RESERVES FOR LIVES DISABLED UNDER GROUP IN-SURANCE EXTENDED DEATH BENEFIT PROVI-SIONS OF THE PREMIUM-WAIVER TYPE

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ABSTRACT

In the past a number of actuarial bases have been used to reserve for lives disabled under group insurance extended death benefit provisions of the premium-waiver type.

A study of the experience of twelve companies for such disabled lives was published in the Society's 1968 *Reports*. The present paper starts with the published experience, discusses the factors involved in developing a valuation basis from the basic data, and describes the proposed basis so derived. Commutation functions are developed and included in the paper.

GENERAL INTRODUCTION

OF THE three major extended death benefit provisions included in group term life insurance policies issued in the United States and Canada, the premium-waiver type of provision is by far the most common. From the 1965 *Reports* we note that about 32 million life-years were exposed between 1955 and 1964 calendar years under the provision being studied, or slightly more than were exposed for the other two provisions combined. As a measure of the amount of reserves involved industry-wide, we crudely estimate that there were about $400–$500 million of premium-waiver reserves for the industry held as of the 1969 year end; this figure includes reported claims whether approved, pending, or resisted, and incurred but unreported claims.

Several considerations make it important to examine carefully the basis of reserving for approved premium-waiver claims. Among these considerations are the increasing size of the reserves for such claims, the current availability of fairly up-to-date data (1968 *Reports*, Reports of Mortality and Morbidity Experience), and questions raised by state insurance departments as to whether reserves held by companies recognize recent intercompany experience.

The purpose of this paper is to present the results of our studies of intercompany group experience and to propose an actuarial basis appropri-

ate for setting up disabled life reserves held under extended death benefit provisions of the premium-waiver type. A double decrement table representing the average company experience is developed, which we call the "1970 Intercompany Group Life Disability Experience Table." The name adopted for the proposed valuation table is the "1970 Intercompany Group Life Disability Valuation Table." For convenience these tables will be referred to as the "experience" table and the "valuation" table, respectively. Our studies have been limited to a nine-month presumptive provision, that is, one in which total disability is presumed to be permanent after a nine-month waiting period from date of disablement and where proof of continued disability must be provided annually. Appendix 1 shows an example of the type of provision with which we are dealing. Typically these provisions stipulate that disability must have occurred prior to age 60, although about 6 per cent of total intercompany exposure as published in the 1968 *Reports* relates to disabilities where the date of disablement occurs after age 60.

STARTING POINT FOR THE STUDY

The starting point for the study of experience was the study published in the 1968 *Reports* number of the *Transactions* (hereinafter referred to as the "1968 Study"); the experience was derived from an exposure to termination from disability of over one-half billion dollars face amount and over 135,000 life-years. The 1968 Study was based on the same types of cases as are included in the quinquennial studies of group life mortality experience; that is, it excludes union, trusteeship, and association cases as well as group indebtedness experience. Disabled life data were contributed by the Aetna Life Insurance Company, the Bankers Life Company, the Connecticut General Life Insurance Company, the Continental Assurance Company, the Equitable Life Assurance Society, the John Hancock Mutual Life Insurance Company, the Lincoln National Life Insurance Company, the Metropolitan Life Insurance Company, the Occidental Life Insurance Company, the Prudential Insurance Company of America, the Sun Life Assurance Company of Canada, and the Travelers Insurance Company. The study covered experience between 1955 and 1965 anniversaries of the date of disablement for all disabilities approved before 1965.

The 1968 Study produced graduated select and ultimate total termination rates and probabilities of recovery and death for a ten-year select period, using select ages at quinquennial intervals between 17 and 62. These were based on an average of the twelve-company experience. The study also produced whole life terminal reserves for interest rates of 3 and

$3\frac{1}{2}$ per cent based on these rates and probabilities. Although the probabilities were published in the 1968 *Reports*, they are shown in this paper in Appendixes 2A and 2B to make the paper more self-contained.

<div align="center">INDIVIDUAL COMPANY VARIATIONS</div>

When the 1968 Study was prepared, individual company variations were not studied; only average company experience was examined. Since annual statement reserves ought to assure solvency for companies with widely different mortality and morbidity experience, the first step in developing a proposed valuation standard was to study individual company variations in death and recovery experience. The contribution for one company, representing less than $\frac{1}{2}$ per cent of contributed exposure, was entirely excluded from our intercompany comparisons, since the form of its contribution would have required the introduction of undesirable complications in the processing system.

Actual-to-expected ratios were calculated for age (at disablement)–duration (from disablement) cells for each company by both lives and amounts; the expected rates in each case were the intercompany average experience by lives (see Appendixes 2A and 2B). Since the data were not extensive enough for individual companies, or even for all companies combined, to be considered as a function of both age and duration, we accordingly examined the patterns by age at disablement across all durations and, alternatively, by duration from disablement ignoring age. Tables 1A and 1B show the extent to which individual company death and recovery experience varies as a function solely of quinquennial age at disablement, and Tables 2A and 2B show the experience solely as a function of duration since disablement. The distributions of exposure in Tables 1A, 1B, 2A, and 2B are shown to indicate the relative importance of the ages and durations for the industry as a whole. These tables show the five highest individual company ratios of actual to expected in the case of death probabilities and the five lowest in the case of recovery probabilities for each duration and for each quinquennial grouping of age at disablement. Note that the five highest (or lowest) companies for one age or duration grouping are not necessarily the same as those for another grouping. These tables indicate the cells in which the experience is based on expected deaths or recoveries of less than $30,000 (equivalent, on the average, to about ten expected deaths or recoveries).

Table 3 shows, for each individual company identified by code number, the actual-to-expected ratio by amounts and the underlying exposure for deaths and for recoveries if each contingency is viewed as an independent variable. The expected claims for Tables 1A, 1B, 2A, 2B, and 3

TABLE 1A

DATA FOR COMPANIES THAT HAVE THE FIVE HIGHEST RATIOS OF ACTUAL TO EXPECTED DEATHS BY AMOUNTS FOR EACH AGE-AT-DISABLEMENT GROUP

AGE AT DISABLEMENT	EX-POSURE*	INDIVIDUAL COMPANY RATIOS OF ACTUAL TO EXPECTED DEATHS				
		5th High-est Ratio	4th High-est Ratio	3d High-est Ratio	2d High-est Ratio	Highest Ratio
19 and under......	0.1%	0†	0†	0†	0.54†	5.60†
20–24.............	0.8	1.34	1.69	1.85†	1.86†	4.70†
25–29.............	1.8	1.28	1.86†	2.17†	2.29†	4.27†
30–34.............	3.1	1.11	1.15	1.16†	1.63	2.88†
35–39.............	4.5	1.15	1.27†	1.83	1.98	2.04†
40–44.............	7.9	0.97	1.02	1.09	1.74	1.82†
45–49.............	13.5	1.07	1.22	1.30	1.91	2.30†
50–54.............	24.4	1.19	1.23	1.33	1.46	1.54†
55–59.............	38.3	1.13	1.21	1.29	1.40	2.07†
60 and over.......	5.6	1.02	1.24†	1.33	1.34	2.10†
All ages—select	92.3%	1.16	1.27	1.30	1.31	1.75
All ages—ultimate..	7.7	0.94	1.09	1.09	1.34	1.80†
All ages—select and ultimate.	100.0%	1.15	1.24	1.30	1.30	1.75

* By amounts, based on 1968 Study.

† Based on expected deaths of less than $30,000 (equivalent, on the average, to about 10 expected deaths).

TABLE 1B

DATA FOR COMPANIES THAT HAVE THE FIVE LOWEST RATIOS OF ACTUAL TO EXPECTED RECOVERIES BY AMOUNTS FOR EACH AGE-AT-DISABLEMENT GROUP

AGE AT DISABLEMENT	EX-POSURE*	INDIVIDUAL COMPANY RATIOS OF ACTUAL TO EXPECTED RECOVERIES				
		5th Lowest Ratio	4th Lowest Ratio	3d Lowest Ratio	2d Lowest Ratio	Lowest Ratio
19 and under......	0.1%	1.45†	1.02	0.88	0.84	0.72
20–24.............	0.9	0.56	0.55†	0.35†	0.0†	0.0†
25–29.............	1.8	0.87	0.72	0.0†	0.0†	0.0†
30–34.............	3.3	0.78	0.59	0.47†	0.45†	0.0†
35–39.............	4.7	0.98	0.84	0.64	0.63	0.29
40–44.............	8.3	0.66	0.62	0.37	0.34	0.0†
45–49.............	13.6	0.82	0.78	0.69	0.34	0.24
50–54.............	24.3	0.73	0.66	0.56	0.09	0.0†
55–59.............	37.5	0.55	0.44	0.40	0.34†	0.0†
60 and over........	5.5	0.74	0.28	0.0†	0.0†	0.0†
All ages—select....	92.3%	0.79	0.69	0.67	0.59	0.26
All ages—ultimate..	7.7	0.67	0.38†	0.0†	0.0†	0.0†
All ages—select and ultimate.	100.0%	0.79	0.69	0.68	0.59	0.25

* By amounts, based on 1968 Study.

† Based on expected recoveries of less than $30,000 (equivalent, on the average, to about 10 expected recoveries).

TABLE 2A

DATA FOR COMPANIES THAT HAVE THE FIVE HIGHEST RATIOS
OF ACTUAL TO EXPECTED DEATHS BY AMOUNTS,
BY DISABILITY YEAR

DISABILITY YEAR	Ex-POSURE*	INDIVIDUAL COMPANY RATIOS OF ACTUAL TO EXPECTED DEATHS				
		5th High-est Ratio	4th High-est Ratio	3d High-est Ratio	2d High-est Ratio	Highest Ratio
1................	2.1%	1.12	1.17	1.28	1.50	2.07†
2................	16.9	1.20	1.20	1.34	1.46	1.68
3................	19.1	1.09	1.11	1.12	1.37	2.84†
4................	15.1	1.10	1.12	1.26	1.27	1.30
5................	11.6	1.05	1.27†	1.30	1.31	1.40
6................	8.9	1.33	1.51	1.75	2.27†	6.55†
7................	6.8	1.05	1.20	1.35	1.93†	2.42
8................	5.1	1.09	1.13	1.17†	1.43†	1.61
9................	3.8	1.38	1.57	1.75†	1.83†	2.99†
10...............	2.9	1.47	1.53	1.67†	2.52†	2.55†
11 and over—ulti-mate...........	7.7	0.94	1.09	1.09	1.34	1.80†
All durations—select and ul-timate......	100.0%	1.15	1.24	1.30	1.30	1.75

* By amounts, based on 1968 Study.

† Based on expected deaths of less than $30,000 (equivalent, on the average, to about 10 expected deaths).

TABLE 2B

DATA FOR COMPANIES THAT HAVE THE FIVE LOWEST RATIOS
OF ACTUAL TO EXPECTED RECOVERIES BY AMOUNTS,
BY DISABILITY YEAR

DISABILITY YEAR	Ex-POSURE*	INDIVIDUAL COMPANY RATIOS OF ACTUAL TO EXPECTED RECOVERIES				
		5th Lowest Ratio	4th Lowest Ratio	3d Lowest Ratio	2d Lowest Ratio	Lowest Ratio
1................	2.2%	0.37	0.26	0†	0†	0†
2................	16.9	0.83	0.80	0.50	0.18	0.06†
3................	19.0	0.85	0.82	0.78	0.71	0.21
4................	15.1	0.61	0.60	0.34	0.23†	0†
5................	11.6	0.92†	0.66	0.65†	0.53	0†
6................	8.9	0.76	0.73	0†	0†	0†
7................	6.8	0.56†	0.48	0.39	0.30†	0†
8................	5.1	0.79	0.62	0†	0†	0†
9................	3.8	0.78	0.78†	0.50†	0†	0†
10...............	2.9	0.23†	0.20	0†	0†	0†
11 and over—ulti-mate...........	7.7	0.67	0.38†	0†	0†	0†
All durations—select and ul-timate......	100.0%	0.79	0.69	0.68	0.59	0.25

* By amounts, based on 1968 Study.

† Based on expected recoveries of less than $30,000 (equivalent, on the average, to about 10 expected recoveries).

are derived by applying the termination probabilities by lives to exposures by amounts.

Table 4 takes the results of Table 3, considers deaths and recoveries independently of each other, and shows, cumulatively, the number of companies excluded and the proportion of exposure excluded at each actual-to-expected level.

In seeking appropriate margins to cover individual company variations, we tried to include as many companies as possible without including the highest actual-to-expected death ratio or lowest recovery ratio

TABLE 3

ACTUAL-TO-EXPECTED RATIOS BY AMOUNTS
EXPECTED VALUES BASED ON GRADUATED RATES BY LIVES
FOR BOTH SEXES AND ALL DURATIONS COMBINED

COMPANY	DEATHS		RECOVERIES	
	Distribution of Exposure to Death (by Amounts)	A/E	Distribution of Exposure to Recovery (by Amounts)	A/E
1.........	0.7%	1.30	0.7%	0.79
2.........	0.9	1.07	0.9	0.59
3.........	34.3	1.02	34.5	1.20
4.........	17.0	0.91	17.0	0.87
5.........	1.5	0.85	1.5	0.25
6.........	0.1	1.75	0.1	0.69
7.........	4.3	1.30	4.2	1.07
8.........	14.9	1.15	14.8	0.95
9.........	11.4	1.11	11.0	0.68
10.........	1.1	1.24	1.1	1.04
11.........	13.8	0.71	14.2	0.89
All....	100.0%	1.00	100.0%	0.97

at each central age at disablement or at each duration.[1] We studied company-to-company variations (a) by age at disablement, (b) by duration, and (c) in the aggregate for all ages and durations combined.

We first compared the group life disability results with the 1930–50 termination rates (which are termination rates specified in New York's minimum valuation standard for total and permanent disability benefits issued in conjunction with individual policies); they were examined in terms of their suitability (adjusted or unadjusted) as a valuation standard for group benefits. It turns out (see Table 5) that the 1930–50 termination

[1] This is an extension of the procedure used in developing the 1958 CSO Table. See *TSA*, Vol. IX.

rates for Benefit 5 (the premium-waiver benefit) are completely out of phase with the group experience. The 1964 Commissioners Disability Table was considered and dismissed as a starting point, since it is derived from income-type benefits. We decided that it was more logical to develop a new table based entirely on the average group experience than, for example, to adjust the rates in the 1930–50 individual experience.

From Table 4, if we view the probabilities as being independent of one another, we see that a choice of probabilities of death and recovery equal to 130 per cent and 60 per cent of the respective average twelve-company

TABLE 4

CUMULATIVE DISTRIBUTION FOR ELEVEN COMPANIES OF
ACTUAL-TO-EXPECTED RATIOS BY AMOUNTS
EXPECTED VALUES BASED ON GRADUATED RATES BY LIVES
FOR BOTH SEXES AND ALL DURATIONS COMBINED

| A/E | DEATHS | | A/E | RECOVERIES | |
	No. of Companies Excluded	Exposure Excluded		No. of Companies Excluded	Exposure Excluded
0.71......	10	86.2%	1.20.....	10	65.5%
0.85......	9	84.7	1.07.....	9	61.3
0.91......	8	67.7.	1.04.....	8	60.2
1.02......	7	33.4	0.95.....	7	45.4
1.07......	6	32.5	0.89.....	6	31.2
1.11......	5	21.1	0.87.....	5	14.2
1.15......	4	6.2	0.79.....	4	13.5
1.24......	3	5.1	0.69.....	2	2.4
1.30......	1	0.1	0.59.....	1	1.5
1.75......	0	0.0	0.25.....	0	0.0

probabilities would exclude the over-all death experience of only one company and the recovery experience of only one company (not the same company). Note that higher death probabilities and lower recovery probabilities both tend to increase reserves. Although the 130 per cent and 60 per cent factors clearly accommodate over-all company experience well, we wanted to ensure adequate reserves for companies with unusual distributions of exposure by age at disablement and for duration from disablement. We note from Tables 1A, 1B, 2A, and 2B that the factors include most of the experience at all ages and durations, and especially so if we remove companies with insignificant experience. The select experience is accommodated well by the 130 per cent and 60 per cent factors in the aggregate and by central ages at disablement. The ultimate experi-

ence is accommodated in the aggregate; it was not examined in, say, quinquennial or decennial age groups, because of the relatively meager experience.

