the earnings level should be considerably above that which now prevails, and if the benefits for those on the roll are at the same time adjusted upward so that the annual costs relating to payroll will remain the same, then the increased dollar outgo resulting will offset the increased dollar income. This is an important reason for considering costs relative to payroll rather than in dollars.

The cost estimates have not taken into account the possibilities of a rise in earnings levels, although such a rise has characterized the past history of this country. If such an assumption were used in the cost estimates, along with the unlikely assumption that the benefits nevertheless would not be changed, the cost relative to payroll would, of course, be lower. If benefits are adjusted to keep pace with rising earnings trends, the year-by-year costs as a percentage of payroll would be unaffected. However, in such case this would not be true for the level-premium cost which would be higher, since under such circumstances the relative value of the interest earnings of the trust fund would gradually diminish with the passage of time.

For the estimates based on low-employment and high-employment assumptions, all cost factors (including earnings rates) are the same, other than employment assumptions. In the low-employment estimates it is assumed that about 85 percent of all males aged 25–34

in the country have covered earnings in the course of a year, decreasing to about 60 percent for ages 60–64, as against about 90 percent and 70 percent respectively for the high-employment assumptions. For women the corresponding proportions are 35 percent for ages 25–34 and 15 percent for ages 60–64 for the low-employment assumptions, and 40 and 20 percent respectively for the high-employment assumptions. Further, the proportion of those covered who work in all 4 quarters varied for men from about 75 percent for the low-employment assumptions to about 80 percent for the high-employment assumptions, with somewhat lower proportions at the youngest and oldest ages. For women, the same proportions were used for both employment assumptions, namely about 55 percent for ages 20–35 and about 65 percent for ages 40 and over. As a result of these assumptions, the annual covered payroll currently amounts to about $110 billion under the low-employment assumptions and $130 billion under the high-employment assumptions, the latter figure being quite close to actual experience.

There are a number of other basic factors which must be continuously recognized in estimating the costs of this program. These will be discussed hereafter.

(*a*) *Population.*—The future trend of the population depends on the size and age distribution of the existing population, on future births and immigration, and on future deaths and emigration. As a basis for making such estimates, there are available great quantities of census and vital statistics data. There are various types of error and bias in such data, as has been recognized by the Bureau of the Census in its many comprehensive reports on this subject. For instance, the 1940 census showed about 600,000 more persons aged 65 and over than had been indicated as likely by data in the 1930 census and the deaths and migration between the 2 censuses. The 1950 census shows about 700,000 more persons age 65 and over than are indicated by a similar projection of the 1940 census. In the cost estimates the 1950 census is used as the base, despite any errors or bias it may have, since there is at this time no adequate basis for adjustment.

Crude birthrates declined for many years until the middle thirties, due in part to the increasing proportion of the female population past the childbearing ages, and in part to a decline in age-specific birthrates. However, since 1937 the long decline of the birthrate has been reversed. During the war years quite high rates were reported, the wartime peak having been reached in 1943. Although the birthrate declined somewhat in 1944–45, it remained higher than at any time during the thirties despite the effect of the war in removing from this country many young potential fathers. Beginning in the middle of 1946, the birthrate rose very rapidly, and for the 12-month period ending June 1947 was higher than at any time since before the beginning of World War I. Thereafter there was some decline and a subsequent rise in 1951–53, although not quite to the 1947 level.

The increase in birth rates in recent years seems to be largely concentrated in the rates for first, second, and third births. The increase in first births tends to increase the proportion of the insured population with dependents eligible for immediate monthly benefits, as well as the number of such dependents. As a result, the cost of survivor benefits is increased even though there is a decline in the number of large families; the latter factor has only a limited effect upon benefits

because aggregate benefits for a family are not increased for children in excess of three where the mother is also receiving benefits.

Net immigration had been very heavy prior to 1915 and moderate in the early twenties, but was quite negligible thereafter. Most population forecasts have assumed that no return to high net immigration rates may be expected.

As a basis for the cost estimates, two population projections have been developed. These do not reflect the maximum possible range in population which might develop in the future, but rather embody factors which produce either low cost or high cost in regard to old-age and survivors insurance; for example, unfavorable mortality assumptions versus favorable ones. These population projections are presented in detail in Actuarial Study No. 33 of the Social Security Administration (*Illustrative United States Population Projections, 1952*).

Table 11 indicates the alternative trends of population growth resulting for the total population, for those aged 20–64, and for those aged 65 and over. The high-cost projection shows a larger aged population than the low-cost projection because of the assumed lower mortality, but a somewhat lower population in age groups under 65 because of the assumed lower fertility which more than offsets the improved mortality.

