

**ESTIMATED AMOUNT OF LIFE INSURANCE VALUE IN FORCE UNDER  
SURVIVORS BENEFITS OF THE OLD-AGE AND SURVIVORS INSURANCE SYSTEM**

by

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## FOREWORD

This actuarial study presents a consideration of "life insurance values". The effective protection of the families of American workmen against need in the event of the death of the workman is one aspect of the enlarged old-age and survivors insurance system. Its benefits are predominantly incomes in jobless old age, yet life insurance values in billions of dollars represent the incomes furnished to orphaned children and their widowed mothers.

In arriving at these values two approaches are made:

- (a) Assuming the determination of present values at date of death by using 3% interest;
- (b) Assuming present values at date of death by assuming no interest earnings.

The use of a 3% interest rate is in accord with much insurance company practice. No particular rate of interest is altogether tenable. The rate of earnings on the investments held by the old-age and survivors insurance trust fund is somewhat below 3%. The rate on new investments is 2 $\frac{1}{2}$ %. Future interest returns will depend upon the growth of the fund and other factors. If as a result of Congressional action relatively small reserves are developed, the interest earnings will have little practical effect in reducing the share of contributions in meeting benefits.

The techniques of social insurance are in many respects at variance with those of private insurance. Any such comparisons as are attempted here must, therefore, carry inherent limitations. The very existence of the benefits may influence such sensitive factors as remarriage and employment.

It will be instructive to file this analysis for comparison with those future studies made after actual experience has accumulated.

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ESTIMATED AMOUNT OF LIFE INSURANCE VALUE IN FORCE UNDER  
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Purpose:

It is the purpose of this study to make an estimate of the amount of life insurance value in force in 1940 under the survivors benefits provisions of Title II of the 1939 Act. This is of interest in order to compare the total amount of such protection with the total amount of life insurance customarily said to be in force in the private life insurance companies of the United States (about 115 billion dollars at the end of 1939). The amount of life insurance value effective under the old-age and survivors insurance program may be defined as the sum of the individual protections available in the event of the death of the insured person, mainly for orphaned children and their widowed mothers and for aged widows, but also to a small extent for "dependent" parents and as lump-sum death payments to a rather wide range of beneficiaries.

Protection in any individual case is considered on two bases:

- (a) As the present value at 3% interest (as of the date of death of the insured individual) of all benefits payable to his surviving dependents (taking mortality into account);
- (b) As the sum total of such payments without reduction because of any interest discount factor.

In both cases it is assumed that benefits are actually paid over as long a period as possible. Thus, it is postulated that all children will remain in school until age 18; widows will never remarry nor engage in covered employment; and wherever there is choice, benefits will be paid.

The use of a 3% interest rate follows:

- (a) The use of this rate of interest in the reserve provisions of the 1935 Act;
- (b) For comparative purposes, the current valuation basis of private participating life insurance.

The investment provisions for the Old-Age and Survivors Insurance Trust Fund result in an interest rate of only 2½% at present, but future interest returns may be higher or lower. Since no specific provision has been made for setting up reserves at each death at any rate of interest, figures are also quoted on the basis of no

interest return. These figures are comparable with benefits paid during the expectation of life and indicate the aggregate sums of money deemed to be necessary under the assumptions made for the payment of benefits to these named beneficiaries.

The resulting amounts of life insurance value obtained in this study are thus somewhat academic in that they represent the amount of protection available in 1940, similar to the practice common with insurance companies of measuring their service to the insuring public in terms of face amounts of insurance protection in force. The report is divided into four sections: the first is a general summary of the results of the entire study, the second analyzes in detail the "low" estimate based on 3% interest, the third deals with corresponding material for a zero interest rate, while the appendix contains a description of the assumptions made and the methods of estimation.\* The casual reader may therefore obtain a broad viewpoint of the subject by reading only this introduction and the succeeding section. For more detail the next two sections should be considered, while a study of the appendix will bring out the degree of validity and limitations of these estimates.

Before proceeding further with the discussion it may be worth while to illustrate the meaning of amount of life insurance value in force with a specific example. Let us consider a man who was age 22 in 1937 and who is steadily employed at \$100 per month in a covered industry so that he is always fully insured. There will be examined the amount of life insurance value which he has in various future calendar years (as of January 1) for different assumed changes in his family status. The amount of life insurance value at any given time represents the lump sum which is equivalent to the present value of all the immediate and deferred benefits payable if the man were to die then. The resulting figures are shown for each year until 1995 on Chart A.

(a) 1940: The calculated monthly primary benefit is \$25.75 so that the amount of life insurance value in force on January 1 is represented only by a lump-sum death payment of \$154.50 (6 x \$25.75) assuming that he is not yet married and has no dependent parents. At the end of the year it is assumed that he marries a woman aged 20 (born on January 1, 1920). As of January 1, 1941, the amount of life insurance value is still based only on the lump-sum death payment since he will not have been married for the one year period required.

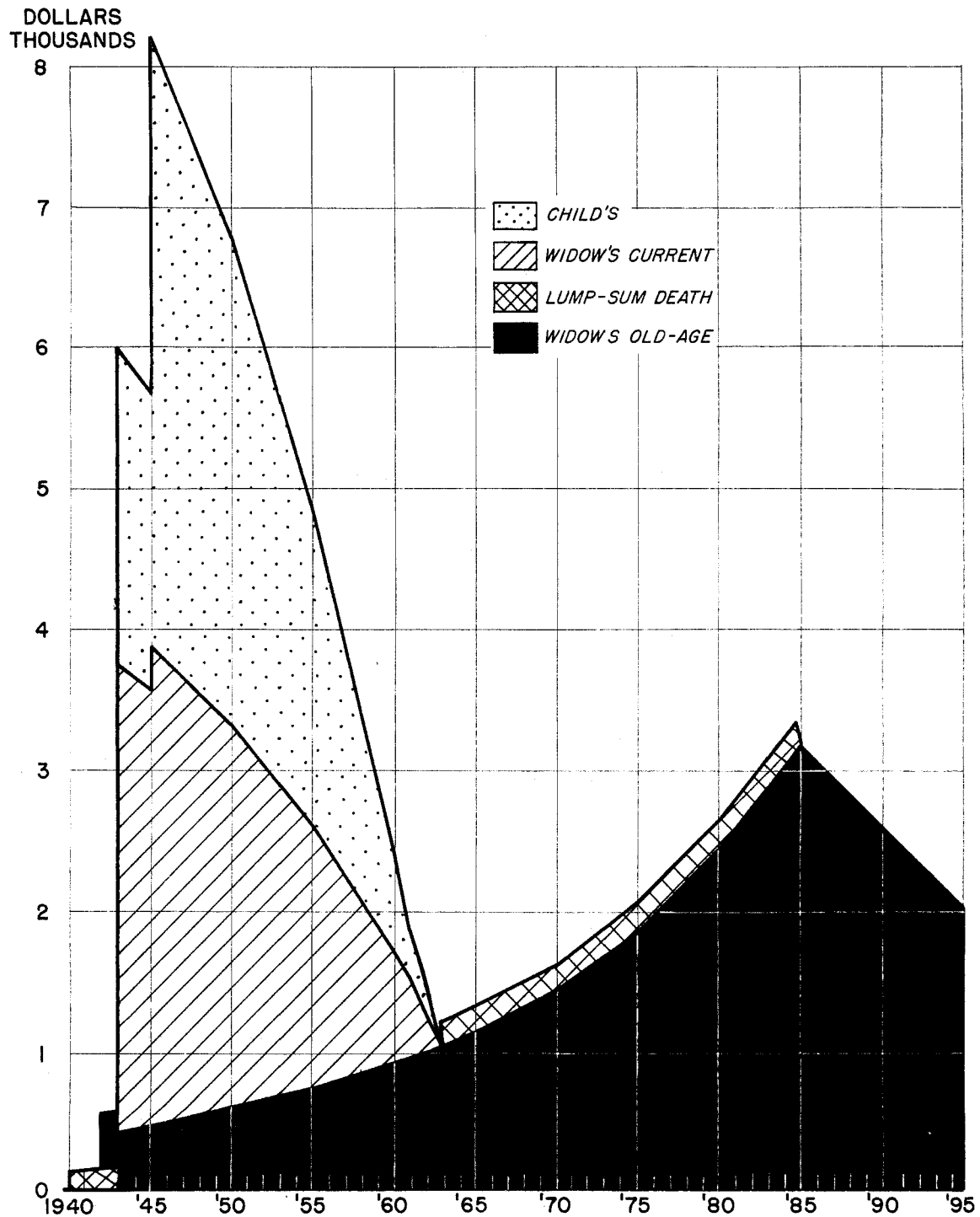
(b) 1942: The calculated monthly primary benefit is now \$26.25. The life insurance value is \$584, representing a lump-sum death payment of \$157.50 and the present value of the deferred widow's old-age benefits of \$19.69 per month (\$426).