The margins were deliberately chosen to include essentially all the company averages and most of the intercompany experience at all ages durations, thereby producing desired conservative coverage of the twelve-

TABLE 5

1930–50 GRADUATED TERMINATION RATES—BENEFIT 5 AS RATIO TO CORRESPONDING* RATES FOR 1968 STUDY

DISABILITY YEAR	AGE* AT DISABLEMENT			
	25–29	35–39	45–49	55–59
	Total Termination Rate			
2	1.40	1.50	1.52	1.18
5	1.47	1.43	1.35	1.22
10	1.68	1.33	1.28	0.96
15	1.42	1.06	0.96	0.81
20	1.22	0.99	0.91	0.91
25	1.06	0.99	0.85	0.97
35	0.99	0.85	0.97	1.07
	Probability of Recovery			
2	1.63	2.06	2.83	3.22
5	1.57	1.88	2.65	3.94
10	2.15	1.94	2.40	3.17
15	2.57	2.34	3.00	2.00
20	2.47	2.69	4.25	....
25	2.34	3.00	2.00	....
35	3.00	2.00	....	....
	Probability of Death			
2	0.60	0.59	0.61	0.75
5	1.09	0.79	0.80	0.94
10	1.08	0.96	1.03	0.87
15	0.72	0.66	0.78	0.80
20	0.68	0.69	0.82	0.91
25	0.66	0.81	0.84	0.97
35	0.81	0.84	0.97	1.07

* 1952 Study was based on age attained on policy anniversary preceding disablement, and 1968 Study was based on age nearest birthday at disablement; the rates are thus actually ½ year out of phase. No comparison is shown for first year of disability due to the different waiting periods in the two studies.

company experience. This conservative coverage was felt to be necessary, since our data excluded about 550 companies that write group life insurance but did not contribute to the study. These excluded companies are primarily the smaller ones, with smaller total insurance in force, that would tend to be subject to wider statistical fluctuations than would the larger companies in the study.

LEVEL OF TERMINATION RATES

Rates of admission to disability (rates of disablement) and of termination from disability are generally conceded to be extremely sensitive to economic cycles. From the standpoint of a valuation standard, it is therefore desirable to use termination rates that cover disability experience over relatively long periods of time, including both economic "peaks" and "troughs." While it is clear that general economic conditions affect termination rates, the quantitative relationships are probably not simple and, in any event, are difficult to measure. After long deliberation we concluded that the 1968 Study, which produced termination experience between 1955 and 1965, provides a reasonably long base period for a valuation standard with respect to the effects of economic cycles on such experience. This period includes both economic "peaks" and "troughs" relative to a historically increasing secular economic trend line.

CONTINUATION OF INSURANCE

Typically, reserve factors used by insurance companies ignore the extent to which insurance coverage continues after an age such as 65. Recognizing that the pattern of insurance continuation has a substantial effect on reserves, we decided to examine this effect by calculating reserves based on five alternative assumptions as to such continuation. These model-office patterns are shown in Table 6.

While there are many variations, and individual contracts will certainly differ from our models, reserves based on these patterns show clearly the effect on reserves of representative insurance continuation practices.

SEX

As a general rule, reserve factors in use ignore the sex distribution of disabled employees. The twelve-company average rates are appropriate for a group in which about 15 per cent of the disabled employees are females and in which about 15 per cent of the recoveries and 10 per cent of the deaths relate to female lives (see 1968 *Reports*, p. 200, Table 9). In order to assess the effect of female content on reserves, we developed Table 7. The table was developed by assuming that the relationship between male and female recovery and death experience was as shown in

Table 11, page 201, of the 1968 *Reports*. For example, the 100 per cent female figures in Table 7 assume that recovery and death rates are 92 per cent and 75 per cent, respectively, of the average recovery and death rates in Appendixes 2A and 2B.

Note that, although Table 7 specifically applies to a situation in which the male-female relationships among recovery rates, death rates, and exposures are as they exist in the 1968 Study, for most groups the female content probably has a relatively small effect on the theoretically correct reserves.

TABLE 6

ILLUSTRATIVE BENEFIT REDUCTION PATTERN, AS PER CENT
OF PRE-65 BENEFIT, PAYABLE FOR DEATH
DURING YEAR OF AGE SHOWN

YEAR BEGINNING AT AGE	PATTERN				
	A	B	C	D	E
64 and under	100%	100%	100%	100%	100%
65	100	50	90	90	0
66	100	50	80	80	0
67	100	50	70	70	0
68	100	50	60	60	0
69	100	50	50	50	0
70 and over	100	50	50	0	0

TABLE 7

RATIO OF AVERAGE RESERVES FOR ILLUSTRATIVE
FEMALE CONTENT TO RESERVES
BASED ON 1970 INTERCOMPANY GROUP LIFE
DISABILITY VALUATION TABLE

PER CENT FEMALES*	BENEFIT REDUCTION PATTERN				
	A	B	C	D	E
0%	1.00	1.01	1.01	1.01	1.01
15	1.00	1.00	1.00	1.00	1.00
25	0.99	0.99	0.99	0.98	0.98
50	0.98	0.97	0.97	0.94	0.94
75	0.97	0.94	0.94	0.90	0.89
100	0.95	0.91	0.90	0.83	0.81

* Proportion of females measured by lives among outstanding disability claims under group insurance extended death benefit provisions of the premium-waiver type.

AMOUNTS

Table 3 indicates that the over-all death experience is the same by lives as by amounts but that the over-all recovery experience is 3 per cent "lighter" by amounts than by lives.

PROPOSED VALUATION BASIS AND DEVELOPMENT OF TABLE

The valuation basis we are proposing is based on the following:

1. Average intercompany experience by amounts.
2. The proportion of females in the average intercompany experience.
3. An assumption that reserves produced by the average intercompany experience will, over the long term, appropriately take into account the effect of economic cycles on termination rates.
4. Margins introduced by calculating probabilities of death and of recovery equal to 130 per cent and 60 per cent of the average intercompany experience; these margins are designed to cover most of the likely company-to-company variations.

The first step in deriving the proposed valuation table was to multiply each death probability in the experience table by 1.30 and each recovery probability by 0.60. Values of $q_x^{(d)}$ at ages 90 and over were modified by hand-adjusting second differences to effect a smooth grading into a value of 1.000 at age 99. Note that there are no recoveries in the table at ages over 75. Since the underlying experience table was already graduated (see 1968 *Reports*, p. 202, for details of the graduation) this approach automatically produces a graduated valuation table.

The table so derived is the proposed valuation table, designated for purposes of this paper the "1970 Intercompany Group Life Disability Valuation Table." Appendixes 3A–3K show $l_x^{(T)}$, $(1,000)q_x^{(d)}$, $(1,000)q_x^{(r)}$, $d_x^{(d)}$, $d_x^{(r)}$, $C_x^{(d)}$, $M_x^{(d)}$, and $D_x^{(T)}$ for the proposed table, where the commutation functions are based on $3\frac{1}{2}$ per cent interest. Note that there is a slight departure from standard actuarial notation in the case of $C_{[x]+t}^{(d)}$ for the first two years after disablement. The convention was adopted to assume payment at the end of the year of death even where quarterly probabilities are shown, and hence, for example, $C_{[17]+5/4}^{(d)} = d_{[17]+5/4}^{(d)}V^{19}$ but $C_{[17]+4}^{(d)} = d_{[17]+4}^{(d)}V^{21}$, where in both cases age 17 is the age at disablement. The table is based on a radix of 10,000,000 for each select central age at disablement and at age 27, which is the starting age for the ultimate experience. We have also calculated commutation functions for the valuation table at interest rates of $2\frac{1}{2}$ and 3 per cent. Although they are not included in the paper, they are available on request from the author.

DISABLED LIFE RESERVES

Disabled life reserves were calculated for the experience basis, and for the proposed valuation standard, on a select and ultimate basis for the five insurance continuation patterns in Table 6, using $2\frac{1}{2}$, 3, and $3\frac{1}{2}$ per cent as alternative interest rates.

For comparison purposes reserves were also calculated on a 3 per cent interest basis, for the same insurance continuation patterns using the 1952 Intercompany Table (1930–50 termination rates) for Benefit 5 (the premium-waiver benefit). Note that we calculated reserves on this basis for a central age at disablement of 62, even though experience for ages at disablement over 59 was excluded from the 1952 Study and no termination rates were calculated for ages over 59 in the 1952 *Reports*. In order to have a consistent comparison with the group study, we developed termination rates by extrapolation.

Valuation basis reserves on a 3 per cent basis for each of the five insurance continuation patterns may be found in Appendixes 4A–4E. The relationship of experience to valuation reserves at pivotal points is shown in Tables 8 and 9.

BASIS FOR TAKING AVERAGE RESERVES

In order to evaluate the over-all effect of the select and ultimate reserves, we composited reserves based alternately on a distribution of relatively new claims (Distribution I), on a relatively mature distribution (Distribution M), and on two assumed stable populations.

Distributions I and M were derived from a distribution of the Equitable's reported disability claims. One distribution was based on claims arising from a few large cases considered to be relatively "mature"; this distribution we called "Distribution M." The distribution of the balance of the Equitable's claims was called "Distribution I." Distributions I and M are both by lives, since the Equitable's records reflect reductions in amounts subsequent to disablement, thereby distorting the distribution by amounts. The stable populations chosen are both based on the termination patterns of the average intercompany experience (Appendixes 2A and 2B). Stable Population A assumes that all claims are admitted to disability exactly nine months after disablement and that the distribution of exposure by age at disablement is in proportion to the distribution of exposure to death by amounts.

Tables 10A and 10B show Distributions I and M as well as Stable Populations A and B. Stable Population B is based on the same average

TABLE 8

PIVOTAL SELECT PERIOD DISABLED LIFE TERMINAL RESERVES PER
$1,000 OF INSURANCE AT APPROVAL OF DISABILITY BASED ON
1970 INTERCOMPANY GROUP LIFE DISABILITY EXPERIENCE
TABLE AT 3 PER CENT INTEREST AS RATIO TO CORRE-
SPONDING RESERVES BASED ON 1970 GROUP LIFE
DISABILITY VALUATION TABLE

DURATION FROM DIS-ABLEMENT (YEARS)	CENTRAL AGE AT DISABLEMENT				
	22	32	42	52	62
Benefit Reduction Pattern A					
¾	0.58	0.70	0.79	0.88	0.93
2	0.61	0.72	0.81	0.90	0.94
5	0.75	0.82	0.87	0.92	0.95
9	0.81	0.86	0.91	0.94	0.96
Benefit Reduction Pattern C					
¾	0.58	0.70	0.78	0.85	0.89
2	0.60	0.71	0.79	0.86	0.90
5	0.74	0.80	0.84	0.88	0.94
9	0.80	0.84	0.87	0.90	0.96
Benefit Reduction Pattern E					
¾	0.57	0.69	0.76	0.81	0.79
2	0.60	0.70	0.77	0.81	0.76
5	0.72	0.77	0.80	0.80	. . . .
9	0.78	0.80	0.81	0.79	. . . .

TABLE 9

PIVOTAL ULTIMATE PERIOD DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY BASED ON 1970 INTERCOMPANY
GROUP LIFE DISABILITY EXPERIENCE TABLE AT 3 PER CENT IN-
TEREST AS RATIO TO CORRESPONDING RESERVES BASED ON
1970 GROUP LIFE DISABILITY VALUATION TABLE

ATTAINED AGE	BENEFIT REDUCTION PATTERN			ATTAINED AGE	BENEFIT REDUCTION PATTERN		
	A	C	E		A	C	E
27	0.80	0.78	0.77	57	0.93	0.89	0.80
37	0.84	0.82	0.80	67	0.96	0.94	. . . .
47	0.89	0.86	0.81	77	0.97	0.97	. . . .

TABLE 10A

DISTRIBUTION BY AGE AT DISABLEMENT OF REPORTED AND APPROVED DISABILITY CLAIMS* IN FORCE

CENTRAL AGE AT DIS- ABLEMENT	DISTRIBU- TION I (BY LIVES)		DISTRIBU- TION M (BY LIVES)		STABLE POPULATION A ("LAG" = 0.75 YEAR)				STABLE POPULATION B ("LAG" = 1.4 YEARS)			
					Individual		Cumulative		Individual		Cumulative	
	Indi- vid- ual	Cu- mu- la- tive	Indi- vid- ual	Cu- mu- la- tive	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.
17.......	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22.......	1	1	3	3	1	1	1	1	1	1	1	1
27.......	1	2	4	7	1	2	2	3	2	2	3	3
32.......	2	4	7	14	2	3	4	6	3	4	6	7
37.......	4	8	9	23	4	4	8	10	5	6	11	13
42.......	7	15	13	36	7	8	15	18	8	9	19	22
47.......	13	28	17	53	13	14	28	32	13	15	32	37
52.......	23	51	23	76	25	25	53	57	25	25	57	62
57.......	36	87	22	98	41	38	94	95	38	34	95	96
62.......	13	100	2	100	6	5	100	100	5	4	100	100

* Disability claims under group insurance extended death benefit provisions of the premium-waiver type.

TABLE 10B

DISTRIBUTION BY DURATION FROM DISABLEMENT OF REPORTED AND APPROVED DISABILITY CLAIMS* IN FORCE

YEAR OF DIS- ABILITY	DISTRIBU- TION I (BY LIVES)		DISTRIBU- TION M (BY LIVES)		STABLE POPULATION A ("LAG" = 0.75 YEAR)				STABLE POPULATION B ("LAG" = 1.4 YEARS)			
					Individual		Cumulative		Individual		Cumulative	
	In- di- vid- ual	Cu- mu- la tive	In- di- vid- ual	Cu- mu- la- tive	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.	Dur. 1-10	All Dur.
1.......	1%	1%	1%	1%	5%	3%	5%	3%	1%	0%	1%	0%
2.......	14	15	11	12	16	10	21	13	11	6	12	6
3.......	16	31	14	26	14	8	35	21	15	8	27	14
4.......	13	44	9	35	12	7	47	28	14	7	41	21
5.......	10	54	8	43	11	6	58	34	12	7	53	28
6.......	8	62	7	50	10	6	68	40	11	6	64	34
7.......	7	69.	6	56	9	5	77	45	10	6	74	40
8.......	6	75	6	62	8	5	85	50	9	5	83	45
9.......	5	80	5	67	8	5	93	55	9	5	92	50
10.......	4	84	5	72	7	4	100	59	8	4	100	54
11+.....	16	100	28	100	0	41	100	100	0	46	100	100

* Disability claims under group insurance extended death benefit provisions of the premium-waiver type.

termination experience and on a model-office approximation to the over-all pattern of admission to disability observed in the study which produced an average lag of about 1.4 years from date of disablement to date of approval. This pattern was not examined by age at disablement.

Distribution I turned out to be similar to the distribution of exposures in the 1968 Study and more similar to the stable populations than was Distribution M. Distribution M (the "mature" distribution), as expected, shows a greater proportion of claims at the lower ages at disablement and higher durations from disablement than does Distribution I; that is, Distribution M shows a tendency to less "heaping."

TABLE 11

AVERAGE DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY
BASED ON 1970 INTERCOMPANY GROUP LIFE DISABILITY VALUATION
TABLE ASSUMING NO REDUCTION AFTER AGE 65

INTEREST RATE	DISTRIBUTION		STABLE POPULATION	
	I	M	A ("Lag" = 0.75 Year)	B ("Lag" = 1.4 Years)
2½%........	$765	$727	$788	$784
3%.........	736	696	760	756
3½%........	708	667	734	729

Since Distribution I is similar to the distribution of exposures in the 1968 Study, averages based on Distribution I probably come closest to measuring the effect of the proposed valuation standard on the aggregate reserves for the industry.

AVERAGE RESERVES

Table 11 gives average reserves for a level whole life benefit for three alternative interest rates. Tables 12 and 13 bring out clearly the effect of insurance continuation patterns on reserves. Tables 14 and 15 compare average reserves based on the valuation table with corresponding figures for the experience table and for the 1952 Intercompany Table.

From Table 11 we note for the industry as a whole that the proposed valuation standard produces an average reserve factor of $750 in the case

of a level whole life benefit if we assume an interest rate of between $2\frac{1}{2}$ and 3 per cent.