TABLE 11.—*Estimated population of the United States, 1960–2000*

[In millions]

Calendar year	All ages			Ages 20–64			Ages 65 and over		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
	Actual data								
1950 (April)	151	75	76	87	43	44	12.3	5.8	6.5
1952 (July)	157	78	79	89	44	45	13.1	6.1	7.0
	Projection for low-cost assumptions								
1960	174	86	88	95	46	49	15.4	7.0	8.4
1980	209	103	106	117	58	59	22.0	9.4	12.6
2000	248	123	125	139	70	69	25.8	11.0	14.8
	Projection for high-cost assumptions								
1960	173	86	87	95	47	48	15.5	7.1	8.4
1980	197	97	100	116	58	58	22.8	9.9	12.9
2000	216	108	108	128	64	64	28.0	12.2	15.8

(*b*) *Mortality.*—Mortality rates by age have been improving steadily since the turn of the century for both sexes and for virtually all ages up to age 60. Although there was relatively little change above that age during the first four decades, during the past decade there has been significant improvement.

In the low-cost assumptions, some improvement in mortality rates at all ages is assumed. However, in the high-cost assumptions, con-

siderably more improvement is assumed. Although both sets of assumptions are arbitrary, they may reasonably bound, for the purposes of this report, the range within which mortality rates will fall. If the range between them seems wide, it should be recalled that no allowance has been made for the effects of such diverse factors as the application of new discoveries to the prevention of disease and to the impairments caused by disease and the possibilities of increasing the survival of impaired lives for only temporary periods.

Mortality rates are of major importance for estimates of future benefits for the aged and of importance also in determining potential deaths among the younger parents which will give rise to mother's and child's survivor benefits and ultimately to aged widow's benefits.

(*c*) *Amount of covered employment.*—In determining the number of covered persons, percentages of men and women in the population who are in covered employment are developed by age through analysis of wage data for the previous coverage and preliminary data for 1951 for the present coverage, along with census and other data in regard to the newly covered groups. The level of employment in the high employment assumptions is roughly that currently prevailing. It is assumed that in the future the proportion of women who would be in covered employment would gradually rise for each age group, since in recent years they have been participating more and more in the covered labor force.

Because the coverage of the system excludes several large categories of employment (considerable portions of agricultural, domestic, nonprofit, and public employment, and agricultural and most professional self-employment), there is a flow of workers between covered and noncovered employment in addition to that between covered employment and unemployment. The restricted coverage necessarily will result in large numbers of workers who have not had sufficient contact with the program to establish or maintain the insured status necessary for benefit qualification. The extent of contact is a function both of stability of covered jobs and of age; older persons are somewhat more settled in their work than younger persons.

(*d*) *Proportion of time in covered employment prior to qualification for benefits.*—The number of persons who gain protection through becoming either "fully insured" or "currently insured" under old-age and survivors insurance depends upon the volume and pattern of their work in covered employment and upon the amount of taxable earnings from such work. A discussion of the latter factor is presented subsequently under item (h).

Estimates are presented in table 12, showing for the future the percentages of the population insured by reason of current or previous work experience, subdivided by sex and by age groups above and below 65. The percentages for age 65 and over include old-age beneficiaries (i. e., retired workers). Table 13 relates the old-age beneficiaries and the total beneficiaries age 65 and over actually drawing benefits to the total aged population.

TABLE 12.—*Estimated proportion of the population insured under old-age and survivors insurance, 1960–2000*

[In percent]

Calendar year	Low-cost estimate		High-cost estimate	
	Ages 20–64	Ages 65 and over [1]	Ages 20–64	Ages 65 and over [1]
	Men			
1960	80	67	83	71
1980	81	78	87	82
2000	80	85	88	94
	Women [2]			
1960	44	20	47	22
1980	46	34	53	42
2000	46	43	54	58

[1] Including old-age beneficiaries.
[2] Excludes wives and widows of fully insured men except such wives and widows who are insured on the basis of their own employment.

NOTE.—The figures in this table are based on the cost estimate involving high-employment assumptions

TABLE 13.—*Estimated proportion of population aged 65 and over receiving benefits, 1960–2000*

[In percent]

Calendar year	Men receiving benefits [1]	Women receiving benefits		
		Old-age benefits [2]	Other benefits [3]	Total
	Low-cost estimate			
1960	49	15	30	45
1980	59	30	37	67
2000	68	39	37	76
	High-cost estimate			
1960	57	19	32	51
1980	69	38	38	76
2000	82	54	34	88

[1] Consists almost entirely of old-age beneficiaries (retired insured workers).
[2] Old-age beneficiaries are retired insured workers. Women qualified both for old-age and wife's, widow's, or parent's benefits are considered as old-age beneficiaries.
[3] Wives of old-age beneficiaries, and widow's and dependent mothers of deceased insured workers.