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\*See appendix for explanation of "low" and "high" estimates.

# CHART A

## AMOUNT OF INSURANCE\* FOR HYPOTHETICAL CASE† BY TYPES OF BENEFITS



\* SEE TEXT FOR DESCRIPTION AND EXPLANATION

† BASIC ASSUMPTIONS:

1. MAN ENTERS COVERED EMPLOYMENT IN JANUARY 1937, AT AGE 22 AND HAS LEVEL MONTHLY WAGE OF \$100
2. HE MARRIES IN 1940 TO WOMAN AGE 20
3. CHILDREN ARE BORN IN JANUARY 1943 AND 1945

(c) 1943: On January 1 a child is born. At this time the life insurance value is \$5992, made up of the present value of widow's current, child's and widow's benefits (\$3,328, \$2,219, and \$445, respectively). No lump-sum death payment is available since there are immediate monthly benefits. The present value of the widow's current benefits is based on a monthly annuity of \$19.88 for the next 18 years, while similarly the present value of the child's benefits is based on a monthly amount of \$13.25. The present value of the widow's old-age benefits is determined as previously, but is larger since the period of deferment is shorter and the monthly amount slightly larger (because of more 1% increments).

(d) 1944: The life insurance value is slightly less than in 1943 because of decreases in the widow's current and child's benefits (payable for only 17 years more since the child is age 1) which more than offset the increase in the present value of widow's benefit (as explained previously).

(e) 1945: On January 1 a second child is born. As a result, the life insurance value increases to \$8203, primarily because of the presence of the second child, who not only receives benefits for a period of 18 years, but also lengthens the period that the mother will receive them. Thus, the benefits payable are \$20.25 per month to the widowed mother for 18 years and \$13.50 to each of the children for periods of 16 and 18 years, respectively. In addition, there is a deferred annuity at age 65 to the widow amounting to \$20.25.

(f) 1946-62: During this period, since no additional children are born, the total amount of life insurance value gradually decreases as shown by Chart A. For both the widow's current and the child's benefits there is a steady decrease on account of the diminishing period of payment which more than offsets the slightly larger calculated primary benefits resulting from more 1% increments. On the other hand, the life insurance value representing the widow's old-age benefits increases steadily as explained previously. Thus, as of January 1, 1962, the life insurance value is \$277 for widow's current benefits, \$185 for child's benefits, and \$1009 for widow's old-age benefits, making a total of \$1471.

(g) 1963: Since both children are now over age 18, widow's current and child's benefits are no longer available. Therefore, since there are no immediate benefits, the lump-sum death payment again enters in, being \$189. The total life insurance value is thus \$1243 since the insurance for the widow's old-age benefits (\$23.63 per month) is \$1054.

(h) 1964-79: During this period the life insurance value increases steadily since the calculated monthly primary benefit becomes larger because of more 1% increments and since the period of deferment for widow's old-age benefits becomes shorter.

(i) 1980-84: It is assumed that the worker retires at exact age 65 so that his monthly primary benefit is "frozen" at \$35.75. Since his wife is under age 65 during this period, the lump-sum death payment is always \$214.50. However, the life insurance value for the widow's old-age benefits increases slowly as she approaches age 65.

(j) 1985: The wife is now age 65 so that since the widow's old-age benefits of \$26.81 per month are immediately available on the death of her husband, no lump-sum death payment will be made. At this time the present value of the widow's old-age benefits is \$3193, which is greater than in the previous year but since the lump-sum death payment is not available the total life insurance value is slightly less.

(k) 1986 and thereafter: As long as both husband and wife are alive the amount of life insurance value depends solely on the present value of the widow's benefits. This decreases slowly as the widow becomes older since she then has a shorter expectation of life. Thus, in 1990 the life insurance value would be reduced to \$2584. If the wife should die first, the life insurance value would be based only on the lump-sum death payment of \$214.50.

From the following charts which are computed on the same assumptions as the main portion of this study, approximate figures for the life insurance value in 1940 of the benefits payable to the survivors of covered employees for various types of families may be readily obtained. The following examples for wage earners having an average wage of \$100 a month and 4 increment years illustrate the method of using the charts. The specific values on the charts are encircled.

Case A: Wage earner has no dependents.

From insert on Chart B

Value of lump-sum death benefit ----- \$156

Case B: Wage earner has a wife age 50 and no other dependents.

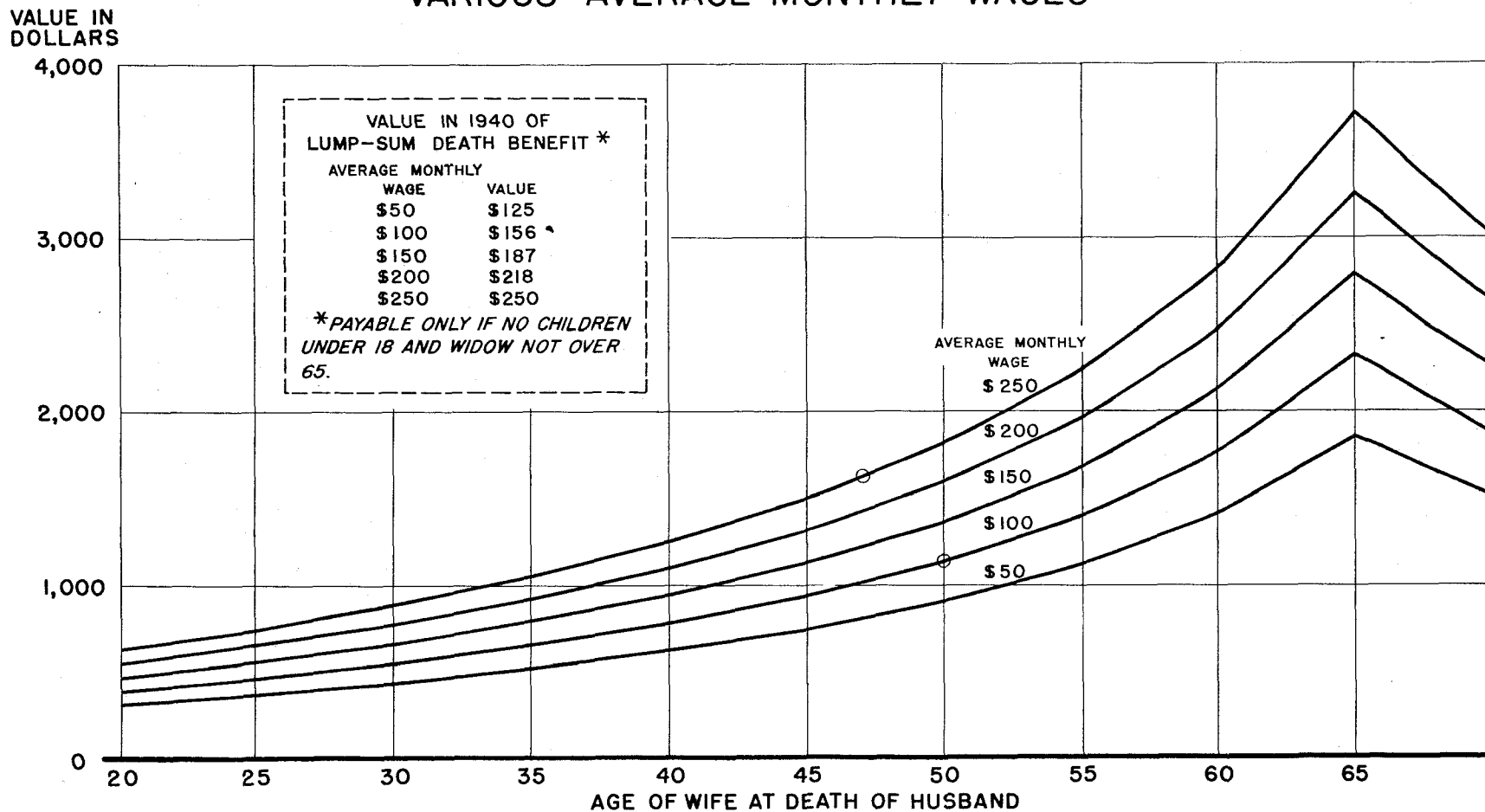
From Chart B:

Value of lump-sum death benefit ----- \$ 156

Value of widow's old-age benefit ----- 1130

Total ----- \$1286

**CHART B**  
**LIFE INSURANCE VALUE IN 1940 OF WIDOW'S OLD-AGE BENEFIT, FOR**  
**VARIOUS AVERAGE MONTHLY WAGES**

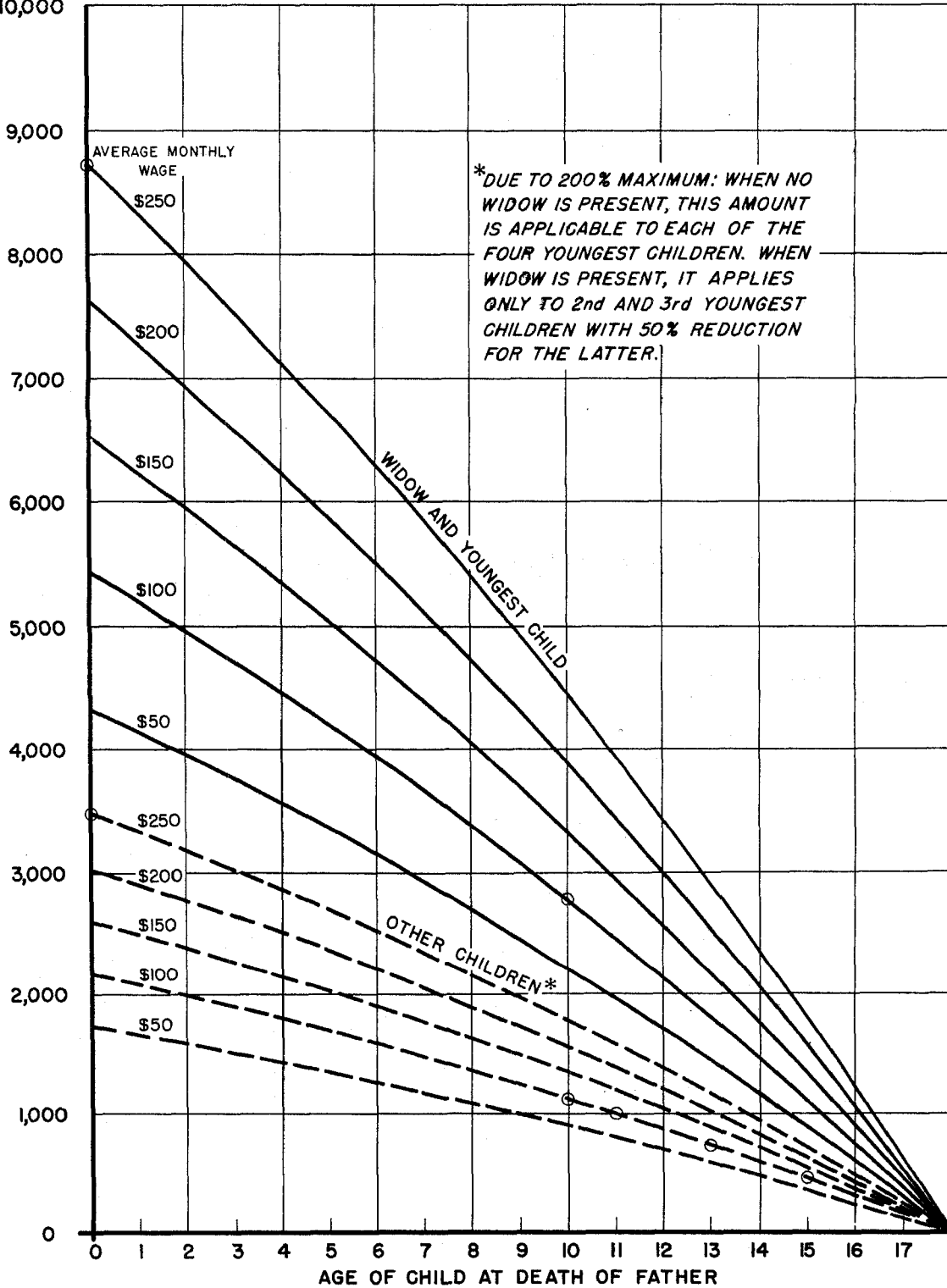




### CHART C

## LIFE INSURANCE VALUE IN 1940 OF BENEFITS PAYABLE WHEN CHILDREN ARE PRESENT, FOR VARIOUS AVERAGE MONTHLY WAGES

VALUE IN DOLLARS  
10,000



Case C: Wage earner has a wife age 50, and 1 child age 10.  
From Chart C:  
Value of immediate benefit for widow  
and child ----- \$2760  
From Chart B:  
Value of widow's old-age benefit ----- 1130  
Total ----- \$3890

Case D: Wage earner has a wife age 50 and 4 children,  
ages 10, 11, 13, and 15.  
From Chart C:  
Value of immediate benefit for widow  
and youngest child ----- \$2760  
Value of 2nd youngest child's benefit -- 980  
Value of 3rd youngest child's benefit -- 360  
Value of 4th youngest child's benefit -- ---  
From Chart B:  
Value of widow's old-age benefit ----- 1130  
Total ----- \$5230

Case E: Wage earner has no wife but 4 children, ages  
10, 11, 13, and 15.  
From Chart C:  
Value of youngest child's benefit ----- \$1120  
Value of 2nd youngest child's benefit -- 980  
Value of 3rd youngest child's benefit -- 720  
Value of 4th youngest child's benefit -- 450  
Total ----- \$3270

Although there are many more types than illustrated above, those shown, while not particularly representative, will suffice to demonstrate the methodology. It should be remembered that the values from the chart are for wage earners dying in 1940 who have been covered since 1936 and have 4 increment years. Values for any other year in the near future can be obtained by multiplying by 100 plus the increment years and dividing by 104.

An example of an extremely large amount of life insurance protection is the hypothetical case of a wage earner with a \$250 average wage, having in 1940, a wife age 47 with at least 3 children aged 0:

From Chart C:  
Value of widow's and youngest child's benefit --- \$8650  
Value of 2nd youngest child's benefit ----- 3460  
Value of 3rd youngest child's benefit ----- 1730  
From Chart B:  
Value of widow's deferred benefit ----- 1600  
Total ----- \$15440

General Summary of Results:

Table A presents a summary of the entire study based on both a 3% interest rate and using no interest. It should be emphasized that the amount of life insurance value shown for widow's old-age benefits is somewhat overstated; many of these widows who survive to age 65 will not receive such benefits because of remarriage or subsequent covered employment sufficient to yield larger benefits in their own right. It is virtually impossible to make estimates involving these two contingencies although the probability of survival to 65 can be (and has been) readily taken account of. Similarly, the life insurance value for widow's current benefits is overstated slightly because of the withholding of benefits during months of covered employment in excess of \$15; also orphan's benefits\* insurance is affected by the fact that no payments will be made between ages 16 and 18 when not in school or at any age when working in covered employment (wages in excess of \$15 per month). It is believed that the amount of overstatement present is relatively far more in the case of the widow's old-age benefits (mostly deferred for a long period) than for widow's current or children's benefits (payable immediately upon death of worker). No account has been taken of parent's benefits because of the lack of pertinent data on dependency and the relatively small aggregate financial effect of this benefit.

