THE COST OF RECENT ADDITIONAL MORTALITY
UNDER GROUP CONVERSIONS

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T HE Ordinary insurance resulting from the exercise of the conversion privilege in Group policies shows a very high death rate, especially in the first few policy years. Experience shows that mortality in the period immediately following conversion is extremely heavy at all ages; it tapers off to some extent over the first few years before it begins an upward course, but it continues at a relatively high level for many years.

That the strongest kind of self-selection is present is quite evident. The experience reported in the Group Conversion Study made by the Committee on Group Insurance Mortality appearing in the Society's 1960 Reports showed a weighted ratio for all ages during the year following conversion of not less than 1100% of the mortality given in the Select 1946–1949 Basic Tables! What a ratio of this magnitude means may be appreciated by considering that in a report of the New England Life's experience on a group of lives included in certain pension plans, all of whom had been declined for insurance at that company's highest regular rating, John L. Stearns (*TSA*, VIII) indicated a corresponding first year experience of only 729% of the same basic table.

The nature of the mortality experience under group conversions has long been known, and the propriety of recognizing the high cost of this form of protection in interdepartmental accounting is of long standing. However, expositions in American actuarial literature embodying the determination of the charges to be levied against group experience for the excess Ordinary mortality are apparently limited to two papers presented by E. E. Cammack to the Actuarial Society of America in 1932 and 1940.[1]

The data for both of Cammack's papers were mortality and withdrawal figures developing from a combined investigation of several companies' experience. Also introduced into Cammack's computations were the offsets derived from savings in underwriting expenses and medical examinations and of the nonpayment of commissions otherwise payable. In the earlier paper, the resultant of these several elements, giving recognition to the effects of the level of gross premiums charged as well as the distribution of the business involved by age and plan, prompted the conclusion that a uniform charge of $50 per $1,000 of new Ordinary insurance

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[1] *TASA*, XXXIII, 333; *TASA*, XLI, 416.

was a fair charge to be made against the Group Department in connection with conversions within a nonparticipating company with rates approximating those of the Aetna Life in the year 1931. The 1940 paper using new data but the same principles indicated the higher charge of $67.68 per $1,000 of insurance.

Charges about those of the size recommended by Cammack in 1940 (in some instances, higher) are still being made. (Dickinson C. Duffield in his paper "Group Conversion Charges—Accounting for Annual Statement," *TSA*, VIII, 53, cited Cammack's two figures and, referring to such charges reported by several companies in *TSA* 1951 Reports, stated that "Three companies reported $65 per $1,000, one $70 per $1,000 and two $75 per $1,000. Weighted by the in-force as of December 31, 1949 for these companies, the over-all average cost in use becomes $69.")

The primary objective of this paper is the evaluation of the mortality element of the Group Conversion charge, and attention is focused on the death rates experienced and the magnitude of the extra cost involved in offering Ordinary insurance under the conditions included in Group contracts. Some consideration, however, is paid below to the question of the savings associated with conversions resulting from the absence of the underwriting processes and from the nonpayment of commissions.

The method used in this paper for evaluating the charge differs from that used by Cammack, and the data used are those appropriate to the current period. The raw material for this paper is taken from the report of the Committee on Group Insurance Mortality referred to before (*TSA* 1960 Reports, p. 105). The mortality ratios (p. 109) enable us to derive crude select death rates over twenty policy years for the following age groups: under 25, 25–34, 35–44, 45–54, 55–64, 65 and over. Year-by-year withdrawal rates (p. 111) are given for ages under 45, for ages 45–59 and for ages 60 and over.

In the employment of these data in this paper it has been assumed that the mortality experience for age groups 25–34, 35–44, 45–54 and 55–64 could be represented by corresponding rates for ages 30, 40, 50 and 60, respectively, without material departure from the basic significance of the figures. Withdrawal rates given in the Report were limited to withdrawal in the first nineteen policy years and were calculated as operating at mean durations. In the present paper, for ease of computation, withdrawals are assumed to be operative at the end of each policy year, and in the calculations in which a withdrawal rate in the twentieth policy year would be relevant, the rate shown in the Report for the nineteenth year is taken as being effective also in the twentieth year. It is assumed that no withdrawals would occur after the twentieth year.

In the computations carried out to measure the extra risks involved, the following formula was used in arriving at the single sum to cover anticipated mortality in excess of that employed in standard annual non-participating rates or that assumed in the dividends credited to participating policies:

$$\sum_{n=1}^{\infty} v^n \frac{l'_{[x]+n-1}}{l'_{[x]}} \left(q'_{[x]+n-1} - q'^{'46-'49}_{[x]+n-1} \right) \left(1 - {}_nV_x \right) .$$

The l' symbol in the foregoing formula represents the survivors among the lives effecting conversion who do not withdraw from the experience by discontinuance of the insurance so acquired; the q' function measures the rate of death (select basis) among these lives. Standard Ordinary mortality, the unprimed function, is measured by the rates given in the Select Basic 1946–1949 Tables. Amounts at risk, computed only for the ordinary life plan, assuming net level premiums, were based on the nearest age 1958 CSO Table, curtate, with interest at $2\frac{1}{2}\%$ per year. Present values of the extra risk expressed in the formula were taken at $3\frac{1}{2}\%$.

The 1960 Report referred to did not show separate mortality results according to sex. Since there is considerable variation in mortality by sex, caution should be exercised in applying any conclusions drawn from the report to particular small segments of experience in which the proportion of female lives is significantly different. Since coding by sex is coming more and more into use, we can perhaps look forward to the possibility of resolving this situation some time in the future.

To the extent that prospective interest returns seem likely to exceed $3\frac{1}{2}\%$, the resulting single sum is on the high side. On the other hand, current Ordinary mortality for most companies is lower than that indicated in the 1946–1949 experience. These two diverse influences may help to offset one another in some measure.

By using the crude mortality and withdrawal figures contained in the 1960 Group Conversion study, modifying them as has been mentioned, and by using the formula procedure indicated above, we get the single sums shown in Table 1 to cover the extra mortality to be anticipated on ordinary life insurance over the periods shown.

If the mortality beyond the twentieth year is taken into account, these charges would be increased. To make such an extrapolation for the four age groups shown in the preceding table, hybrid mortality classes, like those described in "A Theory of Mortality Classes" (*TSA*, XI, 46), were formulated.[2]

The twenty annual rates resulting from these class computations and

[2] In the construction of these classes the theoretical analysis of the 1950 U.S. Census Mortality Table for White Males was employed and the following factors analogous

the corresponding crude rates derived from the ratios on page 109 of the 1960 Reports are shown in Table 2.