NOTE.—The figures in this table are based on the cost estimate involving high-employment assumptions.

(*e*) *Marital and family composition.*—Marital relationships by age have great significance for old-age and survivors insurance costs because the system provides benefits for aged wives and widows (and also for aged dependent husbands and widowers). A woman over 65 cannot draw both the old-age benefit based on her own earnings and a full wife's or widow's benefit based on her husband's earnings. Hence, it is necessary to consider both the marital status of the female covered workers and also the exits from this group because of marriage. There will be a relatively large cost offset on

account of this provision which prohibits duplication of benefits. The experience to date is extremely limited in this respect; this factor will not be of major importance until some 30 or 40 years hence when the vast bulk of the current female workers, those in their twenties and thirties, have attained the minimum retirement age.

Family composition data indicating the proportion of individuals with children and the average number of children in such cases also have great significance because the system provides benefits for orphaned children and their widowed mothers. The future birth rate has an important role in this connection since it determines not only the total number of children, but also how they are divided up into families. The actual claims experience is valuable as a guide.

There must also be considered the various factors affecting termination of married status, chiefly divorce and mortality. The distribution of ages of husbands and wives also affects the cost of illustrations. Various studies have indicated that at almost all ages women have lower mortality rates than men and that the mortality rates of married persons are lower than those for all persons combined. In the cost estimates differential mortality by marital status has been considered in determining costs for the various types of benefits.

Beneficiaries age 65 and over and their dependents are composed of a number of different categories. Table 14 shows the trends in the number of beneficiaries, distinguishing between old-age beneficiaries (retired workers), wives and dependent husbands of old-age beneficiaries, children of old-age beneficiaries, aged widows and dependent widowers of deceased insured individuals, and dependent parents of deceased insured workers who left no widow or child under 18. It has been assumed that all retired persons eligible to receive old-age benefits based on their own earnings would apply for and receive such benefits even though they might be entitled to larger wife's, husband's, widow's, widower's, or parent's benefits (which instead would be paid as reduced supplementary amounts). This assumption has been made because it is never to the individual's disadvantage and may be to his advantage to receive old-age benefits and reduced supplementary benefits of another category, rather than to receive solely the full benefits of the other category.

Although persons age 65 and over make up the bulk of the prospective beneficiaries under the program, the young survivors, composed of orphaned children and widowed mothers, will receive a considerable amount of benefits. Table 15 lists these two groups separately.

The high-cost assumptions show, as expected, a larger number of old-age beneficiaries, and dependents thereof, than the low-cost assumptions (table 14); this is in part because of the lower mortality rates assumed which result in a greater number and proportion of aged persons, and in part because of the higher retirement rates and the greater proportion of the population assumed to be insured as a result of the in-and-out movement between covered and noncovered employment. On the other hand, the lower mortality tends to have the opposite effect in regard to widows (table 14) and, despite the somewhat higher birth rates, in regard to young survivors (table 15); a smaller number of survivor beneficiaries under the high-cost assumptions than under the low-cost assumptions is indicated.

TABLE 14.—*Estimated monthly beneficiaries [1] age 65 and over and children of old-age beneficiaries, in current payment status, 1960–2000*

[In thousands]

Calendar year	Old-age beneficiaries [2]	Wives of old-age beneficiaries [3]	Children of old-age beneficiaries	Aged widows [4]	Dependent parents
	Actual data for December				
1950	1,771	508	46	314	15
1951	2,278	647	71	381	19
1952	2,644	739	74	455	21
1953	3,222	888	90	541	24
	Low-cost estimate				
1960	4,715	1,180	99	1,328	27
1980	9,338	1,592	156	3,082	35
2000	13,211	1,899	181	3,644	43
	High-cost estimate				
1960	5,625	1,348	120	1,353	31
1980	11,751	1,764	172	3,076	47
2000	18,570	2,021	190	3,266	63

[1] Persons qualifying both for old-age benefits and for wife's, widow's, husband's, widower's, or parent's benefits are shown as old-age beneficiaries.
[2] I. e., retired insured workers.
[3] Including dependent husbands and also a small number of wives under age 65 with child beneficiaries in their care.
[4] Including dependent widowers.