First, considering the figures based on a 3% interest rate, it may be seen that the total amount of insurance in force is about  $42\frac{1}{2}$  billion dollars for the "low" estimate and 53 billion dollars for the "high" estimate. The former figure is 37% as large as the total life insurance in force in all insurance companies (about 115 billion dollars), while the latter is 46% as large. Thus, the life insurance value under the old-age and survivors insurance system is about  $\frac{2}{5}$  as large as that of all private life insurance companies. The amount of life insurance value for widow's current benefits is about the same as that for orphan's benefits, each representing about  $\frac{1}{3}$  of the total amount. The bulk of the remainder is accounted for by widow's old-age benefits with only about  $2\frac{1}{2}$  billion dollars being due to the lump-sum death benefit provision.

Next, in considering the figures based on no interest, it should be pointed out that they indicate the total amount of "expected" benefits rather than their discounted or present value, a particularly interesting analysis since relatively little interest from advance investment of reserve funds is counted upon under the 1939 Amendments. It should be emphasized that these non-interest figures are not comparable with the 115 billion dollars of life insurance in force in private life insurance companies as were the figures based on a 3%

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\* The term "orphan's benefits" will be used in the following discussion since "child's benefits" includes supplementary benefits for children of primary beneficiaries as well as those for surviving orphans of insured individuals.

Table A

SUMMARY OF ESTIMATED LIFE INSURANCE VALUE IN FORCE IN 1940,  
BY TYPE OF BENEFIT,<sup>a/</sup> LOW AND HIGH ESTIMATES

(All figures in billions of dollars)

<u>Type of Benefit<sup>a/</sup></u>	<u>Low Estimate</u>	<u>High Estimate</u>
	Using 3% Interest	
Widow's Old-Age	9.7	12.1
Widow's Current	14.8	18.5
Orphan's	15.7	19.6
Lump-sum Death	2.2	2.8
Total	42.4	53.0
	Using No Interest	
Widow's Old-Age	26.4	33.0
Widow's Current	17.9	22.4
Orphan's	18.7	23.3
Lump-sum Death	2.2	2.8
Total	65.2	81.5

<sup>a/</sup> No account is taken of parent's benefits (see text).

interest rate. As an example of the distinction between the total benefits payable under the zero interest rate assumption and their discounted value, consider an annuity of \$10 per month payable for 10 years certain regardless of any life contingencies. The total payments made will be \$1200 which is the value based on a zero interest rate assumption. On the other hand, the discounted value at 3% interest is only \$1039.

The total life insurance value on this basis ranges from 65 billion dollars for the "low" estimate to 81½ billion dollars for the "high" estimate, or about 50% greater than the corresponding figures for a 3% interest rate. This indicates that based on the assumptions used, the discounted value of the "expected" amounts of payments is about two-thirds as large as the aggregate payments themselves. About 70% of the increase which results from changing from 3% to no interest arises from the life insurance value for widow's old-age benefits with only small increases for widow's current and orphan's benefits. Obviously no change at all occurred for lump-sum death payments since they are payable immediately at the time of death so that the interest assumption can have no effect. The major change occurred for widow's old-age benefits which involve a much longer average period of deferment than any of the other categories so that discounting at interest has a much greater effect.

The previous discussion has centered about the amount of life insurance value in 1940 under the survivors benefits provisions of the Act. Some general future trends may be anticipated. Disregarding the business cycle and assuming no further extension of the Act to categories not now covered, the total amount of life insurance value should increase slowly, principally because of labor turnover. Those who first enter covered employment in the future will obtain insured status after about 1½ years, while those who withdraw from covered employment will have protection continued for a varying period depending upon the length of their previous coverage. Particularly, by the end of 1946, individuals who have been steadily covered will in most instances be permanently insured thereafter (as a result of having 40 quarters of coverage) for both old-age and survivors benefits regardless of their future work status, with the benefits being determined by their "over-all" average wage. In the aggregate, the continued protection whether temporary or permanent for those who withdraw from covered employment will more than compensate for the absence of protection for those who have not been in covered employment sufficiently long to obtain insured status.

Other factors tending to lead to a growth in the amount of life insurance value are the apparent long-time upward trend in wages, the increasing effect of the 1% increment on the benefits payable, the continued improvement in mortality of women and children, and the addition of new categories of employment. Several factors are present

which will tend to decrease the total amount of life insurance value; namely, the aging of the population (since the amount tends to decrease with age as will be shown in the subsequent discussion) and the declining birth rate which if continued will result in smaller families (i.e., there will be fewer children per family to be given protection). Short-term business fluctuations will have little effect on the amount of life insurance value, but a long depression would tend to have a decreasing effect since insured status would lapse in many instances from want of covered employment. On the other hand, a long period of prosperity would have an increasing effect since more persons would gain insured status through sustained employment. As a result of the many unpredictable factors it is as yet impossible to make a satisfactory quantitative estimate of the future trend of the amount of life insurance value in force, but from a qualitative standpoint it may be said that the amount will probably increase gradually.

Analysis of "Low" Estimate Involving 3% Interest:

Table 1 presents a summary of the entire study based on 3% interest according to quinquennial age groups of the insured population; subsequent tables give more detailed analyses. Only figures for the "low" estimate are presented here since the calculations were made on this basis, the "high" estimate being obtained by a flat 25% increase for all types of benefits. The validity of such an adjustment if applied further by age and sex, would be open to even greater doubt. The maximum amount of insurance occurs for those 30-34 at almost 9 billion dollars. For widow's old-age benefits the maximum occurs at 45-49, while for widow's current and orphan's benefits it is at 30-34. The maximum for lump-sum death payments is at ages 20-24 since there a large number of persons are exposed, most of whom do not have children. For ages 50 and over the amount of life insurance value for widow's old-age benefits is larger than for any of the other types of benefits. Also for ages 60 and over the life insurance value under lump-sum death benefits is greater than under widow's current or orphan's benefits since employees at those ages have relatively few children.

Table 2 breaks down the estimated orphan's insurance value according to sex, marital status, and decennial age-groups (single persons are excluded since few will have eligible dependent children). As would be expected, the great majority of the insurance values arises in the case of married men. Roughly 1% of the total arises on account of widowed men, while 2% arises from women (widows who are in covered employment and whose children are not receiving orphan's benefits in respect to their father). It may thus be seen that in making cost estimates for orphan's benefits the neglect of orphans of widows and widowers is substantially accurate, there being apparently only about a 3% understatement present.

Table 1

SUMMARY OF ESTIMATED LIFE INSURANCE VALUE IN 1940, BY AGE,  
LOW ESTIMATE<sup>a</sup>/WITH 3% INTEREST

(All figures in millions of dollars)

<u>Age</u>	<u>Widow's Old-Age</u>	<u>Widow's Current</u>	<u>Orphan's</u>	<u>Lump-Sum Death</u>	<u>Total<sup>b</sup></u>
15-19	3	8	9	114	134
20-24	281	853	752	444	2,330
25-29	838	2,708	2,673	388	6,607
30-34	1,164	3,572	3,826	279	8,841
35-39	1,292	3,062	3,440	208	8,002
40-44	1,332	2,258	2,520	178	6,288
45-49	1,348	1,378	1,504	169	4,399
50-54	1,133	633	665	146	2,577
55-59	912	242	246	115	1,515
60-64	645	68	67	78	858
65-69	420	18	18	47	503
70-74	232	4	3	24	263
75 & over	72	1	1	11	85
Total	9,672	14,805	15,724	2,201	42,402

<sup>a</sup>/ Only figures for the "low" estimate are presented in the detailed analyses since the calculations were made on this basis, the "high" estimate being obtained by a flat 25% increase for all types of benefits. The validity of such an adjustment if applied further by age and sex, would be open to even greater doubt.

<sup>b</sup>/ No account is taken of parent's benefits (see text).