Twenty year graphs of the q-curves generated by these mortality classes and by the comparable crude rates derived from the Committee Report are shown in Chart A. The characteristic trough in the curves in the first few years is perhaps the clearest signal that strong antiselection is being exercised. Few tables show such a dip. Among tables which do, those showing mortality experienced by lives approved for disability benefits[3]

TABLE 1

SINGLE SUM AT INCEPTION OF ORDINARY LIFE
INSURANCE TO COVER EXTRA MORTALITY (PER $1,000 INSURANCE)
ON GROUP CONVERSIONS OVER PERIOD INDICATED

Basis of Crude Rates Indicated in Report

PERIOD	AGE GROUP			
	25–34	35–44	45–54	55–64
1st– 5th policy years, inclusive..	$21.68	$35.45	$ 68.60	$150.10
1st–10th " " " ..	30.28	50.07	96.56	199.08
1st–15th " " " ..	35.34	57.43	110.51	215.79
1st–20th " " " ..	37.64	61.04	113.78	217.59

to those shown on page 67 of the aforementioned paper were used:

	AGE GROUP			
	25–34	35–44	45–54	55–64
Assumed equivalent central age.........	30	40	50	60
$\langle y' \rangle$.................	30	40	50	60
$\langle y'' \rangle$.................	83.380	85.466	80.590	86.670
a....................	.94477	.92895	.83590	.72700
g_1...................	4	4	4	4
g_2...................	15	15	15	15

The death rates considered appropriate for the primed subgroup (the "better" subgroup from the standpoint of mortality from which all withdrawals are assumed to occur) were taken as equivalent to those experienced among all white males at the corresponding ages in the general U.S. population in 1949–51. Only the death rates given for the first 15 years were employed in the determinations of the four mortality classes rather than those for the full 20 years. The rates for years 16–20 were deliberately omitted for this purpose. In all four age groups, the reported mortality ratios in this latter five year period manifested fluctuations which it seemed might materially impair their credibility.

[3] For example, TSA 1952 Reports, pp. 102–104.

show a dip similar in nature but considerably more protracted. (For entirely different reasons, dips in the succession of mortality rates occur at the infantile ages and frequently, as has been pointed out by Walter G. Bowerman in *TSA*, V, 117, in the twenties of age.)

To demonstrate the degree to which the theoretical rates and resulting costs reflect the crude data, the single sums already shown in Table 1 were recalculated on the basis of the computed rates. The excesses of these figures over those given before are shown in Table 3.

Single sums to cover the additional mortality on the ordinary life plan over the entire period of life following conversion for the four age groups are given in Table 4.

These charges bear reasonable relationships to the twenty year figures given before in Table 3 and seem quite acceptable. It will be noted that in the case of persons in age group 25–34 at time of conversion, the meas-

TABLE 2

RATES OF MORTALITY PER 1,000 ON CONVERTED GROUP INSURANCE 1953–1959

| | AGE AT CONVERSION | | | | | | | |
| | 25–34 | | 35–44 | | 45–54 | | 55–64 | |
POLICY YEAR	Derived from Report	Computed by Theory	Derived from Report	Computed by Theory	Derived from Report	Computed by Theory	Derived from Report	Computed by Theory
1.	9.69	9.63	15.11	15.64	27.71	27.33	72.82	67.73
2.	6.90	7.26	11.79	12.32	22.05	24.38	51.82	55.22
3.	7.09	6.09	12.76	10.82	24.80	23.12	47.89	50.53
4.	4.90	5.63	9.65	10.39	23.30	23.04	49.42	49.16
5.	5.45	5.41	11.12	10.33	25.23	23.42	48.21	49.06
6.	6.17	5.30	12.09	10.46	24.44	24.08	50.80	49.64
7.	5.33	5.27	12.24	10.72	24.01	24.92	53.85	50.89
8.	5.68	5.32	10.37	11.10	26.88	25.92	58.58	52.70
9.	4.64	5.44	11.75	11.57	25.33	27.05	53.35	54.92
10.	5.75	5.61	11.55	12.12	27.33	28.30	59.29	57.50
11.	5.47	5.84	11.90	12.77	28.27	29.72	59.75	60.44
12.	6.18	6.13	12.75	13.52	31.14	31.32	63.36	63.94
13.	6.51	6.49	14.54	14.43	32.09	33.11	66.27	67.98
14.	6.57	6.90	14.59	15.45	34.54	35.02	72.75	72.52
15.	7.23	7.35	15.83	16.58	40.66	37.04	69.48	77.50
16.	7.38	7.87	17.16	17.81	41.28	39.23	69.70	82.92
17.	5.89	8.45	15.63	19.15	41.69	41.70	86.31	88.82
18.	7.00	9.10	24.71	20.57	41.08	44.50	93.41	95.21
19.	9.10	9.80	22.78	22.07	40.43	47.57	92.13	101.91
20.	9.58	10.55	19.71	23.64	50.17	50.91	109.29	108.92

CHART A

MORTALITY EXPERIENCED FOLLOWING CONVERSION OF GROUP INSURANCE
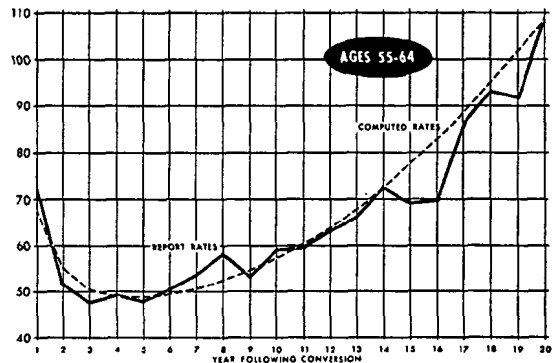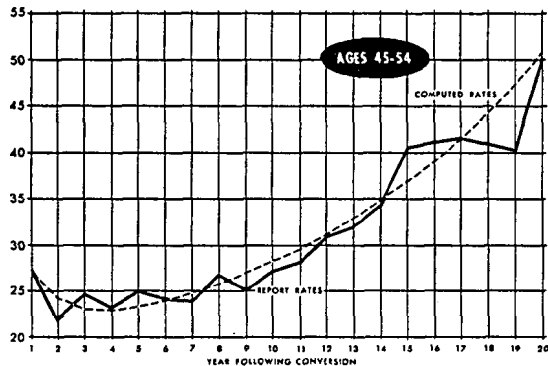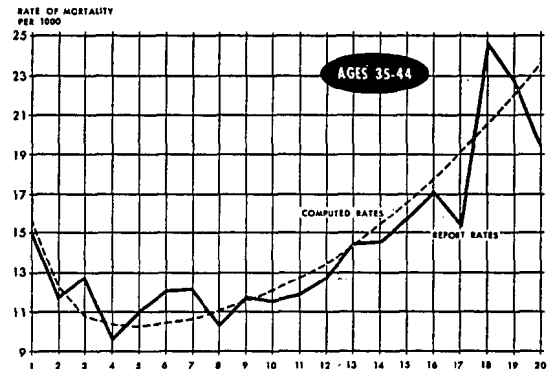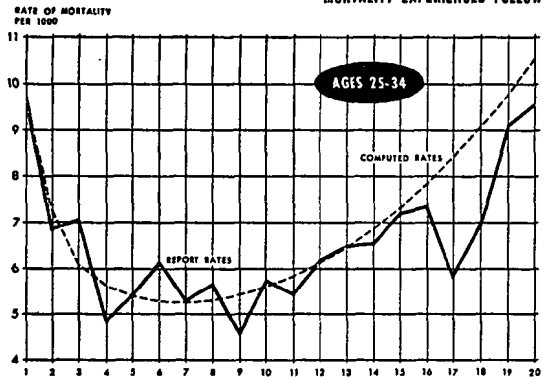
ure of the extra mortality to be experienced over the whole of life in terms of dollars is $46.16, 18.5% over the twenty year charge of $38.94. For age group 35–44 the increase is 7.3%; for age group 45–54, 3.1%; and for age group 55–64, less than 1%.