NOTE.—The estimated figures in this table are based on the cost estimate involving high-employment assumptions.

TABLE 15.—*Estimated younger survivor insurance monthly beneficiaries in current payment status, 1960–2000*

[In thousands]

Calendar year	Orphaned children	Widowed mothers
	Actual data for December	
1950	653	169
1951	776	204
1952	865	228
1953	964	254
	Low-cost estimate	
1960	1,282	359
1980	1,413	421
2000	1,614	473
	High-cost estimate	
1960	1,341	442
1980	1,366	496
2000	1,289	478

NOTE.—The estimated figures in this table are based on the cost estimate involving high-employment assumptions.

TABLE 16.—*Estimated old-age and survivors insurance beneficiaries in current payment status, 1960–2000*

[In thousands]

Calendar year	Aged beneficiaries [1]	Younger survivors	Lump-sum death payments [2]
	Actual data for December		
1950	2,654	822	200
1951	3,399	980	414
1952	3,933	1,093	437
1953	4,764	1,217	512
	Low-cost estimate		
1960	7,349	1,641	758
1980	14,203	1,834	1,184
2000	18,978	2,087	1,557
	High-cost estimate		
1960	8,477	1,783	784
1980	16,810	1,862	1,245
2000	24,110	1,767	1,701

[1] Including children of old-age beneficiaries and wives under age 65 having such children in their care.
[2] Number of deaths resulting in lump-sum payments during the year.

NOTE.—The estimated figures in this table are based on the cost estimate involving high-employment assumptions.

Table 16 summarizes the previous discussion by showing illustrative numbers of beneficiaries and lump-sum death payments. The category "younger survivors" comprises orphaned children and their widowed mothers. Widows, widowers, and parents aged 65 and over are included under the old-age category, as are also spouses and dependent children of old-age beneficiaries.

In tables 12 to 16 only potential long-range trends have been set down, without recognition of cyclical or periodic fluctuations. Bearing this in mind, certain trends may be observed in these illustrative tables of number of beneficiaries.

(1) An overall uptrend in beneficiaries under all types of benefits payable to persons aged 65 and over;

(2) After 1960, a relatively small increase under the low-cost assumptions and a leveling off under the high-cost assumptions in the number of orphan-child and widowed-mother beneficiaries;

(3) The relatively small, and increasingly smaller, proportion that younger survivor benefits are of all benefits;

(4) A relatively rapid advance in the percent of insured persons aged 65 and over (including those drawing benefits) as compared with the rise in the percent insured at ages 20–64; and

(5) A rapid rise in the percent of aged persons who are receiving old-age benefits.

(*f*) *Remarriage rates.*—Remarriage of "young widows" is an important cost factor because mother's insurance benefits terminate thereupon, as do also rights to deferred widow's benefits at age 65. The greatest possible duration of benefits occurs among the younger widows, who can receive benefits for many years as mothers of young

children and later as aged widows. These, however, are also the women with the greatest chance of remarriage. Among the older mothers with fewer prospective years of benefit receipt (their youngest child being nearer age 18), the probability of remarriage is lower.

Remarriage rates vary both by age of the widow and by duration of widowhood. This factor produces a tangible reduction in the volume of "life insurance" afforded by the program when such "life insurance" is interpreted as meaning the present value, in case of the worker's death, of prospective benefit payments to his surviving dependents. It is estimated that at the end of 1953 the program provided over $300 billion of such "life insurance" protection for survivors.

(*g*) *Employment of beneficiaries.*—Since monthly benefits for all categories of beneficiaries are, in effect, suspended in any month in which the beneficiary is under age 75 and earns more than $75 in covered employment, assumptions as to the employment of beneficiaries rank high in importance among the various cost elements. As of December 1952, 63 percent of those age 65 and over who were fully insured were actually receiving benefits. The proportion is influenced to some extent by the favorable work opportunities for the aged now prevailing. In the future this proportion will probably increase somewhat, if for no other reason than the aging of the insured population.

Then, too, a large demand for labor draws into employment and away from benefit receipt many widowed mothers and older children. There is assumed to be more employment of beneficiaries, and thus savings in cost, in the low-cost assumptions than in the high-cost ones.

(*h*) *Earnings in covered employment.*—One of the most striking changes in earned income on record has taken place since 1940. Not only have there been further rises in the hourly rate of earnings since the end of World War II, but also there has tended to be relatively little unemployment, including partial unemployment, so that most workers have had a full workweek. Since the outbreak of the Korean conflict, another sharp rise in earnings rates has occurred.