Table 2

ESTIMATED ORPHAN'S AND LUMP-SUM DEATH INSURANCE VALUE IN 1940,  
BY SEX, MARITAL STATUS, AND AGE, LOW ESTIMATE<sup>a/</sup> WITH 3% INTEREST

(All figures in millions of dollars)

<u>Age</u>	<u>Orphan's Benefits<sup>b/</sup></u>			<u>Lump-Sum Death Payments</u>	
	<u>Married Men</u>	<u>Widowers<sup>c/</sup></u>	<u>Widows<sup>c/</sup></u>	<u>Men</u>	<u>Women</u>
15-24	712	3	47	364	193
25-34	6,301	37	161	448	219
35-44	5,781	67	113	266	120
45-54	2,077	52	40	253	62
55-64	296	14	3	170	22
65 & over	21	2	-	77	5
Total	15,188	175	364	1,578	621

a/ See footnote a, Table 1.

b/ No account is taken of single persons (see text).

c/ Including divorced and separated.

Table 3

ESTIMATED AVERAGE AMOUNT OF LIFE INSURANCE VALUE PER INSURED PERSON IN 1940,  
BY AGE AND SEX, LOW ESTIMATE<sup>a/</sup> WITH 3% INTEREST

<u>Age</u>	<u>Men</u>	<u>Women</u>	<u>Age</u>	<u>Men</u>	<u>Women</u>
15-19	\$117	\$99	50-54	\$2,010	\$163
20-24	771	135	55-59	1,706	135
25-29	2,186	180	60-64	1,580	120
30-34	3,271	213	65-69	1,579	120
35-39	3,481	222	70-74	1,651	120
40-44	3,145	206	75 & over	1,099	-
45-49	2,571	194	All Ages	2,270	173

a/ See footnote a, Table 1.



Table 2 also shows the estimated lump-sum death payment insurance value by sex. Due to their higher wages and the larger number exposed, the amount of life insurance value for men is about  $2\frac{1}{2}$  times that for women despite the fact that this type of protection is not applicable to men with children or with wives over age 65.

Table 3 gives the average amount of life insurance value per insured person by age and sex. For men the average is about \$100 for the age group 15-19 increasing rapidly to a maximum of \$3500 for those 35-39 and then decreasing slowly to about \$1100 for those 75 and over. For all ages combined the average is about \$2300. For women the average increases slowly from \$100 to a maximum of about \$225 at 35-39 and then decreases to about \$120 at the older ages. The average for women tends to be low since most of the life insurance value arises from the lump-sum death payments which are relatively small. It may thus be seen that on the average most covered men have obtained a rather sizable amount of life insurance value protection.

As mentioned previously, the whole concept of the amount of life insurance value in force has elements of the artificial since it represents the total current life insurance protection rather than the total liability which will be entered into in any given year. Table 4, giving the estimated "cost of insurance" by age and sex, might be said to be more "practical." The "cost of insurance" represents the discounted value of the estimated amount of obligations (based on a 3% interest rate and a given mortality table) that will be entered into as a result of deaths in 1940. For example, if 1000 persons at age 35 each have \$1000 of insurance and are subject to a death rate of .004, then the insurance in force is \$1,000,000, while the cost of insurance is \$4,000 since 4 persons will be "expected" to die. The "cost of insurance" for any particular age and sex category is obtained by multiplying the total amount of life insurance value in force by age (as shown in Table 1) and sex by the appropriate death rate. The total "cost of insurance" is 342 million dollars of which all but  $4\frac{1}{2}$  million dollars applies to men. In other words, the "cost of insurance" for women is only about 1% of the total. Although this appears discriminatory, there is contrasting discrimination in that the relative value of the primary benefits for women is, on the average, sufficiently larger than for men because of women's superior mortality and lower average earnings. As a result, this difference is probably more than offset.

The employee taxes based on a 32 billion dollar pay roll are 320 million dollars per year at the current tax rate (and 960 million dollars if the tax rate were 3%). As a result, the "cost of insurance" for survivors benefits is slightly greater than the employee contributions currently being paid, but only about one-third of what they would be on the basis of the 3% ultimate rate. Similarly it may be

Table 4

ESTIMATED "COST OF INSURANCE"<sup>a/</sup> IN 1940, BY AGE AND SEX,  
 LOW ESTIMATE<sup>b/</sup> WITH 3% INTEREST

(All figures in millions of dollars)

<u>Age</u>	<u>Men</u>	<u>Women</u>	<u>Total</u>
15-19	.2	.08	.3
20-24	6.2	.49	6.7
25-29	21.1	.62	21.7
30-34	35.1	.61	35.7
35-39	41.7	.59	42.3
40-44	44.6	.52	45.1
45-49	44.6	.50	45.1
50-54	36.5	.36	36.9
55-59	31.4	.27	31.7
60-64	26.7	.20	26.9
65-69	22.9	.13	23.0
70-74	18.4	.08	18.5
75 & over	8.5	-	8.5
Total	337.9	4.45	342.4

a/ i.e. estimated amount of obligations (present value) entered into as result of deaths in 1940. Based on death rates of U.S. 1933 White Life Tables and estimated life insurance value in force as shown in Table 1.

b/ See footnote a, Table 1.

stated that the liability for survivors benefits resulting from deaths in 1940 is equivalent to about one-half of the total taxes paid by both employers and employees. If the old-age and survivors insurance system were functioning as a life insurance company, at the end of 1940 a reserve of over 300 million dollars would have been set up to pay out over the future these benefits which had already been incurred on account of deaths in 1940. In addition, about the same amount of reserves for primary and wife's benefits would have been put up for individuals who became entitled to such benefits in 1940.

Analysis of Estimates Involving No Interest:

This section will carry out exactly the same analysis as the preceding one except that a zero interest rate will be considered instead of 3%.

Tables 1a and 2a give figures similar to those shown in Tables 1 and 2. The tendencies shown in the previous tables are also present here. It is interesting to note from Table 1a that for practically all ages the life insurance value in force for widow's old-age benefits is greater than for widow's current benefits.

Table 3a gives the average amount of life insurance value per insured person by age and sex. In reality, these figures indicate the average amount of benefits which would be payable in case such an individual dies. For men the amount is about \$150 for 15-19, increasing rapidly to a maximum of over \$5000 for those 35-39 and then decreasing slowly to about \$1300 for those 75 and over. For all ages combined the average is about \$3500. For women the figures in most cases are between \$100 and \$200 regardless of age.

Table 4a shows the estimated "cost of insurance" which indicates the probable amount of future benefit payments that will be made as a result of deaths in 1940. Such total expected future payments amount to 515 million dollars, of which all but about 1% arise from male deaths. This figure is about two-thirds greater than the employee taxes which will be received in respect to 1940 although, of course, there is a difference in timing since the taxes will be received in 1940 or 1941, whereas the benefit payments will extend many years into the future. Similarly, it may be stated that the amount of expected future survivors benefit payments in respect to 1940 deaths is about 20% less than the combined employee-employer tax receipts for that year.

Table 1a

SUMMARY OF ESTIMATED LIFE INSURANCE VALUE IN 1940, BY AGE,  
 LOW ESTIMATE<sup>a</sup>/WITH NO INTEREST

(All figures in millions of dollars)

<u>Age</u>	<u>Widow's Old-Age</u>	<u>Widow's Current</u>	<u>Orphan's</u>	<u>Lump-Sum Death</u>	<u>Total<sup>b</sup></u>
15-19	17	10	11	114	152
20-24	1,308	1,079	944	444	3,775
25-29	3,468	3,381	3,295	388	10,532
30-34	4,282	4,382	4,632	279	13,575
35-39	4,105	3,694	4,076	208	12,083
40-44	3,759	2,666	2,938	178	9,541
45-49	3,282	1,599	1,724	169	6,774
50-54	2,450	724	751	146	4,071
55-59	1,701	274	275	115	2,365
60-64	1,037	76	75	78	1,266
65-69	599	21	20	47	687
70-74	295	4	4	24	327
75 & over	89	1	1	11	102
Total	26,392	17,911	18,746	2,201	65,250

<sup>a</sup>/ See footnote a, Table 1.