Tables 12 and 13 show that reflection of reduction in insurance after age 65 results in significantly lower present values of future death benefits; they also show clearly that $750 is significantly redundant where substantial portions of in-force provide for reductions after an age such as 65. Note also from Table 12 that the average reserves for a level whole

TABLE 12

AVERAGE DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY
BASED ON 1970 INTERCOMPANY GROUP LIFE DISABILITY
VALUATION TABLE AT 3 PER CENT INTEREST

BENEFIT REDUCTION PATTERN	DISTRIBUTION		STABLE POPULATION	
	I	M	A ("Lag" = 0.75 Year)	B ("Lag" = 1.4 Years)
A............	$736	$696	$760	$756
B............	526	534	506	501
C............	560	561	534	530
D............	435	464	354	349
E............	317	371	252	247

TABLE 13

AVERAGE DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY BASED ON 1970 IN-
TERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
AT 3 PER CENT INTEREST AS RATIO TO RESERVES
ASSUMING NO REDUCTION

BENEFIT REDUCTION PATTERN	DISTRIBUTION		STABLE POPULATION	
	I	M	A ("Lag" = 0.75 Year)	B ("Lag" = 1.4 Years)
A............	1.00	1.00	1.00	1.00
B............	0.71	0.77	0.67	0.66
C............	0.76	0.81	0.70	0.70
D............	0.59	0.67	0.47	0.46
E............	0.43	0.53	0.33	0.33

TABLE 14

AVERAGE DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY BASED ON 1970 IN-
TERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
AT 3 PER CENT INTEREST AS RATIO TO CORRE-
SPONDING RESERVES BASED ON 1970 INTER-
COMPANY GROUP LIFE DISABILITY
EXPERIENCE TABLE

BENEFIT REDUCTION PATTERN	DISTRIBUTION		STABLE POPULATION	
	I	M	A ("Lag" = 0.75 Year)	B ("Lag" = 1.4 Years)
A............	1.09	1.10	1.07	1.07
B............	1.13	1.15	1.11	1.11
C............	1.13	1.15	1.11	1.12
D...........	1.23	1.23	1.23	1.23
E............	1.26	1.26	1.25	1.25

TABLE 15

AVERAGE DISABLED LIFE TERMINAL RESERVES PER $1,000 OF
INSURANCE AT APPROVAL OF DISABILITY BASED ON 1970 IN-
TERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
AT 3 PER CENT INTEREST AS RATIO TO CORRE-
SPONDING RESERVES BASED ON 1952 INTER-
COMPANY TABLE (BENEFIT 5)

BENEFIT REDUCTION PATTERN	DISTRIBUTION		STABLE POPULATION	
	I	M	A ("Lag" = 0.75 Year)	B ("Lag" = 1.4 Years)
A............	1.24	1.30	1.19	1.18
B............	1.32	1.40	1.26	1.26
C............	1.32	1.40	1.27	1.26
D...........	1.50	1.58	1.52	1.52
E............	1.55	1.62	1.57	1.55

life benefit are lower for Distribution M than for Distribution I, while the reverse is true for the other benefit patterns. This is the net effect of Distribution I's greater proportion (relative to Distribution M) of claims at the higher ages (which serves relatively to increase reserves) and at the lower durations (which serves relatively to decrease reserves).

Table 14 indicates that the margins in the valuation reserves over the experience reserves are greatest where postretirement benefits are lowest relative to preretirement levels.

Table 15 merely affirms the fact that the 1952 Intercompany Table (i.e., the 1930–50 termination rates) is not an appropriate starting point for the valuation basis we are seeking.

MISCELLANEOUS COMMENTS

This paper concerns itself with reserves for reported, approved claims. For reported claims that are either pending approval or are being resisted and for incurred but unreported claims, factors based on a company's own experience are typically developed for use by each company. These factors are not within the scope of this paper. It would, however, be of interest to all concerned if discussants would comment on their practices in this general area.

While experience under the union, trusteeship, association, and group indebtedness cases have not been studied, as a practical matter we should probably calculate reserves for them on the same basis as for other cases, unless and until there is a logical basis for doing otherwise.

It is well established that overinsurance of disability income benefits typically results in worse experience. With the expansion of disability coverage under OASDI and of long-term disability and other disability coverages generally, there might be an unknown, associated future effect on claim persistency that would not have been reflected in the 1955–65 study period for the types of extended death benefit claims we are considering. No provision has been made for this effect in the proposed table. The general point here is that we probably should be evolving toward taking a broader view of modern disability benefits than we do when we consider one coverage at a time.

While the 1968 Study is based primarily on a disability clause covering disabilities occurring prior to age 60, some experience is included in which disabilities are covered if they occur prior to age 65. Although these two types of provisions theoretically produce different experience, our results have not been adjusted to reflect this fact; that is, the experience is assumed to result from a homogeneous, "prior to 60" clause.

The tables developed in this paper assume that all disability claims

are reported, although it is well known that some groups continue to pay active life premiums for, and do not report, some disabled employees. We feel, however, that no bias results in the recovery or the death rates or in the valuation basis derived therefrom.

There are also many practical questions which should probably be left to the independent judgment of each actuary to answer in connection with the proposed valuation table, should it be adopted. For example: (a) Should annual valuations for statement purposes be on a select and ultimate basis? (b) What, if any, data groupings are appropriate? (c) Should such valuations be done, say, every third year on a select and ultimate basis recognizing the distribution by benefit continuation pattern and using a single factor derived from these triennial valuations as a constant factor for all ages, durations, plans, and so on, for the two intervening years? (d) Should the valuation table or the experience table be used in determining experience rating claim charges for individual cases, or should a different basis be used?

CONCLUSION

This paper has attempted to develop a basis appropriate for doing disabled life valuations for lives disabled under group insurance extended death benefit provisions of the premium-waiver type. We hope that it will stimulate both a thorough discussion by members of the Society and early consideration of the proposed basis by state insurance commissioners.

ACKNOWLEDGMENTS

APPENDIX 1

EXTENDED DEATH BENEFIT
OF THE PREMIUM-WAIVER TYPE

A. **During Conversion Period Following Termination of Employment.** Upon receipt of due proof that an employee whose insurance hereunder terminated due to termination of employment in the class or classes of employees insured hereunder, died within thirty-one days after such termination of employment, the Company will pay to the employee's beneficiary an amount of

insurance equal to that for which such employee would have been entitled to have an individual policy issued to him in accordance with paragraph A of the provision hereof entitled "Conversion Privilege."

B. **During Conversion Period Following Termination or Amendment of Policy.** If an employee's insurance is terminated due to termination or amendment of this policy, and if he has been continuously insured under this policy for five years or more immeidately prior to such termination of his insurance, then upon receipt of due proof that the employee died within thirty-one days following such termination, the Company will pay to the employee's beneficiary the lesser of:

  (1) $2,000, and
  (2) the amount of insurance for which the employee was last insured under this policy reduced by any amount for which the employee became insured under any group policy issued or reinstated by the Company or another insurer within thirty-one days after the date of such termination.

C. **During Total Disability Commencing Prior to Age Sixty.** If an employee before attaining 60 years of age and after the effective date of his insurance under this policy but before cessation of his insurance in accordance with the provision hereof entitled "Individual Terminations" becomes totally disabled by bodily injury or disease so as to be prevented from engaging in any occupation for compensation or profit, and

  (1) the employee remains continuously so disabled until his death, and
  (2) death occurs either:
      (a) within one year after the date of discontinuance of premium payments for the employee's insurance, or
      (b) more than one year after said date of discontinuance but prior to termination of this benefit because of failure of the employee to submit due proof of continued total disability as required in the following paragraph,

then, upon receipt within one year after the employee's death of due proof of such continued total disability and death, the Company, provided the employee has complied with the conditions of this provision hereinafter set forth, will pay to the employee's beneficiary (a) the amount of insurance for which the employee's life was last insured under this policy if the employee's death occurred prior to the sixty-fifth anniversary of his date of birth, or (b) 50% of such amount, if the employee's death occurred on or after said sixty-fifth anniversary of his date of birth, but the amount so payable shall be reduced by any amount payable under Paragraph A or Paragraph B of this provision.

Extension of the death benefit hereunder beyond any anniversary of the date of discontinuance of premium payments for the employee's insurance

shall be subject to the employee's submitting due proof in writing at the Home Office of the Company within three months prior to each such anniversary that he has been totally and continuously disabled since said date of discontinuance. If the employee fails to submit such proof within three months prior to any anniversary the benefit shall terminate on that anniversary unless previously terminated because the employee has ceased to be totally disabled as defined herein.

Extension of the death benefit hereunder shall also be subject to the following conditions:

(1) If an individual policy shall have been issued in conversion of the employee's insurance under this policy, such individual policy must be surrendered to the Company at the time due proof of total disability is first submitted during the employee's lifetime. Upon such surrender, the Society will refund any premiums theretofore received by the Company under the individual policy.

(2) The Company shall have the right and opportunity to have a medical representative of the Company examine the person of the employee when and so often as it may reasonably require, but after the benefit has been continued for two full years under this provision, not more than once a year. Upon failure of the employee to submit to any such examination this benefit shall terminate unless previously terminated because the employee has ceased to be totally disabled as defined herein.

Upon termination of this benefit, the employee, unless he becomes insured again under this policy within thirty-one days after such termination, shall be entitled to the rights and benefits set forth in Paragraph A of this provision and in Paragraph A of the provision of this policy entitled "Conversion Privilege," as if employment had terminated on the date of such termination of benefit.

D. If a benefit becomes payable hereunder after an individual policy shall have been issued in conversion of the employee's insurance under this policy, the amount, if any, paid as a death benefit under such individual policy shall be deemed to be a payment toward the amount of benefit becoming due hereunder and any premiums paid under the individual policy will be paid to the beneficiary thereunder upon surrender of the policy. The designation of a beneficiary under such an individual policy or in the application therefor (if such policy has not been issued) different from the beneficiary under this policy shall, notwithstanding any other provision of this policy, effect a change of beneficiary hereunder to the beneficiary so designated. While a benefit is continued under Paragraph C of this provision, an employee may from time to time change the beneficiary by filing a written request with the Company at its Home Office, but such change shall take effect only upon receipt of the request for change at the Home Office of the Company.

APPENDIX 2A

DISABILITY YEAR	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
Termination Rate per Thousand										
1 (4th qtr.)	118	113	110	108	106	99	85	72	55	43
2 (1st qtr.)	115	107	100	95	91	81	69	60	48	40
2 (2d qtr.)	111	99	90	83	78	69	59	50	41	36
2 (3d qtr.)	106	95	83	75	70	61	51	43	36	33
2 (4th qtr.)	102	91	79	71	65	56	46	40	34	33
2 (annual)	369	338	308	287	271	241	207	180	150	135
3	340	277	240	214	196	170	143	121	106	102
4	272	232	194	164	153	130	110	94	93	92
5	203	172	143	121	113	100	88	85	88	88
6	136	114	94	91	90	87	80	82	85	86
7	96	84	73	74	73	73	73	77	83	90
8	71	69	64	65	65	65	66	73	82	94
9	58	57	53	57	60	61	61	70	82	97
10	46	46	43	49	53	54	56	66	81	99
Probability of Recovery (Multiplied by 1,000)										
1 (4th qtr.)	105	90	72	59	49	38	25	16	8	5
2 (1st qtr.)	104	88	71	59	49	36	24	15	7	5
2 (2d qtr.)	102	86	70	57	48	36	24	15	7	5
2 (3d qtr.)	99	85	68	56	47	35	23	14	7	5
2 (4th qtr.)	96	82	66	55	46	34	22	14	7	5
2 (annual)	340	293	239	199	168	126	85	54	26	19
3	322	247	199	162	133	98	63	36	17	12
4	256	207	161	121	102	71	44	23	12	10
5	187	148	112	82	66	45	26	16	8	7
6	120	91	66	56	47	37	22	14	6	6
7	80	63	48	43	35	28	18	12	5	5
8	55	48	40	36	29	24	15	11	5	4
9	42	37	31	29	25	21	13	10	4	3
10	30	28	24	22	20	15	10	8	3	2
Probability of Death (Multiplied by 1,000)										
1 (4th qtr.)	13	23	38	49	57	61	60	56	47	38
2 (1st qtr.)	11	19	29	36	42	45	45	45	41	35
2 (2d qtr.)	9	13	20	26	30	33	35	35	34	31
2 (3d qtr.)	7	10	15	19	23	26	28	29	29	28
2 (4th qtr.)	6	9	13	16	19	22	24	26	27	28
2 (annual)	29	45	69	88	103	115	122	126	124	116
3	18	30	41	52	63	72	80	85	89	90
4	16	25	33	43	51	59	66	71	81	82
5	16	24	31	39	47	55	62	69	80	81
6	16	23	28	35	43	50	58	68	79	80
7	16	21	25	31	38	45	55	65	78	85
8	16	21	24	29	36	41	51	62	77	90
9	16	20	22	28	35	40	48	60	78	94
10	16	18	19	27	33	39	46	58	78	97

APPENDIX 2B

GRADUATED TERMINATION RATES AND PROBABILITIES
OF RECOVERY AND DEATH
ULTIMATE RATES PER 1,000 FOR DISABILITY YEARS 11 AND OVER
BASED ON LIVES FOR BOTH SEXES COMBINED

Attained Age	Termination Rate	Recovery Probability	Death Probability	Attained Age	Termination Rate	Recovery Probability	Death Probability
27......	36	20	16	67......	80	2	78
28......	36	20	16	68......	85	2	83
29......	36	20	16	69......	88	1	87
30......	36	20	16	70......	92	1	91
31......	36	20	16	71......	96	1	95
32......	36	19	17	72......	101	1	100
33......	36	19	17	73......	105	1	104
34......	36	19	17	74......	111	1	110
35......	36	19	17	75......	116	1	115
36......	36	19	17	76......	121	0	121
37......	36	18	18	77......	128	....	128
38......	37	18	19	78......	135	....	135
39......	38	17	21	79......	143	....	143
40......	40	17	23	80......	152	....	152
41......	40	16	24	81......	161	....	161
42......	42	16	26	82......	171	....	171
43......	44	16	28	83......	181	....	181
44......	45	15	30	84......	192	....	192
45......	46	15	31	85......	203	....	203
46......	46	14	32	86......	215	....	215
47......	47	14	33	87......	227	....	227
48......	48	14	34	88......	240	....	240
49......	49	13	36	89......	254	....	254
50......	50	13	37	90......	270	....	270
51......	50	12	38	91......	288	....	288
52......	51	12	39	92......	308	....	308
53......	51	11	40	93......	331	....	331
54......	52	10	42	94......	359	....	359
55......	52	9	43	95......	393	....	393
56......	53	8	45	96......	443	....	443
57......	53	7	46	97......	530	....	530
58......	55	7	48	98......	710	....	710
59......	56	6	50	99......	1,000	....	1,000
60......	58	6	52				
61......	60	5	55				
62......	63	5	58				
63......	67	5	62				
64......	70	4	66				
65......	73	3	70				
66......	76	2	74				

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APPENDIX 3A

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT 3½ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 17

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0......	17	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,055,883	5,572,038
$\frac{1}{4}$......	17$\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,055,883	5,524,322
$\frac{1}{2}$......	17$\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,055,883	5,477,014
$\frac{3}{4}$......	17$\frac{3}{4}$	$\frac{1}{4}$	10,000,000	16.9	63.0	169,000	630,000	90,983	1,055,883	5,430,112
1......	18	$\frac{1}{4}$	9,201,000	14.3	62.4	131,574	574,142	68,439	964,900	4,953,461
1$\frac{1}{4}$......	18$\frac{1}{4}$	$\frac{1}{4}$	8,495,284	11.7	61.2	99,395	519,911	51,701	896,461	4,534,365
1$\frac{1}{2}$......	18$\frac{1}{2}$	$\frac{1}{4}$	7,875,978	9.1	59.4	71,671	467,833	37,280	844,760	4,167,811
1$\frac{3}{4}$......	18$\frac{3}{4}$	$\frac{1}{4}$	7,336,474	7.8	57.6	57,225	422,581	29,766	807,480	3,849,070
2......	19	1	6,856,668	23.4	193.2	160,446	1,324,708	80,635	777,714	3,566,535
3......	20	1	5,371,514	20.8	153.6	111,727	825,064	54,251	697,079	2,699,540
4......	21	1	4,434,723	20.8	112.2	92,242	497,576	43,275	642,828	2,153,372
5......	22	1	3,844,905	20.8	72.0	79,974	276,833	36,251	599,553	1,803,840
6......	23	1	3,488,098	20.8	48.0	72,552	167,429	31,775	563,302	1,581,105
7......	24	1	3,248,117	20.8	33.0	67,561	107,188	28,588	531,527	1,422,536
8......	25	1	3,073,368	20.8	25.2	63,926	77,449	26,135	502,939	1,300,486
9......	26	1	2,931,993	20.8	18.0	60,985	52,776	24,090	476,804	1,198,709
10......	27	1	2,818,232	20.8	12.0	58,619	33,819	22,372	453,714	1,113,236
	28	1	2,725,794	20.8	12.0	56,697	32,710	20,907	430,342	1,040,311
	29	1	2,636,387	20.8	12.0	54,837	31,637	19,537	409,435	972,163
	30	1	2,549,913	20.8	12.0	53,038	30,599	18,257	389,898	908,479
	31	1	2,466,276	20.8	12.0	51,299	29,595	17,062	371,641	848,967
	32	1	2,385,382	22.1	11.4	52,717	27,193	16,940	354,579	793,354
	33	1	2,305,472	22.1	11.4	50,951	26,282	15,819	337,639	740,847
	34	1	2,228,239	22.1	11.4	49,244	25,402	14,772	321,820	691,815
	35	1	2,153,593	22.1	11.4	47,594	24,551	13,794	307,048	646,028
	36	1	2,081,448	22.1	11.4	46,000	23,729	12,881	293,254	603,272