The resulting changes in earnings give workers relatively more chance of obtaining credit for quarters of coverage (at $50 of wages per quarter) than had been the case in the prewar years, and as a result produce an increase in number of persons with insured status and in the average wage used for benefit computations. This increase is assumed to be more or less permanent.

Assumptions as to future covered earnings are essential in developing illustrative actuarial projections. The trend of earnings in the past has been unquestionably of an upward character. Average reported earnings derived from old-age and survivors insurance records were much lower in the early years of the system than currently (table 17).

The cost assumptions involve average annual creditable earnings throughout the future of $2,980 for men working in 4 quarters of a year and, correspondingly, $2,030 for women. For both men and women the average earnings used for 3-quarter workers is about 40 percent of that for 4-quarter workers (i. e., at a lower rate per quarter), while the corresponding proportions for the 2-quarter and 1-quarter workers are about 20 and 10 percent, respectively. As used here, the reference to 4-quarter workers, 3-quarter workers, etc., relates only to the status in a particular year; the estimates allow for the fact that

over the course of a working lifetime an individual would be in covered employment all 4 quarters of some years, 3 quarters of other years, etc. (and, in fact, not in covered employment at all in some years). These ratios of the part-time average covered earnings to the 4-quarter average parallel very closely the actual ratios observed in the old-age and survivors insurance earnings data.

The 4-quarter earnings assumptions may be compared with the actual experience for such workers in the past years as shown by the last two columns of table 17 but allowance must be made for the change in maximum wage base. The earnings assumptions are on about the level prevailing in 1951–52 (somewhat lower than 1952 but higher than 1951) and are about 20 to 25 percent above the experience in 1947 when adjustment is made for the change in the wage base.

TABLE 17.—*Average earnings credits of workers under old-age and survivors insurance by years, 1937–52*

Calendar year	Workers with any earnings in year			Workers with earnings in all 4 calendar quarters		
	Total	Male	Female	Total	Male	Female
	$3,000 maximum earnings base					
1937	$899	$1,037	$539	(1)	(1)	(1)
1938	832	958	507	$1,211	$1,359	$783
1939	881	1,014	535	1,247	1,400	800
1940	926	1,070	553	1,305	1,465	831
1941	1,014	1,188	574	1,466	1,646	910
1942	1,127	1,364	609	1,703	1,939	1,047
1943	1,289	1,580	788	1,913	2,205	1,271
1944	1,369	1,681	887	1,996	2,301	1,402
1945	1,328	1,591	895	1,982	2,293	1,384
1946	1,394	1,635	929	2,031	2,269	1,480
1947	1,571	1,831	1,044	2,173	2,393	1,611
1948	1,677	1,939	1,138	2,281	2,493	1,733
1949	1,711	1,964	1,185	2,298	2,508	1,763
1950	1,769	2,026	1,232	2,375	2,578	1,851
	$3,600 maximum earnings base					
1951 total [2]	$2,031	$2,389	$1,328	(1)	(1)	(1)
1951 wage employment [2]	1,989	2,352	1,314	$2,658	$2,965	$1,936
1951 self-employment [2]	2,300	2,400	1,710	(1)	(1)	(1)
1952 total [2]	2,100	2,480	1,390	(1)	(1)	(1)
1952 wage employment [2]	2,070	2,450	1,380	2,740	3,040	2,060
1952 self-employment [2]	2,320	2,420	1,730	(1)	(1)	(1)

[1] Data not available.
[2] Preliminary.

The development of the prospective cost of the program using the various elements discussed furnishes reasonable illustrations of future beneficiaries and costs. Though neither the lowest nor the highest conceivable, the values derived are well within the outside boundaries of possibility. Experience to date is limited, the payment of monthly benefits having begun only in 1940, and these benefits were revised drastically in 1950 and again to a moderate extent in 1952. As payments got underway, the limitations of coverage and the insured-status requirement excluded large numbers of potential beneficiaries. Payments were further delayed by the lag with which any new program commences. In recent years, as the lag has lessened, payments among those eligible to receive them have been limited by postpone-

ments in the claiming of benefits occasioned by favorable employment conditions during the war and immediate postwar years. The long-range cost estimates look beyond these various limitations and attempt to furnish some indication of the trend in the costs of the old-age and survivors insurance program.