<sup>b</sup>/ No account is taken of parent's benefits (see text).

Table 2a

ESTIMATED ORPHAN'S AND LUMP-SUM DEATH INSURANCE VALUE IN 1940,  
BY SEX, MARITAL STATUS, AND AGE, LOW ESTIMATE<sup>a/</sup> WITH NO INTEREST  
(All figures in millions of dollars)

<u>Age</u>	<u>Orphan's Benefits<sup>b/</sup></u>			<u>Lump-Sum Death Payments</u>	
	<u>Married Men</u>	<u>Widowers<sup>c/</sup></u>	<u>Widows<sup>c/</sup></u>	<u>Men</u>	<u>Women</u>
15-24	894	3	58	364	193
25-34	7,690	45	193	448	219
35-44	6,809	77	128	266	120
45-54	2,375	58	43	253	62
55-64	332	14	3	170	22
65 & over	24	2	-	77	5
Total	18,124	199	425	1,578	621

a/ See footnote a, Table 1.

b/ No account is taken of single persons (see text).

c/ Including divorced and separated.

Table 3a

ESTIMATED AVERAGE AMOUNT OF LIFE INSURANCE VALUE PER INSURED PERSON IN 1940,  
BY AGE AND SEX, LOW ESTIMATE<sup>a/</sup> WITH NO INTEREST

<u>Age</u>	<u>Men</u>	<u>Women</u>	<u>Age</u>	<u>Men</u>	<u>Women</u>
15-19	\$140	\$101	50-54	\$3,191	\$164
20-24	1,289	142	55-59	2,674	135
25-29	3,521	194	60-64	2,338	122
30-34	5,052	232	65-69	2,164	120
35-39	5,283	238	70-74	2,052	130
40-44	4,795	217	75 & over	1,314	-
45-49	3,979	202	All Ages	3,519	182

a/ See footnote a, Table 1.

Table 4a

ESTIMATED "COST OF INSURANCE"<sup>a/</sup> IN 1940, BY AGE AND SEX,  
 LOW ESTIMATE<sup>b/</sup> WITH NO INTEREST

(All figures in millions of dollars)

<u>Age</u>	<u>Men</u>	<u>Women</u>	<u>Total</u>
15-19	.2	.1	.3
20-24	10.3	.5	10.8
25-29	34.0	.7	34.7
30-34	54.2	.7	54.9
35-39	63.3	.6	63.9
40-44	68.1	.5	68.6
45-49	69.1	.5	69.6
50-54	57.9	.4	58.3
55-59	49.2	.3	49.5
60-64	39.5	.2	39.7
65-69	31.4	.1	31.5
70-74	22.8	.1	22.9
75 & over	10.2	--	10.2
Total	510.2	4.7	514.9

a/ i.e. probable amount of future benefit payments  
 that will be made as result of deaths in 1940.  
 Based on death rates of U.S. 1933 White Life Tables  
 and estimated insurance in force as shown in Table 1a.

b/ See footnote a, Table 1.

## Appendix

### Assumptions and Methods of Estimation

In order to determine the amount of life insurance value in force it is first necessary to estimate the total number of persons who are insured. Little data on this subject is at present available although indications from aggregate wage data are that there is a considerable amount of turnover present. So as to obtain an estimate which is certainly not an overstatement, it has been assumed for the "low" estimate that the insured group would be made up of all individuals in the 1937 wage data\* who had \$200 or more of wage credits. To allow for the fact that those who were over age 65 could not obtain 1937 wage credits but may be insured in 1940, there has been estimated the number of such persons and the amount of their wages by age and wage groups. It is assumed that the average 1937 wage credit would represent the average wage for benefit calculations for this group of persons.

The insured group under the above assumptions amounts to 24 million persons or 75% of the estimated 32 million persons who had 1937 wage credits, and 60% of the estimated 40 million persons who had wage credits at any time during 1937-39. Various estimates of the insured population in 1940 have been made, ranging as high as 32 million. It will possibly be several years before actual wage tabulations will yield information sufficiently complete to make more precise estimates of the number insured. The lowest "reasonable" figure has been used here for the "low" estimate so as to obtain a "probable minimum" estimate of the life insurance value in force under the program. In order to give a more complete picture there is also presented a "high" estimate so as to allow for the possible presence of a greater number of insured individuals. This "high" estimate is obtained merely by increasing the "low" estimate by 25% rather than by the 33% excess of the 32 million "maximum" estimate of insured individuals over the 24 million figure because of the lower average wages resultant when a large in and out movement is present in the insured population. Since the "high" estimate is developed in this empirical fashion, it will only be necessary in the subsequent discussion to discuss the assumptions and methods of estimation of the low estimate.

The total 1937 wage credits for the assumed "low" estimate of the insured group amounted to 27.0 billion dollars or 92% of the estimated total wage credits for that year. Thus, their wages represent the great majority of all wages earned in 1937. It may be argued that the elimination of all individuals with less than \$200 of covered earnings in 1937 is too stringent an assumption. While this may be true, there is a counterbalancing element present in

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\* Only the tabulation (uncorrected for carry-over) was available at the time this study was made.

that the average wage as used in the benefit calculations in 1940 will in most cases be based on a four year period so that the average wage credits for 1937 are probably too high as representative of that period. Correspondingly, it may be seen that the "high" estimate based on an assumed 25% increase over the "low" estimate is almost certainly the upper limit of the range.

The "low" estimate was made on the basis of dividing the assumed insured group by sex into quinquennial age groups and four wage categories, namely, \$200-300, \$300-400, \$400-600, and \$600 and over. It was necessary to divide those with under \$600 into three categories because of the various ways in which the \$10 minimum provision could affect the primary benefit, the widow's old-age benefit, and the orphan's benefit where there was only one child without a mother. It may readily be proved mathematically that for individuals with average wages in excess of \$600 per year the primary benefit based on the average wage of all persons is exactly the same as the average of the benefits calculated separately for each individual person. This results from the straight-line nature of the formula beyond \$600. It should also be mentioned that no allowance was made for the 1% increment in calculating benefits since it is such a small item in the early years. Moreover, it partially counterbalances the decrease in average wage due to the turnover present. As a result, the 80% and \$85 maximums did not enter into the calculations.

Considering male employees, the first step was to obtain the number in each quinquennial wage and age group. This was done for those under 65 from the published 1937 wage data and from the estimates previously mentioned for those over 65 (these latter estimates were based on the trends shown in the wage data for the age groups near 65 and resulted in a total of about 700,000 employees over 65 who would have had wage credits in 1937 if there had been no restrictions). The next step was to determine the number of married male employees. The proportion married was obtained from census data for all males since this is the best source available, and the same figures were used for all wage categories for lack of any better information (see Chart I). Obviously the number of wives of male employees is the same as the number of married male employees. For each age group of the husband an average age for the wives was determined from the Richmond Study. Using this average age there was then calculated, using the U.S. White Females 1920-29 Life Table, the value (at 3% interest) of a deferred annuity of \$1 per year payable monthly beginning at age 65 (or in the case where the average age of the wife was over 65, an immediate annuity). This factor was then multiplied by 75% of the primary annuity based on the average wage of the husband according to the given age and wage group, thus yielding the amount of life insurance value for widow's