Intuitively, we are likely to feel that, in general, the poorest risks among those converting will tend to prefer the plans requiring the smallest outlay —that those who elect the endowment and limited payment life plans for the most part will have better prospects of survival. To reflect this state of affairs, in theory, a model office is indicated with appropriate mortality levels for the several components of the total experience. However, it is felt that it may not be too far from the mark, in deriving a single figure for the extra risk on the total experience, to use the amounts at risk associated with the ordinary life plan in conjunction with the average mortality experienced on all plans.

TABLE 3

SINGLE SUM AT INCEPTION OF ORDINARY LIFE
INSURANCE TO COVER EXTRA MORTALITY (PER $1,000 INSURANCE)
ON GROUP CONVERSIONS OVER PERIOD INDICATED

Basis of Computed Class Rates

	AGE GROUP							
	25–34		35–44		45–54		55–64	
PERIOD	Theoretical Basis	Excess over Crude Basis	Theoretical Basis	Excess over Crude Basis	Theoretical Basis	Excess over Crude Basis	Theoretical Basis	Excess over Crude Basis
1st– 5th pol. yrs.....	$21.64	$— .04	$35.09	$— .36	$ 67.76	$— .85	$149.99	$— .11
1st–10th " "	29.90	— .38	48.71	—1.36	96.49	— .07	195.78	—3.30
1st–15th " "	35.19	— .15	56.92	— .51	110.54	.03	213.89	—1.90
1st–20th " "	38.94	1.30	61.04	.00	114.67	.89	217.37	— .22

TABLE 4

SINGLE SUM ON CONVERSION
OF GROUP INSURANCE TO ORDINARY LIFE
INSURANCE—FULL PERIOD OF LIFE (PER $1,000 INSURANCE)

Basis of Computed Class Tables

Age Group	Single Sum per $1,000
25–34...............................	$ 46.16
35–44...............................	65.49
45–54...............................	118.20
55–64...............................	218.42

While there is a definite pattern in the shape of the curves in the four age groups, there is a significant difference in the underlying mortality relative to a fixed standard. What is meant may be perceived if the percentage ratios of actual deaths to those expected by the 1946–1949 Select Basic Tables are examined. The smoothed rates developed from the computed mortality classes produce the percentage ratios shown in Table

TABLE 5

Group Conversions—Select Mortality Ratios
Deaths by Theoretical Table to Tabular
Expected by 1946–1949 Select Basic Tables

Policy Years	Age at Conversion			
	25–34	35–44	45–54	55–64
1........	1460%	1359%	1065%	1278%
2........	835	718	624	659
3........	574	469	428	418
4........	480	379	352	333
5........	414	317	299	277
6........	375	285	272	250
7........	347	271	261	235
8........	312	244	234	209
9........	291	228	220	195
10........	270	214	205	183
11........	242	195	186	169
12........	226	185	174	161
13........	211	177	163	153
14........	196	166	152	146
15........	180	151	139	137
16........	176	140	123	115
17........	169	135	120	115
18........	165	132	118	113
19........	159	128	116	113
20........	154	125	115	110

5. (These ratios correspond with the crude ratios shown on page 109 of the 1960 Reports.)

It will be observed immediately that there is almost a complete inverse association of high mortality ratios with age at time of conversion—that is, the younger the age, the greater the relative mortality. This might have been expected. The standard mortality at the younger ages is absolutely so low that only a few extra deaths per thousand may represent a large percentage of the basic rate. It may be, too, since turnover is proportionately much higher in the area of the young ages and in view of the

irrepressible optimism of youth, that the conversions actually made, by and large, occur among poorer risks than those at the older ages.

It is common practice in determining the charge against the Group Department at the time of conversion to use a single amount per $1,000 uniformly for all ages and plans. For the reasons already cited (page 456) variation by plan may, perhaps, be ignored and the charges be computed as if all conversions were to the ordinary life plan. The differences by age, however, obviously call for some weighting if a uniform figure is to be used for all cases. It has been assumed that the effect of conversions at ages younger than 25 and older than 64 could be adequately reflected in the relative weights given to the conversions within the four age groups mentioned.

From the exposures given on page 106 of the Committee Report, the weights chosen for the purpose stated were taken as .25, .30, .25 and .20 for age groups 25–34, 35–44, 45–54 and 55–64, respectively. The weighted average single sum charge for additional mortality applying these proportions to the sums given in Table 4 comes out to $104.42 per $1,000 of insurance converted. This figure is extremely sensitive to the relative proportions in the several age groups. If the distribution by age in any given body of experience departs significantly from the age distribution in the Report, the corresponding single sum for that experience may be quite different.

The mortality experience given in the 1960 Report seems to indicate that, on the average, the present value of the extra mortality experienced on conversions of group insurance currently is over $100 per $1,000. The figure of $104.42 per $1,000 represents on one hand the single sum to be charged the Group Department at the time of conversion and, on the other, the initial reserve to be set up by the Ordinary Department to pay for the excess mortality to be experienced in all future years among the Ordinary insured lives then entering the exposure.

The total amount set up as such a mortality reserve in any year diminishes in subsequent years as the extra mortality for which it was established actually develops and as the Ordinary experience is compensated for the cost of the extraordinary death claims among these classes.