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	$l_{[x]+t}^{(T)}$	$(1,000){}_s q_{[x]+t}^{(d)}$	$(1,000){}_s q_{[x]+t}^{(r)}$	$d_{[x]+t}^{(d)}$	$d_{[x]+t}^{(r)}$	$C_{[x]+t}^{(d)*}$	$M_{[x]+t}^{(d)}$	$D_{[x]+t}^{(T)}$
	37	1	2,011,719	23.4	10.8	47,074	21,727	12,736	280,373	563,345
	38	1	1,942,918	24.7	10.8	47,990	20,984	12,545	267,637	525,680
	39	1	1,873,944	27.3	10.2	51,159	19,114	12,921	255,092	489,872
	40	1	1,803,671	29.9	10.2	53,930	18,397	13,161	242,171	455,558
	41	1₁	1,731,344	31.2	9.6	54,018	16,621	12,736	229,010	422,502
	42	1	1,660,705	33.8	9.6	56,132	15,943	12,787	216,274	391,560
	43	1	1,588,630	36.4	9.6	57,826	15,251	12,728	203,487	361,899
	44	1	1,515,553	39.0	9.0	59,107	13,640	12,570	190,759	333,577
	45	1	1,442,806	40.3	9.0	58,145	12,985	11,947	178,189	306,826
	46	1	1,371,676	41.6	8.4	57,062	11,522	11,328	166,242	281,835
	47	1	1,303,092	42.9	8.4	55,903	10,946	10,723	154,914	258,689
	48	1	1,236,243	44.2	8.4	54,642	10,384	10,126	144,191	237,119
	49	1	1,171,217	46.8	7.8	54,813	9,135	9,814	134,065	217,050
	50	1	1,107,269	48.1	7.8	53,260	8,637	9,214	124,251	198,260
	51	1	1,045,372	49.4	7.2	51,641	7,527	8,632	115,037	180,848
	52	1	986,204	50.7	7.2	50,001	7,101	8,075	106,405	164,842
	53	1	929,102	52.0	6.6	48,313	6,132	7,539	98,330	150,046
	54	1	874,657	54.6	6.0	47,756	5,248	7,200	90,791	136,477
	55	1	821,653	55.9	5.4	45,930	4,437	6,690	83,591	123,871
	56	1	771,286	58.5	4.8	45,120	3,702	6,350	76,901	112,346
	57	1	722,464	59.8	4.2	43,203	3,034	5,875	70,551	101,675
	58	1	676,227	62.4	4.2	42,197	2,840	5,544	64,676	91,950
	59	1	631,190	65.0	3.6	41,027	2,272	5,208	59,132	82,924
	60	1	587,891	67.6	3.6	39,741	2,116	4,874	53,924	74,624
	61	1	546,034	71.5	3.0	39,041	1,638	4,626	49,050	66,967
	62	1	505,355	75.4	3.0	38,104	1,516	4,362	44,424	59,882
	63	1	465,735	80.6	3.0	37,538	1,397	4,152	40,062	53,321
	64	1	426,800	85.8	2.4	36,619	1,024	3,914	35,910	47,211
	65	1	389,157	91.0	1.8	35,413	700	3,657	31,996	41,591
	66	1	353,044	96.2	1.2	33,963	424	3,388	28,339	36,456
	67	1	318,657	101.4	1.2	32,312	382	3,115	24,951	31,792
	68	1	285,963	107.9	1.2	30,855	343	2,874	21,836	27,566

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	69	1	254,765	113.1	0.6	28,814	153	2,593	18,962	23,728
	70	1	225,798	118.3	0.6	26,712	135	2,322	16,369	20,319
	71	1	198,951	123.5	0.6	24,570	119	2,064	14,047	17,297
	72	1	174,262	130.0	0.6	22,654	105	1,839	11,983	14,639
	73	1	151,503	135.2	0.6	20,483	91	1,606	10,144	12,296
	74	1	130,929	143.0	0.6	18,723	79	1,419	8,538	10,267
	75	1	112,127	149.5	0.6	16,763	67	1,227	7,119	8,495
	76	1	95,297	157.3	0.0	14,990	0	1,060	5,892	6,976
	77	1	80,307	166.4	0.0	13,363	0	913	4,832	5,680
	78	1	66,944	175.5	0.0	11,749	0	776	3,919	4,575
	79	1	55,195	185.9	0.0	10,261	0	655	3,143	3,644
	80	1	44,934	197.6	0.0	8,879	0	547	2,488	2,866
	81	1	36,055	209.0	0.0	7,535	0	449	1,941	2,222
	82	1	28,520	222.3	0.0	6,340	0	365	1,492	1,698
	83	1	22,180	235.3	0.0	5,219	0	290	1,127	1,276
	84	1	16,961	249.6	0.0	4,233	0	227	837	943
	85	1	12,728	263.9	0.0	3,359	0	174	610	684
	86	1	9,369	279.5	0.0	2,619	0	131	436	486
	87	1	6,750	295.1	0.0	1,992	0	97	305	338
	88	1	4,758	312.0	0.0	1,484	0	69	208	231
	89	1	3,274	328.9	0.0	1,077	0	49	139	153
	90	1	2,197	347.1	0.0	763	0	33	90	99
	91	1	1,434	366.6	0.0	526	0	22	57	63
	92	1	908	388.7	0.0	353	0	14	35	38
	93	1	555	413.4	0.0	229	0	9	21	23
	94	1	326	443.3	0.0	145	0	6	12	13
	95	1	181	480.2	0.0	87	0	3	6	7
	96	1	94	532.1	0.0	50	0	2	3	3
	97	1	44	614.0	0.0	27	0	1	1	2
	98	1	17	755.9	0.0	13	0	0	0	1
	99	1	4	1,000.0	0.0	4	0	0	0	0

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* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3B

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT $3\frac{1}{2}$ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 22

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_sq_{[x]+t}$	(r) $(1{,}000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0.	22	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,261,021	4,691,506
$\frac{1}{4}$.	$22\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,261,021	4,651,331
$\frac{1}{2}$.	$22\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,261,021	4,611,499
$\frac{3}{4}$.	$22\frac{3}{4}$	$\frac{1}{4}$	10,000,000	29.9	54.0	299,000	540,000	135,532	1,261,021	4,572,009
1.	23	$\frac{1}{4}$	9,161,000	24.7	52.8	226,277	483,701	99,100	1,125,489	4,152,550
$1\frac{1}{4}$.	$23\frac{1}{4}$	$\frac{1}{4}$	8,451,022	16.9	51.6	142,822	436,073	62,550	1,026,389	3,797,923
$1\frac{1}{2}$.	$23\frac{1}{2}$	$\frac{1}{4}$	7,872,127	13.0	51.0	102,338	401,478	44,820	963,839	3,507,469
$1\frac{3}{4}$.	$23\frac{3}{4}$	$\frac{1}{4}$	7,368,311	11.7	49.2	86,209	362,521	37,756	919,019	3,254,877
2.	24	1	6,919,581	39.0	148.2	269,864	1,025,482	114,192	881,263	3,030,480
3.	25	1	5,624,235	32.5	124.2	182,788	698,530	74,731	767,071	2,379,878
4.	26	1	4,742,917	31.2	88.8	147,979	421,171	58,454	692,340	1,939,083
5.	27	1	4,173,767	29.9	54.6	124,796	227,888	47,629	633,886	1,648,689
6.	28	1	3,821,083	27.3	37.8	104,316	144,437	38,466	586,257	1,458,333
7.	29	1	3,572,330	27.3	28.8	97,525	102,883	34,746	547,791	1,317,290
8.	30	1	3,371,922	26.0	22.2	87,670	74,857	30,179	513,045	1,201,343
9.	31	1	3,209,395	23.4	16.8	75,100	53,918	24,977	482,866	1,104,771
10.	32	1	3,080,377	22.1	11.4	68,076	35,116	21,876	457,889	1,024,502
	33	1	2,977,185	22.1	11.4	65,796	33,940	20,428	436,013	956,697
	34	1	2,877,449	22.1	11.4	63,592	32,803	19,076	415,585	893,379
	35	1	2,781,054	22.1	11.4	61,461	31,704	17,813	396,509	834,252
	36	1	2,687,889	22.1	11.4	59,402	30,642	16,634	378,696	779,038
	37	1	2,597,845	23.4	10.8	60,790	28,057	16,447	362,062	727,479
	38	1	2,508,998	24.7	10.8	61,972	27,097	16,200	345,615	678,839
	39	1	2,419,929	27.3	10.2	66,064	24,683	16,686	329,415	632,600

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	$l_{[x]+t}^{(T)}$	$(1,000)_e q_{[x]+t}^{(d)}$	$(1,000)_s q_{[x]+t}^{(r)}$	$d_{[x]+t}^{(d)}$	$d_{[x]+t}^{(r)}$	$C_{[x]+t}^{(d)*}$	$M_{[x]+t}^{(d)}$	$D_{[x]+t}^{(T)}$
	40	1	2,329,182	29.9	10.2	69,643	23,758	16,995	312,729	588,287
	41	1	2,235,781	31.2	9.6	69,756	21,463	16,447	295,734	545,601
	42	1	2,144,562	33.8	9.6	72,486	20,588	16,513	279,287	505,643
	43	1	2,051,488	36.4	9.6	74,674	19,694	16,436	262,774	467,341
	44	1	1,957,120	39.0	9.0	76,328	17,614	16,232	246,338	430,767
	45	1	1,863,178	40.3	9.0	75,086	16,769	15,428	230,106	396,222
	46	1	1,771,323	41.6	8.4	73,687	14,879	14,628	214,678	363,950
	47	1	1,682,757	42.9	8.4	72,190	14,135	13,847	200,050	334,060
	48	1	1,596,432	44.2	8.4	70,562	13,410	13,077	186,203	306,206
	49	1	1,512,460	46.8	7.8	70,783	11,797	12,674	173,126	280,289
	50	1	1,429,880	48.1	7.8	68,777	11,153	11,898	160,452	256,025
	51	1	1,349,950	49.4	7.2	66,688	9,720	11,147	148,554	233,539
	52	1	1,273,542	50.7	7.2	64,569	9,170	10,428	137,407	212,870
	53	1	1,199,803	52.0	6.6	62,390	7,919	9,735	126,979	193,763
	54	1	1,129,494	54.6	6.0	61,670	6,777	9,297	117,244	176,240
	55	1	1,061,047	55.9	5.4	59,313	5,730	8,640	107,947	159,961
	56	1	996,004	58.5	4.8	58,266	4,781	8,200	99,307	145,078
	57	1	932,957	59.8	4.2	55,791	3,918	7,586	91,107	131,299
	58	1	873,248	62.4	4.2	54,491	3,668	7,159	83,521	118,740
	59	1	815,089	65.0	3.6	52,981	2,934	6,725	76,362	107,084
	60	1	759,174	67.6	3.6	51,320	2,733	6,294	69,637	96,365
	61	1	705,121	71.5	3.0	50,416	2,115	5,974	63,343	86,477
	62	1	652,590	75.4	3.0	49,205	1,958	5,633	57,369	77,328
	63	1	601,427	80.6	3.0	48,475	1,804	5,362	51,736	68,856
	64	1	551,148	85.8	2.4	47,288	1,323	5,054	46,374	60,966
	65	1	502,537	91.0	1.8	45,731	905	4,722	41,320	53,709
	66	1	455,901	96.2	1.2	43,858	547	4,376	36,598	47,077
	67	1	411,496	101.4	1.2	41,726	494	4,022	32,222	41,055
	68	1	369,276	107.9	1.2	39,845	443	3,711	28,200	35,596
	69	1	328,988	113.1	0.6	37,209	197	3,348	24,489	30,641

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	S	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	70	1	291,582	118.3	0.6	34,494	175	2,999	21,141	26,238
	71	1	256,913	123.5	0.6	31,729	154	2,665	18,142	22,337
	72	1	225,030	130.0	0.6	29,254	135	2,374	15,477	18,903
	73	1	195,641	135.2	0.6	26,451	117	2,074	13,103	15,879
	74	1	169,073	143.0	0.6	24,177	101	1,832	11,029	13,258
	75	1	144,795	149.5	0.6	21,647	87	1,585	9,197	10,971
	76	1	123,061	157.3	0.0	19,357	0	1,369	7,612	9,009
	77	1	103,704	166.4	0.0	17,256	0	1,179	6,243	7,335
	78	1	86,448	175.5	0.0	15,172	0	1,002	5,064	5,908
	79	1	71,276	185.9	0.0	13,250	0	845	4,062	4,706
	80	1	58,026	197.6	0.0	11,466	0	707	3,217	3,702
	81	1	46,560	209.3	0.0	9,745	0	580	2,510	2,870
	82	1	36,815	222.3	0.0	8,184	0	471	1,930	2,192
	83	1	28,631	235.3	0.0	6,737	0	375	1,459	1,647
	84	1	21,894	249.6	0.0	5,465	0	294	1,084	1,217
	85	1	16,429	263.9	0.0	4,336	0	225	790	882
	86	1	12,093	279.5	0.0	3,380	0	169	565	628
	87	1	8,713	295.1	0.0	2,571	0	125	396	437
	88	1	6,142	312.0	0.0	1,916	0	90	271	298
	89	1	4,226	328.9	0.0	1,390	0	63	181	198
	90	1	2,836	347.1	0.0	984	0	43	118	128
	91	1	1,852	366.6	0.0	679	0	29	75	81
	92	1	1,173	388.7	0.0	456	0	19	46	50
	93	1	717	413.4	0.0	296	0	12	27	29
	94	1	421	443.3	0.0	187	0	7	15	17
	95	1	234	480.2	0.0	112	0	4	8	9
	96	1	122	532.1	0.0	65	0	2	4	4
	97	1	57	614.0	0.0	35	0	1	2	2
	98	1	22	755.9	0.0	17	0	1	1	1
	99	1	5	1,000.0	0.0	5	0	0	0	0

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3C

1970 Group Life Premium-Waiver Valuation Table and Commutation Functions at $3\frac{1}{4}$ Per Cent Interest Assuming Approval of All Disabilities Exactly Nine Months After Disablement (Average "Lag" of Nine Months) Central Age at Disablement: 27