It is to be noted that in addition to the assumptions already discussed, the long-range cost illustrations include assumptions relating to retirement rates, interest rate, and various miscellaneous administrative factors. Since the earlier cost estimates were developed, sufficient actual experience under the operation of the program is available to permit the introduction of various modifications to allow for such factors as the minimum and maximum provisions as to benefits, and the provision that the lump-sum death payment in certain instances may not exceed the actual burial expenses. Also taken into account are such miscellaneous factors as differential retirement rates by marital status and the effect on the size of survivor benefits of lowered earning capacity during last illness.

An important element affecting old-age and survivors insurance costs arose through amendments made to the Railroad Retirement Act in 1951. These extend the 1946 amendments and provide for a coordination of railroad retirement compensation and old-age and survivors insurance covered earnings in determining not only survivor benefits but also retirement benefits for those with less than 10 years of railroad service. In fact, all future survivor and retirement cases involving less than 10 years of railroad service are to be paid by the old-age and survivors insurance system.

Financial interchange provisions are established such that the old-age and survivors insurance trust fund is to be placed in the same financial position as if there never had been a separate railroad retirement program. It is estimated that the net effect of these provisions will be a relatively small net gain to the old-age and survivors insurance system since the reimbursements from the railroad retirement system will be somewhat larger than the net additional benefits paid on the basis of railroad earnings. The long-range costs developed here are for the operation of the trust fund on the basis, as provided in current law, that all railroad employment will be (and beginning with 1937 has been) covered employment. The balance in the fund thus corresponds exactly to the actual situation arising. But the contribution income and benefit disbursement figures shown (as well as the numbers of beneficiaries) are slightly higher (by less than 5 percent) than the payments which will actually be made directly to the trust fund from contributors and the payments which will actually be made from the trust fund to the individual beneficiaries. This is the case because the figures here include both the additional contributions which would have been collected if railroad employment had always been covered and the additional benefits that would have been paid under such circumstances. The balance for these two elements is to be accounted for in actual practice by the operation of the financial interchange provisions.

The long-range cost estimates of income and outgo were presented previously in the body of the report in tables 9 and 10, the former showing the benefit costs relative to payroll and the latter the progress of the trust fund. In addition to the figures for the low-cost and high-cost estimates, there have been developed intermediate

cost estimates which are merely an average of the low-cost and high-cost estimates and are not intended to represent "most probable" figures. Rather, they have been set down as a convenient and readily available single set of figures to be used for comparative purposes.

Furthermore, since the Congress has adopted the principle of establishing in the law a contribution schedule designed to make the system self-supporting, it was necessary at the time the legislation was enacted to select a single set of estimates as the basis for the contribution schedule. The intermediate estimate was used for this purpose. Quite obviously any specific schedule may require modification in the light of experience, but the establishment of the schedule in the law does make clear the congressional intent that the system be self-supporting. Further, exact self-support cannot be obtained from a specific set of integral or rounded fractional rates, but rather this principle of self-support was aimed at as closely as possible by the Congress in 1950 when it developed the tax schedule in the law, and again in 1952 when further amendments were made.

The low-cost and high-cost estimates result from two carefully considered series of assumptions. The intermediate-cost estimate represents an average of the low-cost and high-cost estimates of beneficiaries, benefit disbursements, and total taxable payroll. The corresponding estimates of benefits relative to payroll are developed from these dollar figures.

The tax schedule in the 1950 amendments was derived such that when the rates therein were applied to the payroll resulting for the intermediate-cost estimate, the system would be on a more or less completely self-supporting basis. From this tax schedule, the progress of the fund was developed at the time this legislation was enacted, and this naturally showed that in the ultimate condition the fund virtually leveled off—neither increasing nor decreasing substantially thereafter. This same tax schedule was also applied to the low-cost and high-cost benefit projections to develop the trust fund balances in the future on these respective bases. Quite obviously, under the circumstances previously outlined, the trust fund would eventually be depleted for the high-cost estimate and would increase indefinitely for the low-cost estimate. Such results are to be expected for these two estimates since for purposes of developing contribution income there was used a tax schedule considered more or less adequate according to the intermediate cost estimate.

Similarly, when the 1952 amendments were considered, low-cost and high-cost estimates were developed and from these also an intermediate-cost estimate. As it turned out according to such intermediate-cost estimate, the tax schedule in existence as a result of the 1950 amendments was sufficient under the modified cost assumptions to support the system to just as great an extent (and, in fact, a little greater) as was the case for the 1950 amendments when they were being considered. Accordingly, the trust fund developing for the 1952 amendments under the intermediate-cost estimate made at the time the legislation was enacted virtually levels off for the ultimate condition; as would be expected, it is exhausted at some future date for the high-cost estimate and increases indefinitely for the low-cost estimate.