The sum so set aside is commonly written off in equal amounts over a given period. Many companies use ten years as the period of amortization. The burden of extra mortality, however, does not appear to diminish uniformly nor in so short a period. The prospective values of the anticipated amounts needed for future extra death claims at the beginning of the tth

policy year is given by the expression already noted, suitably modified, *viz.*:

$$\sum_{n=t}^{\infty} v^{n-t+1} \frac{l'_{[x]+n-1}}{l'_{[x]+t-1}} (q'_{[x]+n-1} - q'^{'46-'49}_{[x]+n-1}) (1 - {}_nV_x) .$$

If the assumptions employed in computing the original reserves at the time of conversion are used, the values at the time of conversion to ordinary life and at the end of policy years 5, 10, 15, 20, 25 and 30 for the four age groups are those shown in Table 6.

If the weightings applied to the individual age group figures of Table 4 are used on the foregoing present values, the weighted average figures resulting are as set out in Table 7.

No simple pattern for the amortization of the initial extra mortality reserve is discernible. However, it was discovered, empirically, that the

TABLE 6

PRESENT VALUE PER $1,000 OF INSURANCE
OF EXTRA MORTALITY ON GROUP CONVERSIONS
TO BE EXPERIENCED IN ALL SUBSEQUENT YEARS

(Ordinary Life Plan of Insurance)

END OF POLICY YEAR	AGE GROUP			
	25–34	35–44	45–54	55–64
0.........	$46.16	$65.49	$118.20	$218.42
5.........	42.12	53.63	88.10	128.75
10.........	37.00	40.32	55.43	74.22
15.........	32.57	27.92	29.99	28.75
20.........	28.05	20.09	22.80	15.22
25.........	21.42	14.94	15.07	7.67
30.........	15.29	11.70	7.07	6.35

TABLE 7

End of Policy Year	Present Values of Future Extra Mortality per $1,000 of Insurance Originally Converted (Weighted Averages—Ordinary Life)
0....................	$104.42
5....................	74.39
10....................	50.05
15....................	29.77
20....................	21.78
25....................	16.22
30....................	11.23

weighted average reserve set up in any year shrinks, approximately, by $7\frac{1}{4}\%$ per year. This ratio, of course, depends on the actual decrements experienced and the composition of the material by age, sex, plan, etc., but tended to come close to the results based on the data in the Committee Report and the assumptions made in this paper. If the volume of conversions remains constant for thirty years at $1,000 per year, on the basis of the assumptions referred to, the theoretical cumulative reserve at the end of that time would come to $1,286. If the $7\frac{1}{4}\%$ decrement is employed, the corresponding reserve amounts fo $1,290. This assumption of a $7\frac{1}{4}\%$ reduction was consequently embodied in the practical conclusions reached in this paper.

The argument in this paper so far indicates that, according to the inter-company experience with respect to mortality and withdrawal given in the 1960 Reports, a sum in the magnitude of $100, on the average, represents the value of the additional mortality likely to be experienced on group coverage converted to Ordinary. The financial effect on the company in which the conversion takes place, of course, is softened by any underwriting and commission savings.

The magnitude of these savings, however, is contingent on the costs of medical examinations and of underwriting normally incurred, and on the commission dollars not paid. These latter, in turn, depend on levels of gross premiums and of commissions. Substantial differences in these respects exist from one company to another and it would obviously be inappropriate to attempt to cite a figure which could have universal application.

The savings developed do have a material effect on the financial sequelae of the conversion privilege and they should be taken into account. But their incidence is quite different from that of the extra death claims and for that reason as well as for the greater significance imparted to ratios derived from a company's accounts involving expenses, it seems wise to account for these savings separately from mortality.

Accordingly, as far as the additional claim costs are concerned, it might be sound procedure to determine a reserve each year solely to cover the cost of the extra mortality. This reserve would equal, say, $92\frac{3}{4}\%$ of the reserve of the previous year together with a current increment of, say, $100 for each $1,000 of new Ordinary insurance issued in the conversion of Group coverage. The latter increment as it is set up would be charged against the Group Department. The $7\frac{1}{4}\%$ decrease in the previous year's reserve would have the effect of increasing the expected Ordinary mortality (E.M.) in the statement computations and thereby provide a suitable measuring rod for the mortality actually experienced.

If the mortality reserve is handled as mentioned, the expenses normally incurred in the Ordinary department in the issue, sale and handling of individual policies should be charged to that department just as they would otherwise be charged. To the extent that actual expenses of these kinds are smaller by reason of the operation of the conversion clause in Group policies, the savings should be current credits to the Group Department. Such a system would provide a basis for comparing, without distortion, expenses on one hand and the margins for expenses on the other, and altogether result in much more businesslike accounting practices. In this connection, incidentally, we should recognize that, though there are no underwriting requirements, expenses for that service are nevertheless frequently incurred. Insurability is generally determined through the medium of an application for new insurance, on the acceptance of which by the insurer a new commission is earned. The conversion becomes effective in such cases only if the applicant is not insurable at standard rates.

CONCLUSIONS

The excess mortality experienced on Group conversions is quite high and residual effects seem to persist longer than the periods usually assumed, in practice, for reserve and study purposes. A good practical method for approximating the rate of amortization of the reserve maintained for extra mortality on Group conversions is to write it off by an annual reduction of $7\frac{1}{4}\%$ as described.

The method of developing mortality rates for classes, contained in the paper "A Theory of Mortality Classes," may be used for extrapolating experience beyond the period of the investigation, and the results are not out of line with what might be expected.

It is preferable to account for the financial implications of Group conversions by treating excess mortality and expense savings separately.

DISCUSSION OF PRECEDING PAPER

MILTON J. WOOD:

I have only a few brief comments on Mr. Levinson's paper. He certainly has developed a very interesting and valuable application of the results of the recent 1953–59 group conversion study. His extension of mortality rates beyond the twentieth year using the author's theory of mortality classes is quite intriguing and convincing. The treatment for developing reserves for extra mortality and the initial charge therefor of about $100 per $1,000 are valuable contributions in this area and bring us up to date on the basis of latest experience. I would like to point out that, when adjustment is made for the savings in commissions and agency expenses, plus some underwriting expense, the paper's $100 charge is once again closely consistent with the charge of $65–$70 per $1,000 which is commonly made for group conversions in experience rating.

I note that the paper states that the 1960 Report of the Group Conversion study did not show separate mortality results according to sex. This appears to be an oversight which should be corrected as a matter of record. The study in the 1960 Report did show a separation by sex on a very sizable portion of the experience so that we now have rather reliable information on differentials by sex for both mortality and withdrawal rates.

FRED H. HOLSTEN:

The cost to a company of issuing group conversions is, of course, primarily affected by the additional mortality. Mr. Levinson's treatment of this matter is both thorough and clear and results in measures of this cost based on over-all intercompany experience as to conversion mortality and lapse and as to basic ordinary mortality.