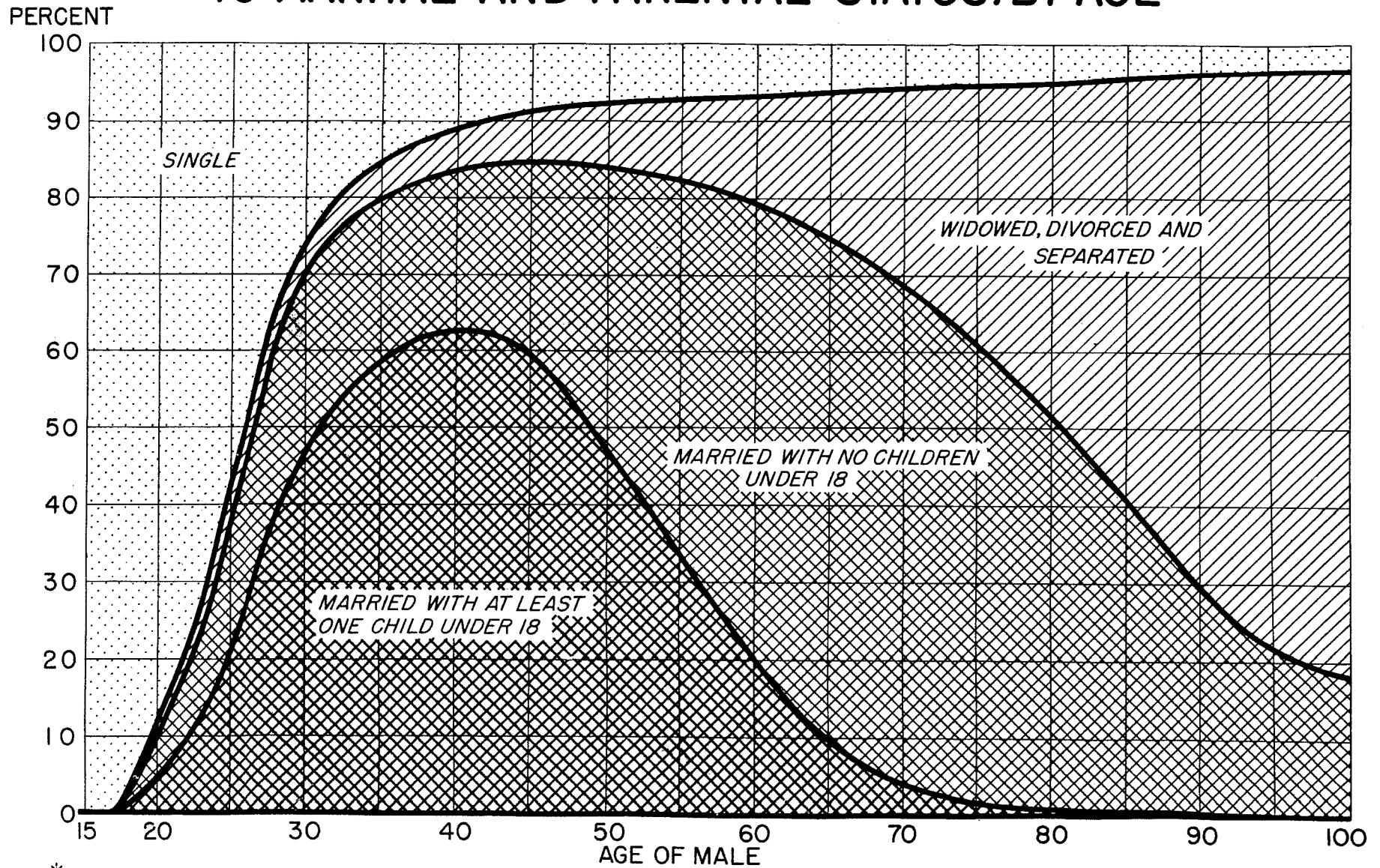
old-age benefits per married man. (Where 75% of the primary benefit was less than \$10, it was raised to \$10.) This value was then multiplied by the number of married men to get the total amount of widow's insurance value for the given age and wage category.

One artificiality present in the above method lies in the fact that it is assumed that every widow will receive these benefits beginning if and when she attains age 65. This will not be the case if she remarries, if she has a larger benefit in her own right, or if she is in covered employment after age 65. However, the figures do represent the value of the benefits that the widows can get if they so desire. In other words, the widow who survives to 65 need not remarry, need not have earned an annuity in her own right, or need not work in covered employment after age 65. The figures thus are representative of the maximum potential liability rather than the actual potential liability. They correspond with "individual equity" studies where it is assumed that the individual retires at exact age 65 because he could retire then if he so desired.

To determine life insurance value in regard to widow's current benefits and orphan's benefits in respect to married men it is necessary to determine the number of married men that have children. Subsequently, the determination of orphan's benefits in respect to widows and widowers will be discussed. To the number of married men obtained previously there was applied the percentage of married men having at least one child as determined from the Richmond Study (see Charts I and II). The same figures were used for all wage groups for lack of any better data. Using the Richmond Study data there was also calculated the average value (at 3% interest) of an annuity-certain of \$1 per year payable monthly up to age 18 for the youngest child, second youngest child, etc., according to age of father (see Chart III). It was assumed that no mortality would occur among the children so that these annuity-certain values could be used. Allowance for mortality among the children would, at most, affect the results by 5%. Similarly for mothers it was assumed that the period for which benefits would be received would be until age 18 of the youngest child so that the same annuity-certain values could be used as for the youngest child. This is somewhat more of an overstatement since mortality of the mothers might have an appreciable effect, probably at most 10%. A partially counterbalancing element is that if the mother dies, the total benefit for the family would not be reduced by the amount of her benefit when there are three or more children present (because of the operation of the 200% maximum).

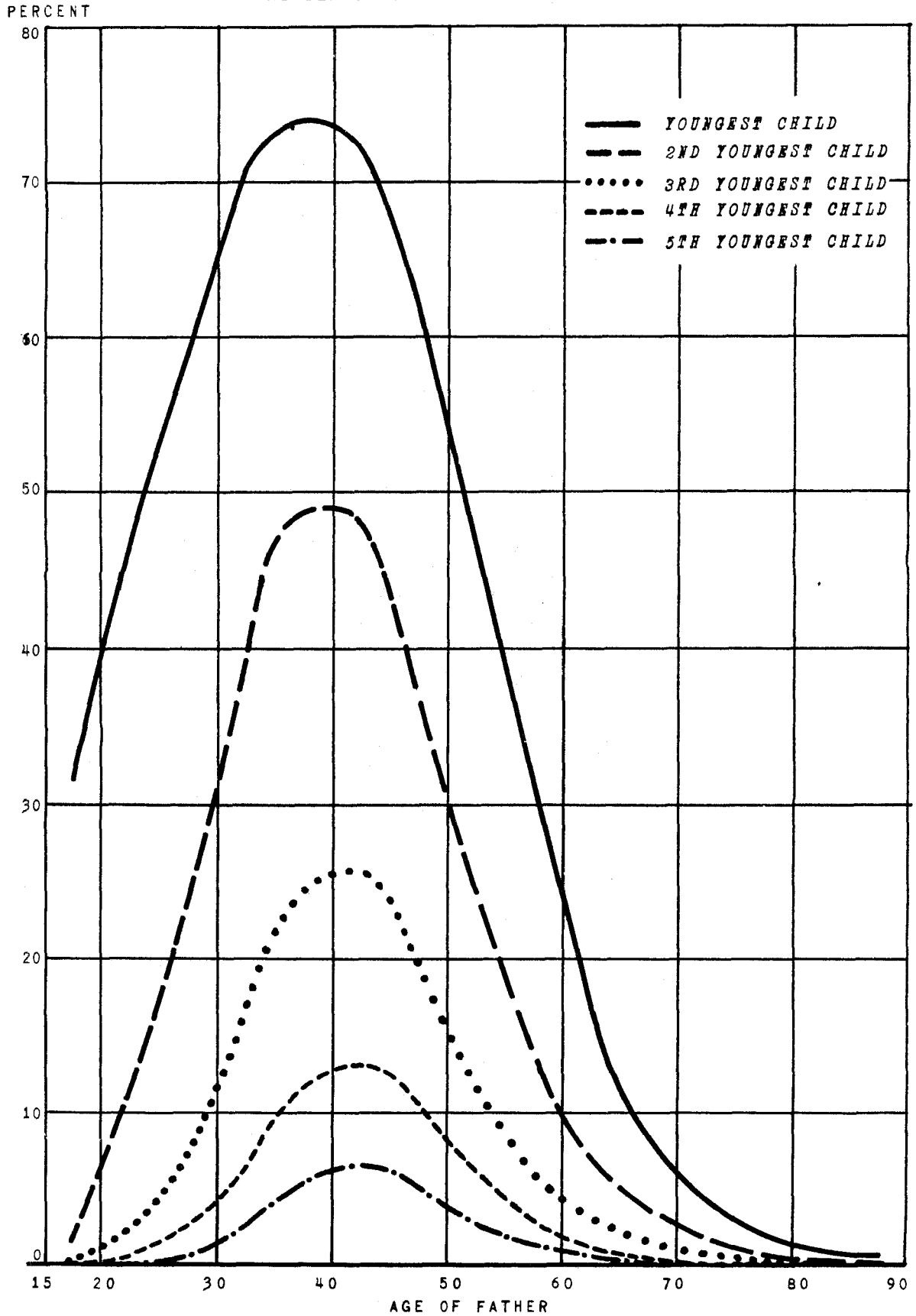
For each quinquennial age group of fathers there was then obtained a weighted annuity factor based on a primary benefit of \$1 per year. For widow's current benefits the factor was 75% of the \$1 per year annuity-certain calculated for the lifetime to age 18 of the first child since the mother receives 75% of the primary benefit (i.e., 75 cents on the basis of a \$1 primary benefit) until the youngest