Tables 9 and 10 show the steady rise in benefit payments under the widely different sets of conditions discussed earlier in this section, and demonstrate the large increases, relatively and in absolute quantities, which would occur even after 1980, particularly under the high-cost assumptions.

Because of the nature of the assumptions, the tables show only smooth trends and hence do not show the irregularities and periodic cyclical variations which may develop. These irregularities are expected to be far more pronounced in regard to contributions than benefits, because the dollar amount of the benefit roll, after the system is well established, will contain a large proportion of fixed payments to permanently retired persons. However, the payroll of covered workers from which the contribution income is derived is quite sensitive to current fluctuations, through increases or decreases in job opportunities, changes in the length of the workweek, and changes in unit rates of pay. For demographic reasons alone, as discussed earlier in this section, it is unlikely that the system would even eventually level out to a completely fixed relationship between contributions and benefits.

Before proceeding with a discussion of the results of the estimates, there might be mentioned several important factors affecting the relationship between the new cost estimates and the previous ones. In the low-cost estimate, the new estimate assumes some improvement in mortality, whereas previously constant mortality had been the basis (this would, of course, produce higher costs). For both cost estimates, the range in regard to a number of the cost factors has been narrowed somewhat since, on the basis of the 14 years operating experience under monthly benefit payments, we have some better ideas as to future trends.

In the previous cost estimates (prepared from 1939 on) it had always been assumed that the system would mature in the year 2000 or, in other words, that benefit payments and contributions would be level thereafter (the 1935 cost estimates assumed maturity by 1980). In the new cost estimates, an alternative assumption is made by maturing any trends such as mortality in the year 2000 but going on with the estimate for another 50 years. In one sense, this seems necessary because the aged population itself cannot mature by the year 2000 (see Actuarial Study No. 33, Social Security Administration, particularly p. 28). The reason for this is that the number of births in the 1930's was very low as compared with those since then, and, as a result, there is a dip in the relative proportion of the aged from 1995 to about 2010, which, in itself, would be reflected in the benefit costs for that period. Accordingly, the year 2000 is by no means a typical "ultimate year."

The interest assumption used in determining level-premium costs is alternatively 2¼ and 2¾ percent. The average rate on investments of the trust fund is currently about 2.4 percent.

Table 9 compares benefit costs related to payroll for the present estimate. Considering the year-by-year figures, those for the low-employment assumptions are higher than those for the high-employment assumptions—by somewhat more than one-half percent of payroll in the early years and by about three-fourths percent of payroll some 50 years hence. The cost rises steadily over the future years

under all estimates—leveling out somewhat between 1990 and 2000 for the reasons indicated previously.

The "ultimate" cost is reached some 20 or 25 years after the year 2000. For the high-employment assumptions, the ultimate cost is roughly 7 percent of payroll for the low-cost estimate, 11 percent for the high-cost estimate, and 8½ percent for the intermediate-cost estimate. On the other hand, for the low-employment assumptions, the corresponding figures are 7⅞, 12, and 9⅞ percent, respectively.

Next, considering level-premium costs, the intermediate-cost estimate based on high-employment assumptions shows a cost of 6.7 percent of payroll at 2¼-percent interest, and 6.4 percent at 2¾-percent interest. The corresponding figures for the low-employment assumptions are 7.4 and 7.1 percent, respectively. These figures may be contrasted with the level rate equivalent to the graded contribution schedule in the law (taking into account the lower contributions payable by the self-employed as compared with the combined employer-employee rate), which is somewhat under 6 percent of payroll. Thus, this comparison indicates that according to these intermediate-cost figures, the tax schedule in the law is not quite self-supporting based on the high-employment assumptions and, further, that such situation also prevails for the low-cost estimate based on low-employment assumptions.

Table 10 shows the progress of the trust fund under the present estimates. In the high-employment, low-cost estimate, contribution income exceeds benefit disbursements in all years over the next three decades and is only slightly lower thereafter (this excess is more than counterbalanced by interest earnings on the trust fund). Accordingly, the trust fund builds up quite rapidly and even some 50 years hence is growing at a rate of over $2½ billion per year (and at that time is about $130 billion in magnitude). On the other hand, under the corresponding high-cost estimate, the benefit disbursements exceed contribution income after 1975, and the trust fund after building up to a maximum of about $40 billion in 1975–80, decreases thereafter until exhausted shortly before the year 2000.