The paper also discusses the offsetting expense savings—specifically referring to the items of underwriting expenses, medical examinations, and commissions that Mr. Cammack first considered in previous conversion cost evaluations.

One of the reasons given for not attempting to combine the expense savings with the mortality cost evaluation is the substantial difference that prevails among companies as to the expense element. This point is worthy of consideration in connection with the mortality cost also.

The important factors affecting this mortality cost can vary appreciably between companies, as was brought out in the 1960 reports on the

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conversion experience and, for example, in the reports on the development of the 1958 CSO mortality table. Undoubtedly, part of the variation in each case is due to statistical fluctuation, but some of it must be attributable to fundamental differences between companies as to their group conversion practices and as to the makeup of their portfolio of ordinary risks. In attempting to assess its own excess mortality cost, therefore, it would seem that a company should take into account where its own basic ordinary and group conversion experiences stand in relation to those used in the paper.

As to the matter of expense savings, there would seem to be room for further exploration beyond commissions, underwriting expenses, and medicals. Group conversions are not particularly sought after by most companies. The question therefore arises as to whether many other expenses that are necessary in connection with the conduct of regular ordinary business should be considered allocable to group conversions. Perhaps most notable in this area are those expenses related to the sales of the company's ordinary product, but others should readily come to mind.

Additionally, there are other expenses where the fact that group conversions are limited to policies "customarily issued" by the company would seem to make it proper to assess the conversion business only with the amount by which such expenses have increased. One example of this is the cost of printing material on forms that are needed anyway for these policies "customarily issued."

To the paper's references to previous contributions in the literature can be added the discussion by Mr. F. W. Elley in Volume II, Part 2, TSA, beginning on page 149. Mr. Levinson himself has presented us with a very real and stimulating contribution to the subject.

GEORGE C. CAMPBELL:

Mr. Levinson's paper is of interest to all of us who have had any occasion to compute group conversion charges and subsequent reserves for the resulting extra mortality.

The Metropolitan uses the same basic formula presented by Mr. Levinson for computing the single sum cost of extra group conversion mortality. We use our own group conversion mortality and withdrawal experience and measure the extra mortality against our own standard ordinary mortality experience.

Our single sum costs over twenty years run somewhat higher for the two lower age groups and somewhat lower for the two higher age groups than those shown in his Table 1. Applying Mr. Levinson's weights by age

groups (.25, .30, .25, and .20) to his single sums in Table 3 produces a weighted average extra mortality charge for twenty years of $100.19.

Mr. Levinson says that his relative age group distribution is intended to reflect ages below 25 and above 64. The Metropolitan, on the contrary, uses separate age groups for 24 and under and for 65 and over. The 65 and over age group is quite important because at higher ages even small percentages of extra mortality become expensive dollarwise.

Although Mr. Lew is examining in some detail the importance of variations in distributions, I want to illustrate just this one point. Suppose we weight comparable Metropolitan single sums for the four age groups used by Mr. Levinson, first by his age distribution and then by Metropolitan's own age distribution just for these four age groups. The first gives $92.18 and the latter $93.71—not much different. But now bring in our two additional age groups, using the Metropolitan age distribution for our six age groups, and our average single-sum extra mortality charge for the first twenty years becomes $104.36—quite an increase over the $93.71 we just obtained by omitting ages 24 and under and 65 and over.

Mr. Levinson, using the Theory of Mortality Classes developed in his 1959 paper, extends the group conversion mortality rates beyond twenty years and develops an additional charge for longer durations amounting to $4.23, to come to a total charge of $104.42. Metropolitan makes a charge on a more empirical basis for extra mortality beyond twenty years amounting to $1.50, which brings our extra mortality charge at this point to $105.86, which seems quite close to Mr. Levinson's $104.42; but this is something of a coincidence considering the different sources of data. It would be helpful if Mr. Levinson in his discussion would extend to longer durations the mortality ratios shown in his Table 5, at least for quinquennial durations, so that the gradients established by his theoretical analysis might be readily available.

A significant volume of group conversions discontinue premium payments and remain in force as extended term where the extra mortality continues to cost money. This element seems to be missing from Mr. Levinson's charge unless it was introduced without comment. Our study of these policies leads to a further charge of $5.09. This brings us to a total over-all extra mortality charge of $110.95 per thousand of group insurance converted.

Mr. Levinson then considers offsetting expense savings and quite properly indicates that the variations by company are too wide to permit generalized figures. Individual company expense savings, which may offset one-third or more of the extra mortality charges, should be analyzed as closely as the mortality charges. I was concerned, however, that the

author seems to advocate that the group department transfer the full amount of the extra mortality charge to the ordinary department initially, to be adjusted subsequently for the expense savings. I may misunderstand Mr. Levinson, but he seems to imply that each group conversion case would be examined and that the correct accounting entries would be made for that particular policy to reflect such expense savings as may occur. If the company saved a large part of the first-year commission, an imputed commission payment would be put through the books in the ordinary department with an offsetting negative entry in the group department. Such a procedure would seem to be expensive and possibly confusing. The Metropolitan, on the other hand, at the time the conversion charge is established estimates the present value of all future expense savings on the average and deducts this amount from the mortality charge to obtain the average dollar amount per thousand to be transferred from the group department to the ordinary department. This becomes a nonparticipating charge to the group department, and we think it is a more satisfactory procedure. It does not involve any expensive case-by-case accounting, and it produces a perfectly definite final charge for use in computing group dividends.

Naturally, the net conversion charge should be re-examined each year and recomputed whenever it seems likely that any important element of the underlying experience has changed significantly. Any revision would apply only to subsequent conversions.

When we come to the reserve for extra mortality on policies converted from group, the Metropolitan reflects the full amount of extra mortality, as Mr. Levinson does, without any reduction because of savings in expenses. Although the initial reserve is greater than the net charge transferred, the effect on ordinary surplus is not much different from that produced by a directly written policy. Subsequent terminal reserves are computed by carrying the initial reserve forward with benefit of interest and survivorship and by deducting the extra mortality charges year by year. An appropriate factor is introduced to reflect the immediate payment of claims, and we proceed to mean reserves in the usual way.

EDWARD A. LEW:

Mr. Levinson's evaluation of the mortality element in the group conversion charge, based on the 1953–59 mortality and withdrawal experience of ten large companies (*TSA 1960 Reports*, pp. 105–14), is very useful because it provides a solid point of departure for measuring the effect of variations in the major factors involved on the group conversion charge.

A few computations on alternative assumptions clearly show that the

most significant factors are the level of mortality under group conversions and the age distribution of group conversions. Variations in withdrawal rates and in the distribution of group conversions by plan of insurance have relatively little effect on the group conversion charge.