# CHART I PERCENTAGE DISTRIBUTION OF MEN ACCORDING TO MARITAL AND PARENTAL STATUS, BY AGE\*



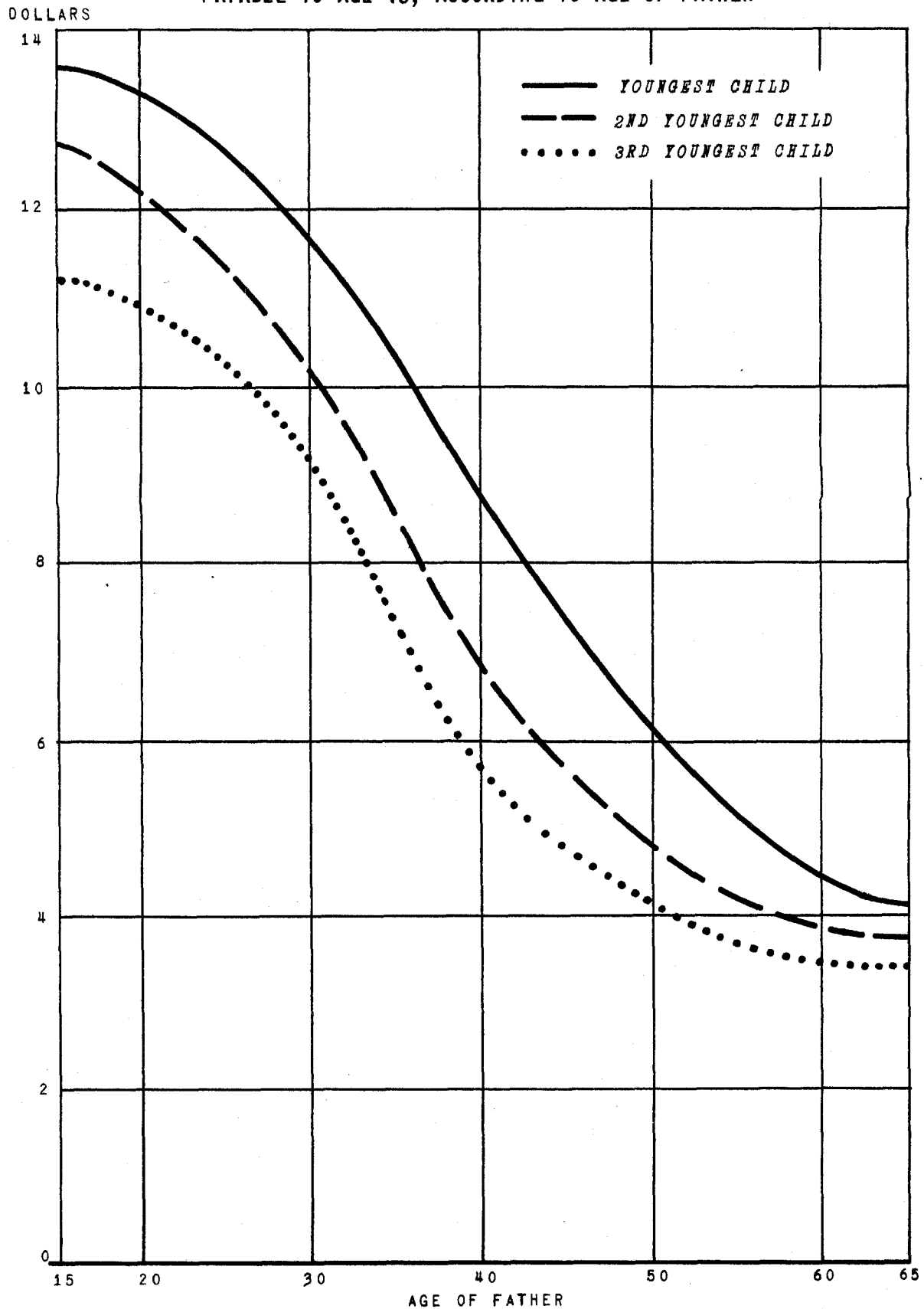
\*BASED ON DATA FROM THE RICHMOND FAMILY COMPOSITION STUDY

CHART II  
 PERCENTAGE DISTRIBUTION OF MARRIED MEN ACCORDING TO  
 NUMBER OF CHILDREN UNDER AGE 18\*



\* Based on data from the Richmond Family Composition Study.

**CHART III**  
**AVERAGE VALUES AT 3% INTEREST OF ANNUITY CERTAIN OF \$1 PER YEAR**  
**PAYABLE TO AGE 18, ACCORDING TO AGE OF FATHER\***



\* Based on data from the Richmond Family Composition Study.

child attains age 18. Likewise, for orphan's benefits the factor was 50% of the annuity-certain value for the youngest child plus 50% of the annuity-certain value for the second youngest child times the proportion of families with children who had at least two children plus 25% of the annuity-certain value for the third youngest child times the proportion of families that had at least three children (see also Chart II). The various percentages used above arise from the benefit provisions and the 200% maximum. In order to obtain the amount of life insurance value for widow's current benefits for any age and wage group, the number of married men with children was multiplied by the amount of life insurance value per capita which is the product of the above weighted annuity factor and the corresponding average primary benefit. A similar process was followed to obtain the amount of life insurance value under orphan's benefits in respect to married men.

In order to obtain the amount of life insurance value for orphan's benefits in respect to widows and widowers there was first obtained the number of widows and widowers in each age and wage group by applying to the total persons percentages obtained from the 1930 census (for women using the gainfully occupied population as a base, while for men the total population). In a fashion similar to that used for orphan's benefits in respect to married men, weighted annuity factors were obtained using 50% for each of the first four youngest children and taking special account of the fact that where there was only one child the benefit would be \$10 in all cases where the primary benefit was less than \$20. The number of widows and widowers in each age and wage group was then multiplied by the amount of life insurance value per capita (the product of the weighted annuity factor and the average primary benefit) so as to obtain the amount of life insurance value in force.

Finally, in order to obtain the amount of life insurance value in force for lump-sum death payments there was obtained by subtraction for each age, sex, and wage group the number of individuals who did not have children and who did not have a wife over 65. All of this group would be eligible to receive a lump-sum payment upon death (since it has been assumed that no "dependent" parents would be present). Multiplying this number by six times the primary benefit produces the amount of life insurance value. Here again there may be an overstatement since the payment actually made might be less than six times the primary benefit in certain cases where the funeral expenditures made by outside parties are smaller. However, to be conservative the full six times the primary benefit was used since probably in the great majority of the cases claims for funeral expenditures will amount to at least as much as the maximum payment available.

- 5 -

After the above calculations had been made, the results were collected so as to have all wage groups combined. No account has been taken of parent's benefits due both to the lack of pertinent data on dependency and to the relatively small aggregate financial importance of this benefit.

A similar process was followed to obtain the amount of life insurance value based on a zero interest rate. The only elements changed were the various deferred annuity values (applicable to aged widow's benefits) and annuity-certain factors (applicable to orphan's and widow's current benefits). Obviously the lump-sum death payments are the same for both estimates.