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_{s}q_{[x]+t}$	(r) $(1{,}000)_{n}q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0	27	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,416,402	3,950,122
$\frac{1}{4}$	$27\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,416,402	3,916,296
$\frac{1}{2}$	$27\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,416,402	3,882,759
$\frac{3}{4}$	$27\frac{3}{4}$	$\frac{1}{4}$	10,000,000	49.4	43.2	494,000	432,000	188,537	1,416,402	3,849,509
1	28	$\frac{1}{4}$	9,074,000	37.7	42.6	342,090	386,552	126,145	1,227,865	3,463,131
$1\frac{1}{4}$	$28\frac{1}{4}$	$\frac{1}{4}$	8,345,358	26.0	42.0	216,979	350,505	80,011	1,101,720	3,157,617
$1\frac{1}{2}$	$28\frac{1}{2}$	$\frac{1}{4}$	7,777,874	19.5	40.8	151,669	317,337	55,928	1,021,709	2,917,836
$1\frac{3}{4}$	$28\frac{3}{4}$	$\frac{1}{4}$	7,308,868	16.9	39.6	123,520	289,431	45,548	965,781	2,718,411
2	29	1	6,895,917	53.3	119.4	367,552	823,373	130,951	920,233	2,542,857
3	30	1	5,704,992	42.9	96.6	244,744	551,102	84,248	789,282	2,032,565
4	31	1	4,909,146	40.3	67.2	197,839	329,895	65,799	705,034	1,689,877
5	32	1	4,381,412	36.4	39.6	159,483	173,504	51,249	639,235	1,457,213
6	33	1	4,048,425	32.5	28.8	131,574	116,595	40,851	587,986	1,300,932
7	34	1	3,800,256	31.2	24.0	118,568	91,206	35,568	547,135	1,179,888
8	35	1	3,590,482	28.6	18.6	102,688	66,783	29,762	511,567	1,077,062
9	36	1	3,421,011	24.7	14.4	84,499	49,263	23,662	481,805	991,521
10	37	1	3,287,249	23.4	10.8	76,922	35,502	20,812	458,143	920,534
	38	1	3,174,825	24.7	10.8	78,418	34,288	20,499	437,331	858,987
	39	1	3,062,119	27.3	10.2	83,596	31,234	21,114	416,832	800,476
	40	1	2,947,289	29.9	10.2	88,124	30,062	21,505	395,718	744,404
	41	1	2,829,103	31.2	9.6	88,268	27,159	20,812	374,213	690,390
	42	1	2,713,676	33.8	9.6	91,722	26,051	20,895	353,401	639,828
	43	1	2,595,903	36.4	9.6	94,491	24,921	20,798	332,506	591,362
	44	1	2,476,491	39.0	9.0	96,583	22,288	20,539	311,708	545,081

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	45	1	2,357,620	40.3	9.0	95,012	21,219	19,522	291,169	501,370
	46	1	2,241,389	41.6	8.4	93,242	18,828	18,510	271,647	460,533
	47	1	2,129,319	42.9	8.4	91,348	17,886	17,521	253,137	422,712
	48	1	2,020,085	44.2	8.4	89,288	16,969	16,547	235,616	387,465
	49	1	1,913,828	46.8	7.8	89,567	14,928	16,037	219,069	354,671
	50	1	1,809,333	48.1	7.8	87,029	14,113	15,056	203,032	323,967
	51	1	1,708,191	49.4	7.2	84,385	12,299	14,105	187,976	295,514
	52	1	1,611,507	50.7	7.2	81,703	11,603	13,195	173,871	269,361
	53	1	1,518,201	52.0	6.6	78,946	10,020	12,318	160,676	245,183
	54	1	1,429,235	54.6	6.0	78,036	8,575	11,765	148,358	223,010
	55	1	1,342,624	55.9	5.4	75,053	7,250	10,932	136,593	202,411
	56	1	1,260,321	58.5	4.8	73,729	6,050	10,376	125,661	183,578
	57	1	1,180,542	59.8	4.2	70,596	4,958	9,599	115,285	166,143
	58	1	1,104,988	62.4	4.2	68,951	4,641	9,059	105,686	150,251
	59	1	1,031,396	65.0	3.6	67,041	3,713	8,510	96,627	135,502
	60	1	960,642	67.6	3.6	64,939	3,458	7,964	88,117	121,938
	61	1	892,245	71.5	3.0	63,796	2,677	7,559	80,153	109,427
	62	1	825,772	75.4	3.0	62,263	2,477	7,128	72,594	97,849
	63	1	761,032	80.6	3.0	61,339	2,283	6,785	65,466	87,129
	64	1	697,410	85.8	2.4	59,838	1,674	6,395	58,681	77,145
	65	1	635,898	91.0	1.8	57,867	1,145	5,975	52,286	67,962
	66	1	576,886	96.2	1.2	55,496	692	5,537	46,311	59,570
	67	1	520,698	101.4	1.2	52,799	625	5,090	40,774	51,950
	68	1	467,274	107.9	1.2	50,419	561	4,696	35,684	45,043
	69	1	416,294	113.1	0.6	47,083	250	4,237	30,988	38,772
	70	1	368,961	118.3	0.6	43,648	221	3,795	26,751	33,201
	71	1	325,092	123.5	0.6	40,149	195	3,373	22,956	28,265
	72	1	284,748	130.0	0.6	37,017	171	3,004	19,583	23,920

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	$l^{(T)}_{[x]+t}$	$(1,000)_s q^{(d)}_{[x]+t}$	$(1,000)_s q^{(r)}_{[x]+t}$	$d^{(d)}_{[x]+t}$	$d^{(r)}_{[x]+t}$	$C^{(d)*}_{[x]+t}$	$M^{(d)}_{[x]+t}$	$D^{(T)}_{[x]+t}$
	73	1	247,560	135.2	0.6	33,470	149	2,625	16,579	20,093
	74	1	213,941	143.0	0.6	30,594	128	2,318	13,954	16,777
	75	1	183,219	149.5	0.6	27,391	110	2,005	11,636	13,882
	76	1	155,718	157.3	0.0	24,494	0	1,732	9,631	11,399
	77	1	131,224	166.4	0.0	21,836	0	1,492	7,899	9,281
	78	1	109,388	175.5	0.0	19,198	0	1,268	6,407	7,475
	79	1	90,190	185.9	0.0	16,766	0	1,070	5,139	5,955
	80	1	73,424	197.6	0.0	14,509	0	894	4,069	4,684
	81	1	58,915	209.3	0.0	12,331	0	734	3,175	3,631
	82	1	46,584	222.3	0.0	10,356	0	596	2,441	2,774
	83	1	36,228	235.3	0.0	8,524	0	474	1,845	2,084
	84	1	27,704	249.6	0.0	6,915	0	371	1,371	1,540
	85	1	20,789	263.9	0.0	5,486	0	285	1,000	1,117
	86	1	15,303	279.5	0.0	4,277	0	214	715	794
	87	1	11,026	295.1	0.0	3,254	0	158	501	553
	88	1	7,772	312.0	0.0	2,425	0	114	343	377
	89	1	5,347	328.9	0.0	1,759	0	80	229	250
	90	1	3,588	347.1	0.0	1,245	0	54	149	162
	91	1	2,343	366.6	0.0	859	0	36	95	102
	92	1	1,484	388.7	0.0	577	0	24	59	63
	93	1	907	413.4	0.0	375	0	15	35	37
	94	1	532	443.3	0.0	236	0	9	20	21
	95	1	296	480.2	0.0	142	0	5	11	11
	96	1	154	532.1	0.0	82	0	3	6	6
	97	1	72	614.0	0.0	44	0	2	3	3
	98	1	28	755.9	0.0	21	0	1	1	1
	99	1	7	1,000.0	0.0	7	0	0	0	0

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* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3D

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT 3½ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 32

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_sq_{[x]+t}$	(r) $(1{,}000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0	32	¼	10,000,000	0.0	0.0	0	0	0	1,454,957	3,325,897
¼	32¼	¼	10,000,000	0.0	0.0	0	0	0	1,454,957	3,297,416
½	32½	¼	10,000,000	0.0	0.0	0	0	0	1,454,957	3,269,178
¾	32¾	¼	10,000,000	63.7	35.4	637,000	354,000	204,695	1,454,957	3,241,183
1	33	¼	9,009,000	46.8	35.4	421,621	318,919	130,903	1,250,262	2,894,977
1¼	33¼	¼	8,268,460	33.8	34.2	279,474	282,781	86,770	1,119,359	2,634,256
1½	33½	¼	7,706,205	24.7	33.6	190,343	258,928	59,097	1,032,589	2,434,102
1¾	33¾	¼	7,256,934	20.8	33.0	150,944	239,479	46,864	973,492	2,272,565
2	34	1	6,866,511	67.6	97.2	464,176	667,425	139,242	926,628	2,131,887
3	35	1	5,734,910	55.9	72.6	320,581	416,355	92,915	787,386	1,720,340
4	36	1	4,997,974	50.7	49.2	253,397	245,900	70,959	694,471	1,448,576
5	37	1	4,498,677	45.5	33.6	204,690	151,156	55,381	623,512	1,259,772
6	38	1	4,142,831	40.3	25.8	166,956	106,885	43,644	568,131	1,120,892
7	39	1	3,868,990	37.7	21.6	145,861	83,570	36,840	524,487	1,011,402
8	40	1	3,639,559	36.4	17.4	132,480	63,328	32,329	487,647	919,252
9	41	1	3,443,751	35.1	13.2	120,876	45,458	28,500	455,318	840.383
10	42	1	3,277,417	33.8	9.6	110,777	31,463	25,236	426,818	772,746
	43	1	3,135,177	36.4	9.6	114,120	30,098	25,118	401,582	714,212
	44	1	2,990,959	39.0	9.0	116,647	26,919	24,806	376,464	658,317
	45	1	2,847,393	40.3	9.0	114,750	25,627	23,577	351,658	605,524
	46	1	2,707,016	41.6	8.4	112,612	22,739	22,356	328,081	556,205
	47	1	2,571,665	42.9	8.4	110,324	21,602	21,161	305,725	510,526
	48	1	2,439,739	44.2	8.4	107,836	20,494	19,984	284,564	467,958
	49	1	2,311,409	46.8	7.8	108,174	18,029	19,369	264,580	428,351

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	50	1	2,185,206	48.1	7.8	105,108	17,045	18,184	245,211	391,269
	51	1	2,063,053	49.4	7.2	101,915	14,854	17,035	227,027	356,905
	52	1	1,946,284	50.7	7.2	98,677	14,013	15,936	209,992	325,318
	53	1	1,833,594	52.0	6.6	95,347	12,102	14,877	194,056	296,118
	54	1	1,726,145	54.6	6.0	94,248	10,357	14,209	179,179	269,338
	55	1	1,621,540	55.9	5.4	90,644	8,756	13,203	164,970	244,460
	56	1	1,522,140	58.5	4.8	89,045	7,306	12,532	151,767	221,715
	57	1	1,425,789	59.8	4.2	85,262	5,988	11,594	139,235	200,657
	58	1	1,334,539	62.4	4.2	83,275	5,605	10,940	127,641	181,464
	59	1	1,245,659	65.0	3.6	80,968	4,484	10,278	116,701	163,651
	60	1	1,160,207	67.6	3.6	78,430	4,177	9,619	106,423	147,270
	61	1	1,077,600	71.5	3.0	77,048	3,233	9,130	96,804	132,159
	62	1	997,319	75.4	3.0	75,198	2,992	8,609	87,674	118,177
	63	1	919,129	80.6	3.0	74,082	2,757	8,195	79,065	105,229
	64	1	842,290	85.8	2.4	72,268	2,021	7,724	70,870	93,171
	65	1	768,001	91.0	1.8	69,888	1,382	7,217	63,146	82,080
	66	1	696,731	96.2	1.2	67,026	836	6,687	55,929	71,945
	67	1	628,869	101.4	1.2	63,767	755	6,147	49,242	62,742
	68	1	564,347	107.9	1.2	60,893	677	5,671	43,095	54,400
	69	1	502,777	113.1	0.6	56,864	302	5,117	37,424	46,826
	70	1	445,611	118.3	0.6	52,716	267	4,583	32,307	40,099
	71	1	392,628	123.5	0.6	48,490	236	4,073	27,724	34,136
	72	1	343,902	130.0	0.6	44,707	206	3,629	23,651	28,889
	73	1	298,989	135.2	0.6	40,423	179	3,170	20,022	24,267
	74	1	258,387	143.0	0.6	36,949	155	2,799	16,852	20,262

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	75	1	221,283	149.5	0.6	33,082	133	2,422	14,053	16,766
	76	1	188,068	157.3	0.0	29,583	0	2,092	11,631	13,767
	77	1	158,485	166.4	0.0	26,372	0	1,802	9,539	11,209
	78	1	132,113	175.5	0.0	23,186	0	1,531	7,737	9,028
	79	1	108,927	185.9	0.0	20,250	0	1,292	6,206	7,192
	80	1	88,677	197.6	0.0	17,523	0	1,080	4,914	5,657
	81	1	71,154	209.3	0.0	14,893	0	887	3,834	4,386
	82	1	56,261	222.3	0.0	12,507	0	720	2,947	3,350
	83	1	43,754	235.3	0.0	10,295	0	572	2,227	2,517
	84	1	33,459	249.6	0.0	8,351	0	449	1,655	1,860
	85	1	25,108	263.9	0.0	6,626	0	344	1,206	1,349
	86	1	18,482	279.5	0.0	5,166	0	259	862	959
	87	1	13,316	295.1	0.0	3,930	0	190	603	668
	88	1	9,386	312.0	0.0	2,928	0	137	413	455
	89	1	6,458	328.9	0.0	2,124	0	96	276	302
	90	1	4,334	347.1	0.0	1,504	0	66	180	196
	91	1	2,830	366.6	0.0	1,037	0	44	114	124
	92	1	1,793	388.7	0.0	697	0	28	70	76
	93	1	1,096	413.4	0.0	453	0	18	42	45
	94	1	643	443.3	0.0	285	0	11	24	25
	95	1	358	480.2	0.0	172	0	6	13	14
	96	1	186	532.1	0.0	99	0	4	7	7
	97	1	87	614.0	0.0	53	0	2	3	3
	98	1	34	755.9	0.0	26	0	1	1	1
	99	1	8	1,000.0	0.0	8	0	0	0	0

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3E

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT $3\frac{1}{2}$ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 37

Exact Duration t	Attained Age $x+t$	s	$l_{[x]+t}^{(T)}$	$(1,000)_s q_{[x]+t}^{(d)}$	$(1,000)_s q_{[x]+t}^{(r)}$	$d_{[x]+t}^{(d)}$	$d_{[x]+t}^{(r)}$	$C_{[x]+t}^{(d)*}$	$M_{[x]+t}^{(d)}$	$D_{[x]+t}^{(T)}$
0	37	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,404,828	2,800,316
$\frac{1}{4}$	$37\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,404,828	2,776,336
$\frac{1}{2}$	$37\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,404,828	2,752,561
$\frac{3}{4}$	$37\frac{3}{4}$	$\frac{1}{4}$	10,000,000	74.1	29.4	741,000	294,000	200,486	1,404,828	2,728,989
1	38	$\frac{1}{4}$	8,965,000	54.6	29.4	489,489	263,571	127,959	1,204,342	2,425,588
$1\frac{1}{4}$	$38\frac{1}{4}$	$\frac{1}{4}$	8,211,940	39.0	28.8	320,266	236,504	83,722	1,076,383	2,202,812
$1\frac{1}{2}$	$38\frac{1}{2}$	$\frac{1}{4}$	7,655,170	29.9	28.2	228,890	215,876	59,835	992,661	2,035,876
$1\frac{3}{4}$	$38\frac{3}{4}$	$\frac{1}{4}$	7,210,404	24.7	27.6	178,097	199,007	46,557	932,826	1,901,170
2	39	1	6,833,300	81.9	79.8	559,647	545,297	141,351	886,269	1,786,310
3	40	1	5,728,356	66.3	61.2	379,790	350,575	92,681	744,918	1,446,825
4	41	1	4,997,991	61.1	39.6	305,377	197,920	72,002	652,237	1,219,667
5	42	1	4,494,694	55.9	28.2	251,253	126,750	57,237	580,235	1,059,755
6	43	1	4,116,691	49.4	21.0	203,365	86,451	44,761	522,998	937,806
7	44	1	3,826,875	46.8	17.4	179,098	66,588	38,087	478,237	842,304
8	45	1	3,581,189	45.5	15.0	162,944	53,718	33,480	440,150	761,573
9	46	1	3,364,527	42.9	12.0	144,338	40,374	28,654	406,670	691,302
10	47	1	3,179,815	42.9	8.4	136,414	26,710	26,165	378,016	631,256
	48	1	3,016,691	44.2	8.4	133,338	25,340	24,710	351,851	578,621
	49	1	2,858,013	46.8	7.8	133,755	22,293	23,949	327,141	529,648
	50	1	2,701,965	48.1	7.8	129,965	21,075	22,484	303,192	483,796
	51	1	2,550,925	49.4	7.2	126,016	18,367	21,063	280,708	441,306

* Assumes payment at end of year of death for both annual and quarterly decrements.