Tables 1–6 present some illustrative figures showing the effect on the excess mortality cost of group conversions (during the first twenty years) of variations in mortality rates, withdrawal rates, age distribution, and plan distribution, respectively.

By far the most striking figures are those in Table 1 indicating that an increase or decrease of 25 per cent in the level of mortality under group

TABLE 1

EFFECT OF VARIATIONS IN MORTALITY RATES ON COST OF
EXCESS MORTALITY UNDER GROUP CONVERSIONS*

AGE GROUP	MORTALITY RATES ASSUMED AS PER CENT OF 1953–59 INTERCOMPANY GROUP CONVERSIONS EXPERIENCE			(1) ÷ (2)	(3) ÷ (2)
	75% (1)	100%† (2)	125% (3)	(4)	(5)
25–34............	$ 23.97	$ 37.64	$ 51.04	64%	136%
35–44............	36.53	61.04	85.31	60	140
45–54............	67.71	113.78	157.84	60	139
55–64............	138.71	217.59	287.50	64	132
65 and over......	186.77	290.58	368.81	64	127
25–64‡..........	$ 61.62	$ 99.69	$135.31	62%	136%

* First twenty years only.
† Excess cost figures for age groups 25–34, 35–44, 45–54, and 55–64 as developed by Mr. Levinson; excess cost figure for ages 65 and over based on 1953–59 Intercompany Group Conversions Experience.
‡ Weighted figure for ages 25–64 based on Mr. Levinson's weights of .25, .30, .25, and .20 for age groups 25–34, 35–44, 45–54, and 55–64.

conversions produces an increase or decrease in the cost of excess mortality (for the first twenty years) of 35–40 per cent. It is particularly noteworthy that 63 per cent of the excess mortality cost on group conversions during the first twenty years is incurred in the first five policy years and 87 per cent in the first ten policy years.

The report on the 1953–59 intercompany experience under group conversions showed in Table 6 in *TSA 1960 Reports* (p. 112) that female mortality under group conversions was approximately 70 per cent of the male mortality under group conversions in the first policy year, 55 per cent in the second to tenth policy years, and 50 per cent in the eleventh to twentieth policy years. A moderate change in the proportion of female group conversions will generally have only a small effect on the cost of

excess mortality. This is indicated in Table 2, which shows the effect of different proportions of females on the excess mortality cost of group conversions, assuming Mr. Levinson's weights for each age group. The proportions shown in the first column of Table 2 approximate those found in the aggregate data of the companies which were able to split their experience by sex when reporting to the Committee on Group Insurance Mortality.

If we begin with the proportions of male and female lives found in the aforementioned data, but otherwise make virtually the same assumptions as Mr. Levinson did, the excess mortality cost of group conversions (during the first twenty years) on male and female lives compares as shown in Table 3.

It should be noted, moreover, that the relative mortality of female group conversions has been found to be much higher in certain experiences than in the 1953–59 intercompany experience reported on by the Com-

TABLE 2

EFFECT OF VARIATIONS IN PROPORTION OF FEMALES ON COST
OF EXCESS MORTALITY UNDER GROUP CONVERSIONS*

AGE GROUP	PROPORTION OF FEMALES			CORRESPONDING EXCESS MORTALITY COST		
	A†	B	C	A	B	C
25–34.....	25%	35%	15%	$ 10.79	$10.15	$ 11.42
35–44.....	15	25	5	20.66	20.07	21.25
45–54.....	15	25	5	30.25	28.95	31.55
55–64.....	15	25	5	41.05	39.00	43.11
25–64.....	....	....	....	$102.75	$98.17	$107.33

* First twenty years only.
† Proportions approximating those found for the companies able to split their data by sex in reporting to the Committee on Group Insurance Mortality.

TABLE 3

EXCESS COST OF GROUP CONVERSIONS
(First Twenty Years)

Age Group	Males	Females
25–34.......	$ 49.46	$ 24.13
35–44.......	71.82	52.10
45–54.......	128.81	76.72
55–64.......	220.69	117.83
All ages..	$110.26	$ 64.41

mittee on Group Insurance Mortality in *TSA 1960 Reports*. High female mortality under group conversions has been observed in the first two policy years, suggesting that women who convert their group insurance may exercise a great deal more anti-selection than men do, at least in some groups. Since high mortality in the early policy years is responsible for a major part of the excess cost of group conversions, the effect of rather high early mortality under female group conversions must be given its proper weight.

The figures in Table 4 demonstrate that a 25 per cent reduction in withdrawal rates increases the excess mortality cost of group conversions by

TABLE 4

EFFECT OF VARIATIONS IN WITHDRAWAL RATES ON COST OF
EXCESS MORTALITY UNDER GROUP CONVERSIONS*

AGE GROUP	WITHDRAWAL RATES ASSUMED AS PERCENTAGE OF 1953–59 INTERCOMPANY GROUP CONVERSIONS EXPERIENCE			$(1) \div (2)$	$(3) \div (2)$
	75% (1)	100%† (2)	125% (3)	(4)	(5)
25–34.......	$ 40.29	$ 37.64	$ 35.06	107%	93%
35–44.......	65.89	61.04	57.23	108	94
45–54.......	121.44	113.78	108.77	107	96
55–64.......	226.95	217.59	212.34	104	98
25–64.......	$105.59	$ 99.69	$ 95.59	106%	96%

* First twenty years only.
† Excess cost figures as developed by Mr. Levinson.

4–8 per cent, while a 25 per cent increase in withdrawal rates decreases the excess cost by 2–7 per cent. The withdrawal rates among female group conversions are somewhat higher than among male group conversions (see Table 8, *TSA 1960 Reports*, p. 114), so that the effect of a greater proportion of female group conversions is to a degree offset by their higher withdrawal rates.

The figures in Table 5 bring out the effect of an older age distribution on the excess cost of group conversions. The greatest proportionate increase occurs when there is a shift of group conversions from age group 45–54 to 55–64, because the excess cost of a group conversion at ages 55–64 is almost double that for ages 45–54. Although the excess cost of a group conversion for the age group 65 and over is only about 35 per cent higher than that for ages 55–64, the absolute increase in cost is quite substantial.

The figures in Table 6 evidence the fact that the excess cost of group

conversions is but little affected by distribution according to plan of insurance.