These results for the high-employment, low-cost and high-cost estimates are to be expected since the system on an intermediate-cost estimate is approximately self-supporting. Accordingly, a low-cost estimate should show that the system is more than self-supporting and a high-cost estimate should show that a deficiency will arise in later years. At any rate, it appears likely that under any reasonable circumstances, there will be ample funds for several decades even under relatively unfavorable experience.

According to the high-employment, intermediate-cost estimate, contribution income exceeds benefit disbursements until about 1980. Accordingly, the trust fund grows steadily, reaching a maximum of about $65 billion in 1985, and then declines slowly. This decrease indicates that the tax schedule in the law is not quite self-supporting according to this intermediate-cost estimate.

For the low-employment assumptions, under the low-cost estimate contribution income exceeds benefit disbursements only until shortly after 1975. Accordingly, the trust fund builds up for the next quarter century, reaching a peak of about $45 billion in 1980 and then declines slowly. On the other hand, under the corresponding high-cost esti-

mate, benefit disbursements in general slightly exceed contributions in most of the early years; as a result the trust fund tends to stay somewhat under $20 billion until 1970 and then declines steadily until being exhausted shortly after 1985. For the intermediate-cost estimate, the trust fund builds up to a maximum of about $30 billion in 1975 and decreases steadily thereafter until being exhausted in about 1995.

A factor mentioned earlier, but not used in the actuarial projections, is the trend, exhibited in the past, of an irregular but upward movement in earnings, both on a dollar basis and in the form of real wages. If this secular trend continues, then—other things being equal—the curves of benefits and contributions would both be more steeply ascending than shown. The upward changes in the contribution curves, however, would be far more accentuated than would be such changes in the benefit curves. There are several reasons for this, the important one being that the benefit increase would be dampened because—

(1) The benefits are determined by the average monthly wage up to the maximum of $300; 55 percent is applied to the first $100 thereof and 15 percent to that part above $100. As average earnings increase and as more persons approach or reach the $300 maximum, a larger portion of such earnings falls in that bracket of the benefit formula to which the 15-percent rather than the 55-percent rate applies. Thus benefits are smaller in relation to earnings, and consequently in relation to contributions.

(2) Any year's contributions are substantially based on the covered earnings of that year, while any year's benefits in force are based on weighted composite earnings of all previous years in which the insured persons on whose account the benefits are paid worked in covered employment, thus including, in far distant future years, earnings of as much as 60 years previously.

The assumption of steadily rising earnings in conjunction with an unamended benefit formula would have an important bearing in considering the long-range cost of the program. With such an assumption, the future rise in earnings would seem to offer significant financial help in the financing of benefits because contributions at a fixed percentage rate would increase steadily relative to benefit disbursements; but the benefits paid to beneficiaries would steadily diminish in relation to current earnings levels. In such a case, offsetting this apparent savings in cost, it is likely that from the long-range point of view the present benefit formula would not be maintained.

In revising the benefit schedule to conform with the altered earnings level, the changed cost and contribution picture would have to be considered. This is especially so as to changes resulting from the fact that benefits would be based on earnings prevailing at the time of such change and thereafter, while the accumulated trust fund at that time would have developed from contributions on the lower earnings prevailing during the past. The fund thus would not play as important a role in financing the program as would have been the case if the earnings level had not changed. If it is assumed that the benefit level in the future will be adjusted in proportion to the increase in the average earnings, the level-premium cost of the program, expressed as a percentage of taxable earnings into perpetuity,

is increased because of the diminishing part played by the accumulated trust fund in financing the program. For small annual rates of increase in average earnings (i. e., for rates less than the assumed valuation interest rate) this increase in cost may be partially counterbalanced by the timelag which would undoubtedly occur between the rise in earnings level and the amendment of the benefit provisions. However, for larger rates of increase in average earnings the level-premium cost into perpetuity would be the ultimate cost, because the fund would ultimately play virtually no role in the financing of the benefits. Nevertheless, during the course of this century, at least, the interest income from the fund would continue to be a significant amount when related to total disbursements.

In addition to excluding the assumption of increasing wages in the future, the detailed cost estimates given have avoided dealing with various other important secular trends. These have diverse effects on costs which cannot now be adequately extrapolated into the future. One illustration is the lengthening of the period of childhood or preparation for work. Another possibility is a drastic change in the average age of retirement, either to a considerably lower effective age so that practically all persons would retire at the minimum age of 65, or conversely to a higher effective age under circumstances of greatly improved health conditions combined with good employment opportunities, such that few would retire before age 70 or even 75.

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