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Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	52	1	2,406,542	50.7	7.2	122,012	17,327	19,704	259,645	402,249
	53	1	2,267,203	52.0	6.6	117,895	14,964	18,396	239,941	366,144
	54	1	2,134,344	54.6	6.0	116,535	12,806	17,569	221,545	333,032
	55	1	2,005,003	55.9	5.4	112,080	10,827	16,326	203,976	302,271
	56	1	1,882,096	58.5	4.8	110,103	9,034	15,495	187,650	274,146
	57	1	1,762,959	59.8	4.2	105,425	7,404	14,335	172,155	248,109
	58	1	1,650,130	62.4	4.2	102,968	6,931	13,528	157,820	224,377
	59	1	1,540,231	65.0	3.6	100,115	5,545	12,708	144,292	202,351
	60	1	1,434,571	67.6	3.6	96,977	5,164	11,893	131,584	182,096
	61	1	1,332,430	71.5	3.0	95,269	3,997	11,289	119,691	163,412
	62	1	1,233,164	75.4	3.0	92,981	3,699	10,645	108,402	146,123
	63	1	1,136,484	80.6	3.0	91,601	3,409	10,133	97,757	130,113
	64	1	1,041,474	85.8	2.4	89,358	2,500	9,550	87,624	115,204
	65	1	949,616	91.0	1.8	86,415	1,709	8,923	78,074	101,490
	66	1	861,492	96.2	1.2	82,876	1,034	8,268	69,151	88,959
	67	1	777,582	101.4	1.2	78,847	933	7,600	60,883	77,579
	68	1	697,802	107.9	1.2	75,293	837	7,012	53,283	67,265
	69	1	621,672	113.1	0.6	70,311	373	6,327	46,271	57,900
	70	1	550,988	118.3	0.6	65,182	331	5,667	39,944	49,581
	71	1	485,475	123.5	0.6	59,956	291	5,036	34,277	42,209
	72	1	425,228	130.0	0.6	55,280	255	4,487	29,241	35,720
	73	1	369,693	135.2	0.6	49,983	222	3,920	24,754	30,005
	74	1	319,488	143.0	0.6	45,687	192	3,462	20,834	25,054
	75	1	273,609	149.5	0.6	40,905	164	2,994	17,372	20,730
	76	1	232,540	157.3	0.0	36,579	0	2,587	14,378	17,023

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	$l_{[x]+t}^{(T)}$	$(1,000)_s q_{[x]+t}^{(d)}$	$(1,000)_s q_{[x]+t}^{(r)}$	$d_{[x]+t}^{(d)}$	$d_{[x]+t}^{(r)}$	$C_{[x]+t}^{(d)*}$	$M_{[x]+t}^{(d)}$	$D_{[x]+t}^{(T)}$
	77	1	195,961	166.4	0.0	32,608	0	2,228	11,791	13,860
	78	1	163,353	175.5	0.0	28,668	0	1,893	9,563	11,163
	79	1	134,685	185.9	0.0	25,038	0	1,597	7,670	8,893
	80	1	109,647	197.6	0.0	21,666	0	1,335	6,073	6,995
	81	1	87,981	209.3	0.0	18,414	0	1,097	4,738	5,423
	82	1	69,567	222.3	0.0	15,465	0	890	3,641	4,143
	83	1	54,102	235.3	0.0	12,730	0	708	2,751	3,113
	84	1	41,372	249.6	0.0	10,326	0	555	2,043	2,300
	85	1	31,046	263.9	0.0	8,193	0	425	1,488	1,668
	86	1	22,853	279.5	0.0	6,387	0	320	1,063	1,186
	87	1	16,466	295.1	0.0	4,859	0	235	743	826
	88	1	11,607	312.0	0.0	3,621	0	169	508	562
	89	1	7,986	328.9	0.0	2,627	0	119	339	374
	90	1	5,359	347.1	0.0	1,860	0	81	220	242
	91	1	3,499	366.6	0.0	1,283	0	54	139	153
	92	1	2,216	388.7	0.0	861	0	35	85	94
	93	1	1,355	413.4	0.0	560	0	22	50	55
	94	1	795	443.3	0.0	352	0	13	28	31
	95	1	443	480.2	0.0	213	0	8	15	17
	96	1	230	532.1	0.0	122	0	4	7	8
	97	1	108	614.0	0.0	66	0	2	3	4
	98	1	42	755.9	0.0	32	0	1	1	1
	99	1	10	1,000.0	0.0	10	0	0	0	0

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3F

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT $3\frac{1}{2}$ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 42

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0.......	42	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,335,822	2,357,791
$\frac{1}{4}$......	42$\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,335,822	2,337,600
$\frac{1}{2}$......	42$\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	1,335,822	2,317,582
$\frac{3}{4}$......	42$\frac{3}{4}$	$\frac{1}{4}$	10,000,000	79.3	22.8	793,000	228,000	180,650	1,335,822	2,297,736
1.......	43	$\frac{1}{4}$	8,979,000	58.5	21.6	525,271	193,946	115,613	1,155,172	2,045,469
1$\frac{1}{4}$.....	43$\frac{1}{4}$	$\frac{1}{4}$	8,259,783	42.9	21.6	354,345	178,411	77,992	1,039,559	1,865,514
1$\frac{1}{2}$.....	43$\frac{1}{2}$	$\frac{1}{4}$	7,727,027	33.8	21.0	261,174	162,268	57,485	961,567	1,730,243
1$\frac{3}{4}$.....	43$\frac{3}{4}$	$\frac{1}{4}$	7,303,585	28.6	20.4	208,883	148,993	45,976	904,082	1,621,421
2.......	44	1	6,945,709	93.6	58.8	650,118	408,408	138,254	858,106	1,528,767
3.......	45	1	5,887,183	76.7	42.6	451,547	250,794	92,778	719,852	1,251,964
4.......	46	1	5,184,842	71.5	27.0	370,716	139,991	73,594	627,074	1,065,318
5.......	47	1	4,674,135	65.0	22.2	303,819	103,766	58,274	553,480	927,908
6.......	48	1	4,266,550	58.5	16.8	249,593	71,678	46,255	495,206	818,352
7.......	49	1	3,945,279	53.3	14.4	210,283	56,812	37,652	448,951	731,140
8.......	50	1	3,678,184	52.0	12.6	191,266	46,345	33,089	411,299	658,591
9.......	51	1	3,440,573	50.7	9.0	174,437	30,965	29,157	378,210	595,214
10.......	52	1	3,235,171	50.7	7.2	164,023	23,293	26,489	349,053	540,753
	53	1	3,047,855	52.0	6.6	158,488	20,116	24,730	322,564	492,216
	54	1	2,869,251	54.6	6.0	156,661	17,216	23,618	297,834	447,703
	55	1	2,695,374	55.9	5.4	150,671	14,555	21,947	274,216	406,350
	56	1	2,530,148	58.5	4.8	148,014	12,145	20,831	252,269	368,541
	57	1	2,369,989	59.8	4.2	141,725	9,954	19,271	231,438	333,539
	58	1	2,218,310	62.4	4.2	138,423	9,317	18,186	212,167	301,635
	59	1	2,070,570	65.0	3.6	134,587	7,454	17,084	193,981	272,025
	60	1	1,928,529	67.6	3.6	130,369	6,943	15,989	176,897	244,796
	61	1	1,791,217	71.5	3.0	128,072	5,374	15,176	160,908	219,678
	62	1	1,657,771	75.4	3.0	124,996	4,973	14,310	145,732	196,437
	63	1	1,527,802	80.6	3.0	123,141	4,583	13,621	131,422	174,914
	64	1	1,400,078	85.8	2.4	120,127	3,360	12,839	117,801	154,871
	65	1	1,276,591	91.0	1.8	116,170	2,298	11,996	104,962	136,436

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[z]+t}$	(d) $(1,000)_sq_{[z]+t}$	(r) $(1,000)_sq_{[z]+t}$	(d) $d_{[z]+t}$	(r) $d_{[z]+t}$	$(d)*$ $C_{[z]+t}$	(d) $M_{[z]+t}$	(T) $D_{[z]+t}$
	66	1	1,158,123	96.2	1.2	111,411	1,390	11,115	92,966	119,589
	67	1	1,045,322	101.4	1.2	105,996	1,254	10,218	81,851	104,291
	68	1	938,072	107.9	1.2	101,218	1,126	9,427	71,633	90,426
	69	1	835,728	113.1	0.6	94,521	501	8,506	62,206	77,836
	70	1	740,706	118.3	0.6	87,626	444	7,618	53,700	66,653
	71	1	652,636	123.5	0.6	80,601	392	6,771	46,082	56,742
	72	1	571,643	130.0	0.6	74,314	343	6,031	39,311	48,020
	73	1	496,986	135.2	0.6	67,193	298	5,269	33,280	40,337
	74	1	429,495	143.0	0.6	61,418	258	4,653	28,011	33,680
	75	1	367,819	149.5	0.6	54,989	221	4,025	23,358	27,868
	76	1	312,609	157.3	0.0	49,173	0	3,478	19,333	22,884
	77	1	263,436	166.4	0.0	43,836	0	2,996	15,855	18,632
	78	1	219,600	175.5	0.0	38,540	0	2,545	12,859	15,007
	79	1	181,060	185.9	0.0	33,659	0	2,147	10,314	11,955
	80	1	147,401	197.6	0.0	29,126	0	1,795	8,167	9,403
	81	1	118,275	209.3	0.0	24,755	0	1,474	6,372	7,290
	82	1	93,520	222.3	0.0	20,789	0	1,196	4,898	5,569
	83	1	72,731	235.3	0.0	17,114	0	951	3,702	4,185
	84	1	55,617	249.6	0.0	13,882	0	746	2,751	3,092
	85	1	41,735	263.9	0.0	11,014	0	572	2,005	2,242
	86	1	30,721	279.5	0.0	8,587	0	431	1,433	1,594
	87	1	22,134	295.1	0.0	6,532	0	316	1,002	1,110
	88	1	15,602	312.0	0.0	4,868	0	228	686	756
	89	1	10,734	328.9	0.0	3,530	0	160	458	502
	90	1	7,204	347.1	0.0	2,501	0	109	298	326
	91	1	4,703	366.6	0.0	1,724	0	73	189	205
	92	1	2,979	388.7	0.0	1,158	0	47	116	126
	93	1	1,821	413.4	0.0	753	0	30	69	74
	94	1	1,068	443.3	0.0	473	0	18	39	42
	95	1	595	480.2	0.0	286	0	11	21	23
	96	1	309	532.1	0.0	164	0	6	10	11
	97	1	145	614.0	0.0	89	0	3	4	5
	98	1	56	755.9	0.0	42	0	1	1	2
	99	1	14	1,000.0	0.0	14	0	0	0	0

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3G

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT 3½ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 47

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[z]+t}$	(d) $(1{,}000)_sq_{[z]+t}$	(r) $(1{,}000)_sq_{[z]+t}$	(d) $d_{[z]+t}$	(r) $d_{[z]+t}$	$(d)*$ $C_{[z]+t}$	(d) $M_{[z]+t}$	(T) $D_{[z]+t}$
0.......	47	¼	10,000,000	0.0	0.0	0	0	0	1,254,700	1,985,197
¼.....	47¼	¼	10,000,000	0.0	0.0	0	0	0	1,254,700	1,968,197
½.....	47½	¼	10,000,000	0.0	0.0	0	0	0	1,254,700	1,951,342
¾.....	47¾	¼	10,000,000	78.0	15.0	780,000	150,000	149,609	1,254,700	1,934,632
1.......	48	¼	9,070,000	58.5	14.4	530,595	130,608	98,330	1,105,091	1,739,685
1¼.....	48¼	¼	8,408,797	45.5	14.4	382,600	121,087	70,904	1,006,761	1,599,050
1½.....	48½	¼	7,905,110	36.4	13.8	287,746	109,091	53,325	935,857	1,490,394
1¾.....	48¾	¼	7,508,273	31.2	13.2	234,258	99,109	43,413	882,532	1,403,453
2.......	49	1	7,174,906	104.0	37.8	746,190	271,211	133,608	839,119	1,329,655
3.......	50	1	6,157,505	85.8	26.4	528,314	162,558	91,397	705,511	1,102,522
4.......	51	1	5,466,633	80.6	15.6	440,611	85,279	73,647	614,114	945,719
5.......	52	1	4,940,743	75.4	13.2	372,532	65,218	60,162	540,467	825,837
6.......	53	1	4,502,993	71.5	10.8	321,964	48,632	50,238	480,305	727,215
7.......	54	1	4,132,397	66.3	9.0	273,978	37,192	41,304	430,067	644,797
8.......	55	1	3,821,227	62.4	7.8	238,445	29,806	34,732	388,763	576,081
9.......	56	1	3,552,976	59.8	6.0	212,468	21,318	29,902	354,031	517,527
10.......	57	1	3,319,190	59.8	4.2	198,488	13,941	26,989	324,129	467,124
	58	1	3,106,761	62.4	4.2	193,862	13,048	25,469	297,140	422,442
	59	1	2,899,851	65.0	3.6	188,490	10,439	23,926	271,671	380,974
	60	1	2,700,922	67.6	3.6	182,582	9,723	22,392	247,745	342,840
	61	1	2,508,617	71.5	3.0	179,366	7,526	21,254	225,353	307,661
	62	1	2,321,725	75.4	3.0	175,058	6,965	20,042	204,099	275,112
	63	1	2,139,702	80.6	3.0	172,460	6,419	19,077	184,057	244,969
	64	1	1,960,823	85.8	2.4	168,239	4,706	17,981	164,980	216,898
	65	1	1,787,878	91.0	1.8	162,697	3,218	16,800	146,999	191,080
	66	1	1,621,963	96.2	1.2	156,033	1,946	15,567	130,199	167,486
	67	1	1,463,984	101.4	1.2	148,448	1,757	14,310	114,632	146,061
	68	1	1,313,779	107.9	1.2	141,757	1,577	13,203	100,322	126,642

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3G—*Continued*

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_s q_{[x]+t}$	(r) $(1{,}000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	69	1	1,170,445	113.1	0.6	132,377	702	11,912	87,119	109,010
	70	1	1,037,366	118.3	0.6	122,720	622	10,670	75,207	93,349
	71	1	914,024	123.5	0.6	112,882	548	9,482	64,537	79,468
	72	1	800,594	130.0	0.6	104,077	480	8,447	55,055	67,252
	73	1	696,037	135.2	0.6	94,104	418	7,379	46,608	56,492
	74	1	601,515	143.0	0.6	86,017	361	6,517	39,229	47,169
	75	1	515,137	149.5	0.6	77,013	309	5,638	32,712	39,030
	76	1	437,815	157.3	0.0	68,868	0	4,871	27,074	32,050
	77	1	368,947	166.4	0.0	61,393	0	4,195	22,203	26,095
	78	1	307,554	175.5	0.0	53,976	0	3,564	18,008	21,017
	79	1	253,578	185.9	0.0	47,140	0	3,007	14,444	16,743
	80	1	206,438	197.6	0.0	40,792	0	2,514	11,437	13,169
	81	1	165,646	209.3	0.0	34,670	0	2,065	8,923	10,210
	82	1	130,976	222.3	0.0	29,116	0	1,675	6,858	7,800
	83	1	101,860	235.3	0.0	23,968	0	1,332	5,183	5,861
	84	1	77,892	249.6	0.0	19,442	0	1,044	3,851	4,330
	85	1	58,450	263.9	0.0	15,425	0	800	2,807	3,139
	86	1	43,025	279.5	0.0	12,025	0	603	2,007	2,233
	87	1	31,000	295.1	0.0	9,148	0	443	1,404	1,554
	88	1	21,852	312.0	0.0	6,818	0	319	961	1,059
	89	1	15,034	328.9	0.0	4,945	0	224	642	704
	90	1	10,089	347.1	0.0	3,502	0	153	418	456
	91	1	6,587	366.6	0.0	2,415	0	102	265	288
	92	1	4,172	388.7	0.0	1,622	0	66	163	176
	93	1	2,550	413.4	0.0	1,054	0	42	97	104
	94	1	1,496	443.3	0.0	663	0	25	55	59
	95	1	833	480.2	0.0	400	0	15	30	32
	96	1	433	532.1	0.0	230	0	8	15	16
	97	1	203	614.0	0.0	125	0	4	7	7
	98	1	78	755.9	0.0	59	0	2	3	3
	99	1	19	1,000.0	0.0	19	0	1	1	1

* Assumes payment at end of year of death for both annual and quarterly decrements.