The 1953–59 intercompany mortality experience under group conversions showed only small improvement (of the order of 4 per cent) from the corresponding experience for the years 1947–53, but it is clearly necessary to watch the trend in the general level of mortality under group conversions, particularly insofar as it may be influenced by changing conditions under which group conversions are effected. It is also important to keep

TABLE 5

EFFECT OF VARIATIONS IN AGE DISTRIBUTION ON COST OF
EXCESS MORTALITY UNDER GROUP CONVERSIONS*

AGE GROUP	AGE DISTRIBUTION ASSUMED			
	A†	B	C	D
25–34.........	.25	.20	.20	.20
35–44.........	.30	.35	.30	.25
45–54.........	.25	.25	.25	.25
55–64.........	.20	.15	.20	.20
65 and over....	0	.05	.05	.10
Weighted excess mortality cost	$99.69	$104.50	$112.33	$123.81

* First twenty years only.

† As assumed by Mr. Levinson.

TABLE 6

EFFECT OF VARIATIONS IN PLAN DISTRIBUTION ON
COST OF EXCESS MORTALITY UNDER
GROUP CONVERSIONS*

AGE GROUP	PLAN DISTRIBUTION		$(2) \div (1)$
	A† (1)	B‡ (2)	(3)
25–34........	$ 37.64	$ 36.41	97%
35–44........	61.04	59.27	97
45–54........	113.78	111.27	98
55–64........	217.59	215.27	99
25–64........	$ 99.69	$ 97.76	98%

* First twenty years only.

† All ordinary life as assumed by Mr. Levinson.

‡ Seventy-five per cent ordinary life, 15 per cent twenty-payment life, 10 per cent twenty-year endowment.

an eye on the trend in the age distribution. Since several of the factors just mentioned are interrelated and can appreciably affect the excess cost of group conversions, great care needs to be exercised in interpreting a developing or immature experience under group conversions.

JULIA OLDENKAMP:

I find this paper to be a valuable and very timely contribution to the subject of the cost of group conversions. I especially welcome the paper because the results support the calculations we made in our office about three years ago.

At that time we made a few calculations to determine what charge should be levied by the ordinary department against the group department in connection with group conversions. As Cammack had done, we undertook to take into account not only the differences in mortality but also the differences in expenses and lapse rates. However, the method we used was to determine what single sum we would need at the outset on group conversions if the asset shares on two ordinary life nonparticipating policies, one regularly underwritten and the other a group conversion, were to be equal at a given point of time—we chose ten, fifteen, and twenty years.

In computing the asset shares, our assumptions for a regularly underwritten policy were the same as we were using in our standard nonparticipating premium calculations except that we used an average size for the plan appropriate to group conversions. The asset share for a policy issued at the same age but as a group conversion took into account mortality based on our own experience for the first five policy years and tied into that of the 1947–53 group conversion mortality reported in the *1954 Reports*. Our own experience was quite similar to that reported both in 1954 and in 1960. We used our own first-year lapse rates on group conversions, and for all years after the first we used the ultimate rate experienced on all policies. Expenses were adjusted to take into account the fact that no commissions are paid, and it was assumed that no medical fee would be incurred. Only 20 per cent of the usual medical, underwriting, and inspection expense was used. This much was used to recognize the fact that applications are frequently submitted concurrently as new business and as group conversions. The interest rate assumed in all cases was $3\frac{1}{4}$ per cent.

The interesting thing is the similarity of the results with those of Mr. Levinson's paper. However, it should be recognized that Mr. Levinson's costs cover only mortality while our calculations included other adjustments. Table 1 may be compared with the single sums from Table 1 and Table 3 of Mr. Levinson's paper assuming, for example, that age 50

corresponds to the age group 45–54. For issue age 50 our calculations are within $1.00 or $2.00 of Mr. Levinson's for both durations 15 and 20 and at issue age 60 the figures are again very close. At age 40 our figures are lower than Mr. Levinson's. Probably the differences are due to the fact that the multiples of standard mortality which we used in connection with the group conversions were not varied as much by issue age as they might have been. Presumably our costs would be greater if they did not reflect savings in expenses.

Based on the age distribution at the date of conversion we obtained a weighted average as shown in the table. This weighted average corresponds to an age just under 50, which is, I believe, a little older than the weighted figure in Mr. Levinson's paper.

TABLE 1

SINGLE SUM REQUIRED AT INCEPTION OF WHOLE LIFE TO
MAKE ASSET SHARES EQUAL AT DURATION SHOWN

DURATION	AGE AT ISSUE			WEIGHTED AVERAGE
	40	50	60	
10........	$27.21	$ 91.06	$195.15	$ 88.07
15........	38.75	108.60	217.72	104.28
20........	44.92	116.10	224.09	111.00

JULIUS VOGEL:

Mr. Levinson is to be congratulated for forcefully pointing up the important effect of age at conversion on the additional mortality cost of ordinary insurance converted from group insurance. He is also to be congratulated for providing an interesting application of the approach to the derivation of mortality rates described in his earlier paper, "A Theory of Mortality Classes."

In the Prudential Insurance Company of America we have developed a method of determining annually the differential effect of converted policies on the surplus of the ordinary line. I hope that a brief description of our procedures may form a useful addition to Mr. Levinson's paper.

The group conversions "broadsheet," as it is called, is a record of certain items of income and disbursement in the ordinary line which are uniquely related to ordinary policies issued as group conversions. The only items of income and disbursement considered are those in which the converted policies differ from otherwise similar ordinary policies issued with normal evidence of insurability. Thus, for example, premium income

from the converted policies does not appear in the broadsheet (since the premiums on these policies are the same as for other comparable ordinary policies not issued as group conversions). Actually, the principal income item on the broadsheet is the periodic transfer of funds on the company's ledger from the group line to the ordinary line as certificates of group insurance are converted.

Our experience is that differences between group conversions and other ordinary policies are not substantial after the converted policies have been in force for approximately twenty years, and, accordingly, a converted policy contributes income or disbursement to the broadsheet only during its first twenty calendar years of existence.

The accumulated fund of the broadsheet may be compared as of each December 31 with an appropriate reserve liability, and any excess or deficiency in the fund may be corrected by transfers between the group and ordinary lines. The principal items appearing on the group conversion broadsheet for any calendar year of account are as follows.

1. *Fund as of beginning of year and reserve as of beginning of year.*— These items are merely the end-of-year figures from the previous broadsheet brought forward.

2. *Transfer arising from beginning of year comparison.*—As indicated before, the broadsheet fund at the beginning of the year is compared with a corresponding reserve liability. Any excess or deficiency in the fund can be eliminated, when appropriate, by a transfer of funds between the ordinary and group lines. This item would record such a transfer.

3. *Transfer of funds on account of paid-for issues during the current year.*—These are the fund transfers made by the group line to the ordinary line in respect of each group conversion issued during the calendar year of account. In the Prudential these transfers depend on the issue age of the converted policy as well, of course, as its amount. They reflect the present value at issue of anticipated future excess mortality and disability costs on converted policies less certain commission and expense savings effected on the policies.