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APPENDIX 3H

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT 3½ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT (AVERAGE "LAG" OF NINE MONTHS)
CENTRAL AGE AT DISABLEMENT: 52

Exact Duration t	Attained Age x+t	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_s q_{[x]+t}$	(r) $(1{,}000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0	52	¼	10,000,000	0.0	0.0	0	0	0	1,144,504	1,671,482
¼	52¼	¼	10,000,000	0.0	0.0	0	0	0	1,144,504	1,657,169
½	52½	¼	10,000,000	0.0	0.0	0	0	0	1,144,504	1,642,978
¾	52¾	¼	10,000,000	72.8	9.6	728,000	96,000	117,569	1,144,504	1,628,908
1	53	¼	9,176,000	58.5	9.0	536,796	82,584	83,759	1,026,935	1,481,886
1¼	53¼	¼	8,556,620	45.5	9.0	389,326	77,010	60,748	943,176	1,370,025
1½	53½	¼	8,090,284	37.7	8.4	305,004	67,958	47,591	882,428	1,284,266
1¾	53¾	¼	7,717,322	33.8	8.4	260,845	64,826	40,701	834,837	1,214,571
2	54	1	7,391,651	110.5	21.6	816,777	159,660	123,136	794,136	1,153,354
3	55	1	6,415,214	92.3	13.8	592,124	88,530	86,249	671,000	967,146
4	56	1	5,734,560	89.7	9.6	514,390	55,052	72,392	584,751	835,296
5	57	1	5,165,118	88.4	8.4	456,596	43,387	62,086	512,359	726,909
6	58	1	4,665,135	84.5	7.2	394,204	33,589	51,789	450,273	634,343
7	59	1	4,237,342	80.6	6.6	341,530	27,966	43,352	398,484	556,689
8	60	1	3,867,846	78.0	6.0	301,692	23,207	37,000	355,132	490,962
9	61	1	3,542,947	75.4	4.8	267,138	17,006	31,654	318,132	434,514
10	62	1	3,258,803	75.4	3.0	245,714	9,776	28,131	286,478	386,150
	63	1	3,003,313	80.6	3.0	242,067	9,010	26,776	258,347	343,842
	64	1	2,752,236	85.8	2.4	236,142	6,605	25,238	231,571	304,441
	65	1	2,509,489	91.0	1.8	228,364	4,517	23,581	206,333	268,202
	66	1	2,276,608	96.2	1.2	219,010	2,732	21,850	182,752	235,085
	67	1	2,054,866	101.4	1.2	208,363	2,466	20,085	160,902	205,012
	68	1	1,844,037	107.9	1.2	198,972	2,213	18,531	140,817	177,757
	69	1	1,642,852	113.1	0.6	185,807	986	16,720	122,286	153,008
	70	1	1,456,059	118.3	0.6	172,252	874	14,976	105,566	131,025

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age x+t	s	(T) $l_{[x]+t}$	(d) $(1{,}000)_s q_{[x]+t}$	(r) $(1{,}000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	71	1	1,282,933	123.5	0.6	158,442	770	13,310	90,590	111,542
	72	1	1,123,721	130.0	0.6	146,084	674	11,857	77,280	94,396
	73	1	976,963	135.2	0.6	132,085	586	10,358	65,423	79,293
	74	1	844,292	143.0	0.6	120,734	507	9,148	55,065	66,207
	75	1	723,051	149.5	0.6	108,096	434	7,913	45,917	54,783
	76	1	614,521	157.3	0.0	96,664	0	6,837	38,004	44,985
	77	1	517,857	166.4	0.0	86,171	0	5,889	31,167	36,627
	78	1	431,686	175.5	0.0	75,761	0	5,002	25,278	29,500
	79	1	355,925	185.9	0.0	66,166	0	4,221	20,276	23,500
	80	1	289,759	197.6	0.0	57,256	0	3,529	16,055	18,485
	81	1	232,503	209.3	0.0	48,663	0	2,898	12,526	14,330
	82	1	183,840	222.3	0.0	40,868	0	2,351	9,628	10,948
	83	1	142,972	235.3	0.0	33,641	0	1,870	7,277	8,226
	84	1	109,331	249.6	0.0	27,289	0	1,466	5,407	6,078
	85	1	82,042	263.9	0.0	21,651	0	1,124	3,941	4,407
	86	1	60,391	279.5	0.0	16,879	0	846	2,817	3,134
	87	1	43,512	295.1	0.0	12,840	0	622	1,971	2,182
	88	1	30,672	312.0	0.0	9,570	0	448	1,349	1,486
	89	1	21,102	328.9	0.0	6,940	0	314	901	988
	90	1	14,162	347.1	0.0	4,916	0	215	587	640
	91	1	9,246	366.6	0.0	3,390	0	143	372	404
	92	1	5,856	388.7	0.0	2,276	0	93	229	247
	93	1	3,580	413.4	0.0	1,480	0	58	136	146
	94	1	2,100	443.3	0.0	931	0	35	78	83
	95	1	1,169	480.2	0.0	561	0	21	43	45
	96	1	608	532.1	0.0	324	0	12	22	22
	97	1	284	614.0	0.0	174	0	6	10	10
	98	1	110	755.9	0.0	83	0	3	4	4
	99	1	27	1,000.0	0.0	27	0	1	1	1

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3I

1970 Group Life Premium-Waiver Valuation Table and Commutation Functions at 3½ Per Cent Interest
Assuming Approval of All Disabilities Exactly Nine Months after Disablement (Average "Lag" of Nine Months)
Central Age at Disablement: 57

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_sq_{[x]+t}$	(r) $(1,000)_sq_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0........	57	¼	10,000,000	0.0	0.0	0	0	0	1,029,545	1,407,343
¼......	57¼	¼	10,000,000	0.0	0.0	0	0	0	1,029,545	1,395,292
½......	57½	¼	10,000,000	0.0	0.0	0	0	0	1,029,545	1,383,343
¾......	57¾	¼	10,000,000	61.1	4.8	611,000	48,000	83,081	1,029,545	1,371,497
1........	58	¼	9,341,000	53.3	4.2	497,875	39,232	65,409	946,464	1,270,144
1¼......	58¼	¼	8,803,893	44.2	4.2	389,132	36,976	51,123	881,055	1,186,860
1½......	58½	¼	8,377,785	37.7	4.2	315,843	35,187	41,495	829,932	1,119,744
1¾......	58¾	¼	8,026,755	35.1	4.2	281,739	33,712	37,014	788,437	1,063,639
2........	59	1	7,711,304	115.7	10.2	892,198	78,655	113,251	751,423	1,013,088
3........	60	1	6,740,451	105.3	7.2	709,770	48,531	87,047	638,172	855,594
4........	61	1	5,982,150	104.0	4.8	622,143	28,714	73,721	551,125	733,662
5........	62	1	5,331,293	102.7	3.6	547,524	19,193	62,685	477,404	631,729
6........	63	1	4,764,576	101.4	3.0	483,128	14,294	53,442	414,719	545,484
7........	64	1	4,267,154	100.1	3.0	427,142	12,801	45,651	361,277	472,015
8........	65	1	3,827,211	101.4	2.4	388,079	9,185	40,073	315,626	409,034
9........	66	1	3,429,947	101.4	1.8	347,797	6,174	34,699	275,553	354,180
10........	67	1	3,075,976	101.4	1.2	311,904	3,691	30,066	240,854	306,888
	68	1	2,760,381	107.9	1.2	297,845	3,312	27,740	210,788	266,088
	69	1	2,459,224	113.1	0.6	278,138	1,476	25,029	183,048	229,041
	70	1	2,179,610	118.3	0.6	257,848	1,308	22,418	158,019	196,135
	71	1	1,920,454	123.5	0.6	237,176	1,152	19,923	135,601	166,970
	72	1	1,682,126	130.0	0.6	218,676	1,009	17,748	115,678	141,304
	73	1	1,462,441	135.2	0.6	197,722	877	15,505	97,930	118,695

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)_*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	74	1	1,263,842	143.0	0.6	180,729	758	13,693	82,425	99,108
	75	1	1,082,355	149.5	0.6	161,812	649	11,845	68,732	82,006
	76	1	919,894	157.3	0.0	144,699	0	10,234	56,887	67,340
	77	1	775,195	166.4	0.0	128,992	0	8,815	46,653	54,828
	78	1	646,203	175.5	0.0	113,409	0	7,488	37,838	44,159
	79	1	532,794	185.9	0.0	99,046	0	6,318	30,350	35,178
	80	1	433,748	197.6	0.0	85,709	0	5,283	24,032	27,670
	81	1	348,039	209.3	0.0	72,845	0	4,338	18,749	21,452
	82	1	275,194	222.3	0.0	61,176	0	3,520	14,411	16,388
	83	1	214,018	235.3	0.0	50,358	0	2,799	10,891	12,314
	84	1	163,660	249.6	0.0	40,850	0	2,194	8,092	9,098
	85	1	122,810	263.9	0.0	32,410	0	1,682	5,898	6,596
	86	1	90,400	279.5	0.0	25,267	0	1,267	4,216	4,691
	87	1	65,133	295.1	0.0	19,221	0	931	2,949	3,266
	88	1	45,912	312.0	0.0	14,325	0	671	2,018	2,224
	89	1	31,587	328.9	0.0	10,389	0	470	1,347	1,478
	90	1	21,198	347.1	0.0	7,358	0	322	877	959
	91	1	13,840	366.6	0.0	5,074	0	214	555	605
	92	1	8,766	388.7	0.0	3,407	0	139	341	370
	93	1	5,359	413.4	0.0	2,215	0	87	202	219
	94	1	3,144	443.3	0.0	1,394	0	53	115	124
	95	1	1,750	480.2	0.0	840	0	31	62	67
	96	1	910	532.1	0.0	484	0	17	31	33
	97	1	426	614.0	0.0	262	0	9	14	15
	98	1	164	755.9	0.0	124	0	4	5	6
	99	1	40	1,000.0	0.0	40	0	1	1	1

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3J

1970 Group Life Premium-Waiver Valuation Table and Commutation Functions at $3\frac{1}{2}$ Per Cent Interest
Assuming Approval of All Disabilities Exactly Nine Months after Disablement (Average "Lag" of Nine Months)
Central Age at Disablement: 62

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
0	62	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	883,641	1,184,945
$\frac{1}{4}$	62$\frac{1}{4}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	883,641	1,174,798
$\frac{1}{2}$	62$\frac{1}{2}$	$\frac{1}{4}$	10,000,000	0.0	0.0	0	0	0	883,641	1,164,738
$\frac{3}{4}$	62$\frac{3}{4}$	$\frac{1}{4}$	10,000,000	49.4	3.0	494,000	30,000	56,557	883,641	1,154,764
1	63	$\frac{1}{4}$	9,476,000	45.5	3.0	431,158	28,428	47,693	827,084	1,084,883
1$\frac{1}{4}$	63$\frac{1}{4}$	$\frac{1}{4}$	9,016,414	40.3	3.0	363,361	27,049	40,194	779,391	1,023,427
1$\frac{1}{2}$	63$\frac{1}{2}$	$\frac{1}{4}$	8,626,004	36.4	3.0	313,987	25,878	34,732	739,197	970,728
1$\frac{3}{4}$	63$\frac{3}{4}$	$\frac{1}{4}$	8,286,139	36.4	3.0	301,615	24,858	33,363	704,465	924,496
2	64	1	7,959,666	117.0	7.2	931,281	57,310	99,531	671,102	880,466
3	65	1	6,971,075	106.6	6.0	743,117	41,826	76,735	571,571	745,036
4	66	1	6,186,132	105.3	4.2	651,400	25,982	64,990	494,836	638,787
5	67	1	5,508,750	104.0	3.6	572,910	19,831	55,226	429,846	549,604
6	68	1	4,916,009	110.5	3.0	543,219	14,748	50,593	374,620	473,881
7	69	1	4,358,042	117.0	2.4	509,891	10,459	45,883	324,027	405,889
8	70	1	3,837,692	122.2	1.8	468,966	6,908	40,773	278,144	345,339
9	71	1	3,361,818	126.1	1.2	423,925	4,034	35,611	237,371	292,287
10	72	1	2,933,859	130.0	0.6	381,402	1,760	30,955	201,760	246,453
	73	1	2,550,697	135.2	0.6	344,854	1,530	27,043	170,805	207,020
	74	1	2,204,313	143.0	0.6	315,217	1,323	23,883	143,762	172,857
	75	1	1,887,773	149.5	0.6	282,222	1,133	20,660	119,879	143,029

* Assumes payment at end of year of death for both annual and quarterly decrements.

Exact Duration t	Attained Age $x+t$	s	(T) $l_{[x]+t}$	(d) $(1,000)_s q_{[x]+t}$	(r) $(1,000)_s q_{[x]+t}$	(d) $d_{[x]+t}$	(r) $d_{[x]+t}$	$(d)*$ $C_{[x]+t}$	(d) $M_{[x]+t}$	(T) $D_{[x]+t}$
	76	1	1,604,418	157.3	0.0	252,375	0	17,850	99,219	117,449
	77	1	1,352,043	166.4	0.0	224,980	0	15,374	81,369	95,628
	78	1	1,127,063	175.5	0.0	197,800	0	13,060	65,995	77,020
	79	1	929,263	185.9	0.0	172,750	0	11,020	52,935	61,355
	80	1	756,513	197.6	0.0	149,487	0	9,214	41,915	48,260
	81	1	607,026	209.3	0.0	127,051	0	7,566	32,701	37,414
	82	1	479,975	222.3	0.0	106,698	0	6,139	25,135	28,583
	83	1	373,277	235.3	0.0	87,832	0	4,883	18,996	21,477
	84	1	285,445	249.6	0.0	71,247	0	3,827	14,113	15,868
	85	1	214,198	263.9	0.0	56,527	0	2,933	10,286	11,505
	86	1	157,671	279.5	0.0	44,069	0	2,210	7,353	8,182
	87	1	113,602	295.1	0.0	33,524	0	1,624	5,143	5,696
	88	1	80,078	312.0	0.0	24,984	0	1,169	3,519	3,879
	89	1	55,094	328.9	0.0	18,120	0	819	2,350	2,579
	90	1	36,974	347.1	0.0	12,834	0	561	1,531	1,672
	91	1	24,140	366.6	0.0	8,850	0	374	970	1,055
	92	1	15,290	388.7	0.0	5,943	0	242	596	645
	93	1	9,347	413.4	0.0	3,864	0	152	354	381
	94	1	5,483	443.3	0.0	2,431	0	93	202	216
	95	1	3,052	480.2	0.0	1,466	0	54	109	116
	96	1	1,586	532.1	0.0	844	0	30	55	58
	97	1	742	614.0	0.0	456	0	16	25	26
	98	1	286	755.9	0.0	216	0	7	9	10
	99	1	70	1,000.0	0.0	70	0	2	2	2

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3K

1970 GROUP LIFE PREMIUM-WAIVER VALUATION TABLE AND COMMUTATION FUNCTIONS AT $3\frac{1}{2}$ PER CENT INTEREST
ASSUMING APPROVAL OF ALL DISABILITIES EXACTLY NINE MONTHS AFTER DISABLEMENT
(AVERAGE "LAG" OF NINE MONTHS)
ULTIMATE PERIOD

Attained Age x	l_x	$(1,000)q_x^{(d)}$	$(1,000)q_x^{(r)}$	$d_x^{(d)}$	$d_x^{(r)}$	$C_x^{(d)*}$	$M_x^{(d)}$	$D_x^{(T)}$
27......	10,000,000	20.8	12.0	208,000	120,000	79,384	1,606,374	3,950,122
28......	9,672,000	20.8	12.0	201,178	116,064	74,184	1,526,990	3,691,361
29......	9,354,758	20.8	12.0	194,579	112,257	69,324	1,452,806	3,449,550
30......	9,047,922	20.8	12.0	188,197	108,575	64,783	1,383,482	3,223,579
31......	8,751,150	20.8	12.0	182,024	105,014	60,539	1,318,699	3,012,411
32......	8,464,112	22.1	11.4	187,057	96,491	60,109	1,258,160	2,815,077
33......	8,180,564	22.1	11.4	180,790	93,258	56,131	1,198,051	2,628,765
34......	7,906,516	22.1	11.4	174,734	90,134	52,416	1,141,920	2,454,784
35......	7,641,648	22.1	11.4	168,880	87,115	48,947	1,089,504	2,292,318
36......	7,385,653	22.1	11.4	163,223	84,196	45,708	1,040,557	2,140,604
37......	7,138,234	23.4	10.8	167,035	77,093	45,193	994,849	1,998,931
38......	6,894,106	24.7	10.8	170,284	74,456	44,514	949,656	1,865,283
39......	6,649,366	27.3	10.2	181,528	67,824	45,849	905,142	1,738,227
40......	6,400,014	29.9	10.2	191,360	65,280	46,698	859,293	1,616,467
41......	6,143,374	31.2	9.6	191,673	58,976	45,192	812,595	1,499,176
42......	5,892,725	33.8	9.6	199,174	56,570	45,373	767,403	1,389,381
43......	5,636,981	36.4	9.6	205,186	54,115	45,162	722,030	1,284,138
44......	5,377,680	39.0	9.0	209,730	48,399	44,601	676,868	1,183,640
45......	5,119,551	40.3	9.0	206,318	46,076	42,392	632,267	1,088,720
46......	4,867,157	41.6	8.4	202,474	40,884	40,195	589,875	1,000,044
47......	4,623,799	42.9	8.4	198,361	38,840	38,047	549,680	917,915
48......	4,386,598	44.2	8.4	193,888	36,847	35,931	511,633	841,378

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 3K—*Continued*

Attained Age x	l_x	(d) $(1,000)q_r$	(r) $(1,000)q_x$	(d) d_x	(r) d_x	$(d)*$ C_x	(d) M_x	(T) D_x
49......	4,155,863	46.8	7.8	194,494	32,416	34,825	475,702	770,166
50......	3,928,953	48.1	7.8	188,983	30,646	32,694	440,877	703,492
51......	3,709,324	49.4	7.2	183,241	26,707	30,628	408,183	641,707
52......	3,499,376	50.7	7.2	177,418	25,196	28,652	377,555	584,915
53......	3,296,762	52.0	6.6	171,432	21,759	26,749	348,903	532,413
54......	3,103,571	54.6	6.0	169,455	18,621	25,547	322,154	484,265
55......	2,915,495	55.9	5.4	162,976	15,744	23,739	296,607	439,535
56......	2,736,775	58.5	4.8	160,101	13,137	22,532	272,868	398,639
57......	2,563,537	59.8	4.2	153,300	10,767	20,845	250,336	360,778
58......	2,399,470	62.4	4.2	149,727	10,078	19,671	229,491	326,268
59......	2,239,665	65.0	3.6	145,578	8,063	18,479	209,820	294,240
60......	2,086,024	67.6	3.6	141,015	7,510	17,294	191,341	264,788
61......	1,937,499	71.5	3.0	138,531	5,812	16,415	174,047	237,618
62......	1,793,156	75.4	3.0	135,204	5,379	15,479	157,632	212,479
63......	1,652,573	80.6	3.0	133,197	4,958	14,734	142,153	189,199
64......	1,514,418	85.8	2.4	129,937	3,635	13,887	127,419	167,519
65......	1,380,846	91.0	1.8	125,657	2,486	12,975	113,532	147,578
66......	1,252,703	96.2	1.2	120,510	1,503	12,023	100,557	129,356
67......	1,130,690	101.4	1.2	114,652	1,357	11,052	88,534	112,808
68......	1,014,681	107.9	1.2	109,484	1,218	10,197	77,482	97,811
69......	903,979	113.1	0.6	102,240	542	9,200	67,285	84,193
70......	801,197	118.3	0.6	94,782	481	8,241	58,085	72,097
71......	705,934	123.5	0.6	87,183	424	7,324	49,844	61,376
72......	618,327	130.0	0.6	80,383	371	6,524	42,520	51,941
73......	537,573	135.2	0.6	72,680	323	5,699	35,996	43,631
74......	464,570	143.0	0.6	66,434	279	5,033	30,297	36,431

* Assumes payment at end of year of death for both annual and quarterly decrements.

Attained Age x	l_x	$(1,000)q_x^{(d)}$	$(1,000)q_x^{(r)}$	$d_x^{(d)}$	$d_x^{(r)}$	$C_x^{(d)*}$	$M_x^{(d)}$	$D_x^{(T)}$
75......	397,857	149.5	0.6	59,480	239	4,354	25,264	30,144
76......	338,138	157.3	0.0	53,189	0	3,762	20,910	24,753
77......	284,949	166.4	0.0	47,416	0	3,240	17,148	20,154
78......	237,533	175.5	0.0	41,687	0	2,752	13,908	16,232
79......	195,846	185.9	0.0	36,408	0	2,323	11,156	12,931
80......	159,438	197.6	0.0	31,505	0	1,942	8,833	10,171
81......	127,933	209.3	0.0	26,776	0	1,595	6,891	7,885
82......	101,157	222.3	0.0	22,487	0	1,294	5,296	6,024
83......	78,670	235.3	0.0	18,511	0	1,029	4,002	4,526
84......	60,159	249.6	0.0	15,016	0	807	2,973	3,344
85......	45,143	263.9	0.0	11,913	0	618	2,166	2,425
86......	33,230	279.5	0.0	9,288	0	466	1,548	1,724
87......	23,942	295.1	0.0	7,065	0	342	1,082	1,200
88......	16,877	312.0	0.0	5,266	0	246	740	818
89......	11,611	328.9	0.0	3,819	0	173	494	543
90......	7,792	347.1	0.0	2,705	0	118	321	352
91......	5,087	366.6	0.0	1,865	0	79	203	222
92......	3,222	388.7	0.0	1,252	0	51	124	136
93......	1,970	413.4	0.0	814	0	32	73	80
94......	1,156	443.3	0.0	512	0	19	41	46
95......	644	480.2	0.0	309	0	11	22	25
96......	335	532.1	0.0	178	0	6	11	12
97......	157	614.0	0.0	96	0	3	5	6
98......	61	755.9	0.0	46	0	2	2	2
99......	15	1,000.0	0.0	15	0	0	0	0

* Assumes payment at end of year of death for both annual and quarterly decrements.

APPENDIX 4A

DISABLED LIFE TERMINAL RESERVES* PER $1,000 OF INSURANCE
AT APPROVAL OF DISABILITY AT 3 PER CENT
BASED ON 1970 INTERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
BENEFIT REDUCTION PATTERN A (NO REDUCTION)

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
At disablement.......	$203	$286	$378	$459	$524	$591	$658	$712	$759	$773
3 quarters..........	208	292	387	469	536	604	673	728	776	791
1 year..............	209	289	375	454	520	590	662	720	772	789
5 quarters..........	213	288	370	447	512	582	656	715	769	787
6 quarters..........	219	294	372	447	512	581	654	714	767	787
7 quarters..........	227	302	378	452	515	584	656	714	767	787
2 years.............	236	312	386	460	522	588	659	716	768	788
3...................	281	347	416	486	543	604	669	722	773	793
4...................	325	386	448	510	566	620	680	729	778	800
5...................	362	416	471	527	580	629	686	734	783	807
6...................	388	435	486	541	591	638	692	739	787	815
7...................	407	450	499	553	602	647	699	745	792	822
8...................	421	462	511	565	612	658	707	753	798	829
9...................	433	473	522	577	623	669	716	761	804	835

DURATIONS 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27........	$442	52........	$679	76........	$864
28........	449	53........	688	77........	870
29........	457	54........	698	78........	875
30........	465	55........	707	79........	880
31........	474	56........	716	80........	885
32........	483	57........	725	81........	890
33........	492	58........	734	82........	895
34........	502	59........	744	83........	899
35........	512	60........	752	84........	904
36........	522	61........	762	85........	908
37........	534	62........	770	86........	912
38........	545	63........	779	87........	916
39........	557	64........	788	88........	920
40........	567	65........	796	89........	923
41........	578	66........	803	90........	927
42........	588	67........	810	91........	930
43........	597	68........	817	92........	934
44........	607	69........	823	93........	938
45........	616	70........	829	94........	942
46........	625	71........	835	95........	946
47........	633	72........	841	96........	952
48........	642	73........	847 ·	97........	957
49........	652	74........	852	98........	964
50........	661	75........	858	99........	971
51........	670				

* Curtate functions, that is, claims assumed payable at the end of the year of death.

APPENDIX 4B

DISABLED LIFE TERMINAL RESERVES* PER $1,000 OF INSURANCE
AT APPROVAL OF DISABILITY AT 3 PER CENT
BASED ON 1970 INTERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
BENEFIT REDUCTION PATTERN B
(IMMEDIATE REDUCTION AT AGE 65 TO 50 PER CENT)

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
At disablement.......	$200	$280	$370	$448	$508	$565	$617	$644	$639	$521
3 quarters..........	204	286	378	458	519	578	630	658	653	532
1 year..............	205	282	366	441	501	560	614	644	639	514
5 quarters..........	208	282	360	433	491	550	604	633	626	496
6 quarters..........	214	286	361	432	489	546	599	626	617	480
7 quarters..........	222	294	366	436	491	546	597	621	609	466
2 years.............	230	303	373	442	496	549	597	618	602	451
3...................	273	336	400	464	512	556	595	606	577	396
4...................	316	372	429	484	528	564	594	596	551	400
5...................	351	400	450	498	537	565	588	581	521	403
6...................	375	418	462	507	543	566	581	565	485	407
7...................	393	431	472	516	549	567	575	548	445	411
8...................	406	441	482	525	554	569	568	530	399	414
9...................	416	450	491	533	559	571	563	511	402	417

DURATIONS 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27........	$424	52........	$572	76........	$432
28........	430	53........	572	77........	435
29........	437	54........	570	78........	438
30........	444	55........	567	79........	440
31........	451	56........	563	80........	443
32........	459	57........	556	81........	445
33........	466	58........	548	82........	447
34........	474	59........	538	83........	450
35........	482	60........	525	84........	452
36........	491	61........	510	85........	454
37........	500	62........	490	86........	456
38........	509	63........	466	87........	458
39........	518	64........	436	88........	460
40........	526	65........	398	89........	462
41........	534	66........	402	90........	463
42........	540	67........	405	91........	465
43........	547	68........	408	92........	467
44........	552	69........	412	93........	469
45........	556	70........	415	94........	471
46........	560	71........	417	95........	473
47........	564	72........	420	96........	476
48........	567	73........	423	97........	479
49........	569	74........	426	98........	482
50........	571	75........	429	99........	485
51........	572				

* Curtate functions, that is, claims assumed payable at the end of the year of death.

APPENDIX 4C

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
At disablement.......	$200	$281	$372	$450	$511	$571	$625	$658	$665	$578
3 quarters..........	205	288	380	460	523	583	639	673	680	591
1 year.............	206	284	368	444	505	566	624	659	668	576
5 quarters..........	209	283	362	436	496	557	615	650	657	562
6 quarters..........	215	288	363	435	494	553	611	644	650	550
7 quarters..........	223	296	368	439	496	554	609	641	644	539
2 years.............	232	305	376	446	501	557	610	638	638	527
3...................	275	339	403	469	518	566	611	630	620	486
4...................	317	375	433	490	536	575	612	623	601	456
5...................	353	403	454	504	546	578	608	613	578	433
6...................	378	421	467	514	553	581	604	601	551	418
7...................	396	435	478	524	560	584	600	589	520	411
8...................	409	446	488	534	566	588	597	576	486	414
9...................	420	455	497	542	572	592	594	563	456	417

DURATIONS 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27........	$428	52........	$594	76........	$432
28........	434	53........	596	77........	435
29........	441	54........	597	78........	438
30........	448	55........	596	79........	440
31........	456	56........	594	80........	443
32........	464	57........	591	81........	445
33........	471	58........	587	82........	447
34........	480	59........	581	83........	450
35........	488	60........	572	84........	452
36........	497	61........	562	85........	454
37........	507	62........	548	86........	456
38........	517	63........	531	87........	458
39........	526	64........	508	88........	460
40........	535	65........	480	89........	462
41........	543	66........	455	90........	463
42........	550	67........	434	91........	465
43........	557	68........	419	92........	467
44........	563	69........	412	93........	469
45........	569	70........	415	94........	471
46........	574	71........	417	95........	473
47........	578	72........	420	96........	476
48........	582	73........	423	97........	479
49........	586	74........	426	98........	482
50........	589	75........	429	99........	485
51........	592				

* Curtate functions, that is, claims assumed payable at the end of the year of death.

APPENDIX 4D

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
At disablement........	$199	$278	$368	$444	$503	$557	$603	$623	$604	$452
3 quarters...........	203	285	376	454	514	570	617	637	617	462
1 year..............	204	280	363	437	495	551	599	620	600	440
5 quarters...........	207	279	356	428	485	540	588	607	585	418
6 quarters...........	212	284	357	427	482	535	582	598	573	398
7 quarters...........	220	292	362·	430	484	535	579	592	563	379
2 years.............	229	301	369	436	488	536	577	588	554	360
3...................	271	333	395	457	502	541	572	570	520	289
4...................	313	368	423	476	517	546	567	554	485	228
5...................	347	395	443	488	524	545	557	533	444	169
6...................	371	412	454	497	528	543	547	510	397	113
7...................	388	425	464	505	532	542	536	486	343	57
8...................	401	435	473	513	536	542	525	460	282	0
9...................	411	443	481	520	539	541	514	432	222	0

DURATIONS 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27........	$419	52........	$538	76........	$0
28........	424	53........	535	77........	0
29........	430	54........	530	78........	0
30........	437	55........	523	79........	0
31........	444	56........	514	80........	0
32........	451	57........	503	81........	0
33........	458	58........	490	82........	0
34........	465	59........	473	83........	0
35........	473	60........	454	84........	0
36........	481	61........	430	85........	0
37........	490	62........	402	86........	0
38........	498	63........	367	87........	0
39........	506	64........	325	88........	0
40........	513	65........	273	89........	0
41........	520	66........	219	90........	0
42........	526	67........	165	91........	0
43........	531	68........	110	92........	0
44........	535	69........	55	93........	0
45........	538	70........	0	94........	0
46........	540	71........	0	95........	0
47........	542	72........	0	96........	0
48........	543	73........	0	97........	0
49........	544	74........	0	98........	0
50........	543	75........	0	99........	0
51........	541				

* Curtate functions, that is, claims assumed payable at the·end of the year of death.

APPENDIX 4E

DISABLED LIFE TERMINAL RESERVES* PER $1,000 OF INSURANCE
AT APPROVAL OF DISABILITY AT 3 PER CENT
BASED ON 1970 INTERCOMPANY GROUP LIFE DISABILITY VALUATION TABLE
BENEFIT REDUCTION PATTERN E (NO BENEFIT AFTER AGE 65)

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60 and Over
At disablement......	$196	$275	$362	$436	$491	$540	$575	$576	$518	$268
3 quarters............	200	281	370	446	502	552	588	589	530	274
1 year...............	201	276	356	428	482	531	567	567	506	239
5 quarters...........	204	275	349	419	470	517	553	550	484	205
6 quarters...........	209	279	350	416	466	511	544	538	466	174
7 quarters...........	216	286	354	419	467	509	539	529	451	144
2 years..............	225	295	360	424	471	509	535	521	436	114
3....................	265	325	384	442	480	509	521	491	382	0
4....................	306	359	410	458	491	508	508	462	325	0
5....................	340	385	428	468	495	501	490	429	258	0
6....................	363	400	438	474	495	494	471	391	183	0
7....................	379	412	446	480	496	487	450	351	97	0
8....................	390	420	453	485	495	481	430	307	0	0
9....................	400	427	459	490	495	474	409	260	0	0

DURATIONS 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27........	$407	52........	$465	76........	$0
28........	411	53........	455	77........	0
29........	417	54........	442	78........	0
30........	422	55........	427	79........	0
31........	428	56........	409	80........	0
32........	434	57........	387	81........	0
33........	440	58........	362	82........	0
34........	446	59........	333	83........	0
35........	452	60........	298	84........	0
36........	459	61........	258	85........	0
37........	467	62........	210	86........	0
38........	473	63........	152	87........	0
39........	480	64........	83	88........	0
40........	485	65........	0	89........	0
41........	490	66........	0	90........	0
42........	493	67........	0	91........	0
43........	496	68........	0	92........	0
44........	497	69........	0	93........	0
45........	497	70........	0	94........	0
46........	496	71........	0	95........	0
47........	494	72........	0	96........	0
48........	491	73........	0	97........	0
49........	487	74........	0	98........	0
50........	481	75........	0	99........	0
51........	474				

* Curtate functions, that is, claims assumed payable at the end of the year of death.