4. *Commission savings.*—The Prudential pays no commissions at all on about one-quarter of the converted policies and only a nominal service commission on the remainder. (Our current practice is to pay full commissions on policies issued standard on normal evidence of insurability, and such policies are not considered "group conversions" even though the insured had a conversion right when they were issued.) Accordingly, there is a substantial savings in commissions on converted policies compared with other ordinary policies. This savings is reflected as an income item on the broadsheet. The item is computed in a rather straightforward way

that gives recognition to the age and plan distribution of the converted policies (those issued in the current year as well as those currently in force which were issued during the preceding nineteen calendar years), the commission rates that would normally be applicable on such policies, and the much smaller commission rates that actually are applicable. The commission rates used in this calculation are "loaded" to reflect agents' security benefits, rent, and other expenses, as well as a portion of agency and home-office supervisory expense which is treated "as agents" in our regular allocation procedures. Such loading factors are developed in the course of our ordinary asset-share calculations and are updated from time to time as new asset-share expense studies are made.

5. *Other expense savings.*—Another source of income to the broadsheet is the expense savings arising from the absence of underwriting requirements on converted policies. The broadsheet is also credited with the asset-share charges we normally make for general acquisition expense other than that associated with underwriting or commissions. The unit costs used in determining "Other Expense Savings" for the broadsheet are changed from time to time to reflect the most recent results of our studies of expenses for asset-share purposes.

6. *Net investment income and capital gains (or losses).*—Net investment income and capital gains or losses are entered on the broadsheet based on the same rates of return as are applicable to allocations to the ordinary line generally.

7. *Cost of excess deaths.*—The really significant item of outgo in the broadsheet is the cost of excess deaths. Every year, we obtain, as part of the regular mortality "run" of our electronic tape valuation system, the actual amount of death claims incurred on converted policies issued in each of the last twenty years. Expected amounts are computed in the course of the same mortality run by applying to the exposure of converted policies at each issue age and duration the actual current calendar-year mortality rate experienced by the company's standard ordinary policies at the same age and duration. The difference between actual and expected claims on converted policies thus arrived at for each issue age and duration is multiplied manually by a factor which reflects the average amount at risk per $1,000 of insurance in force in the cell. The final result of these calculations is entered on the broadsheet as the cost of excess deaths for the calendar year of account.

8. *Disability charge.*—This item adjusts for the inadequacy of the premium actually charged for the converted policy, with respect to any disability benefits actually contained in it. Studies have shown that our disability experience on those converted policies which have a disability

benefit is worse than that on other ordinary policies, and approximate provision is made therefor in this item.

9. *Fund as of end of year.*—This item is, of course, merely the sum of the beginning of year fund and the transactions described in paragraphs 2 through 8 above.

10. *Reserve as of end of year.*—The accumulated fund in the broadsheet is compared each year with the annual statement reserve held in respect of the converted policies. The reserve factors used vary by age and duration. For a particular issue age and duration they reflect the present value during the remainder of the first twenty durations of future excess mortality costs and disability charges less future commission and expense savings. Owing to the concentration of commission and expense savings in the first policy year, the reserve factors rise abruptly, immediately after issue, above the level of the transfer from the group to the ordinary line per $1,000 of converted insurance. The highest mean reserve occurs at the end of the second calendar year for all issue ages. The level of the mean reserve does not decline to the level of the original conversion transfer until a number of years have elapsed—fifteen years for policies issued below age 35, five years for policies issued above age 65. The terminal reserves for all issue ages are, of course, equal to zero at the end of the twentieth policy year.

The major advantage of the group conversion broadsheet is that it enables us continually to adjust (by item 2 above) the fund transfers from the group to the ordinary line made in previous years at issue of converted policies in order to reflect actual emerging experience on the policies. This process also affords an opportunity for a continuing review of experience on converted policies. If substantial transfers are required year after year to align the broadsheet fund with the reserve, it is an indication that revision is required in the transfer made to the ordinary line by the group line for newly converted policies or in the pattern of reserve factors being used in the valuation of in-force converted policies issued in previous years.

RUSSELL M. COLLINS, JR.:

Members of the Society as well as students are indebted to Mr. Levinson for his clear and concise treatment of this subject. Especially significant, I feel, is Mr. Levinson's demonstration of the use of construction of "hybrid mortality classes" to determine the approximate effect of extra mortality beyond the twentieth policy year. As is apparent from the results of his calculations, this effect is quite significant at the younger ages at issue.

Mr. Levinson comments on the higher extra mortality at the younger

ages at issue which is apparent from inspection of his Table 5 as well as Table 3 of the *1960 Reports*. This is perhaps not too surprising, since it would seem that a young person in good health is quite likely either to be re-employed where there is group insurance again available to him, so that he is not as likely to convert, or else to remain unemployed, in which case he might very well feel that he cannot afford to convert.

The fact that the first year extra mortality on group conversions exceeds by a considerable degree that for declinations is also not too surprising, since (1) because of current agency practices, only those who cannot qualify for new standard insurance will convert their group insurance, and (2) the availability of the group conversion right will prompt some who

TABLE 1

PRESENT VALUE AT DATE OF CONVERSION OF EXTRA COST OF GROUP CONVERSIONS (PER $1,000 INSURANCE) TO WHOLE LIFE INSURANCE

PERIOD	AGE							
	25		35		45		55	
	I*	II†	I	II	I	II	I	II
Policy years 1–5......	23.19	4.49	30.95	5.94	63.13	27.92	125.46	73.85
Policy years 1–10......	28.24	9.08	40.22	14.51	83.49	47.22	170.01	117.25
Policy years 1–15......	30.22	10.72	45.32	19.09	92.09	55.06	187.90	135.14
Policy years 1–20......	31.15	11.42	47.33	20.71	95.32	57.75	192.94	140.18

* I = Cost of extra mortality only, excluding expense savings.
† II = Net cost of extra mortality in excess of expense savings.

would never apply for ordinary insurance because they know that they could get it only with a heavy extra premium or not at all to convert their group insurance.

It so happens that my company has just completed a study of this subject, based on the results of the study appearing in the *1960 Reports* combined with our own mortality experience on standard issues and expenses. The formula used to calculate the cost of extra mortality is identical to that on page 452 of Mr. Levinson's paper. Expense savings arise solely from the saving in commissions and other compensation based on commissions. There are no significant savings in underwriting expense, since practically every case is first submitted as ordinary business in order to determine insurability. There are no savings in policy issue expense. Extra mortality and expense savings were discounted at 4 per cent to the date of conversion. Table 1 shows the results of our calculations.

As Mr. Levinson points out, the conversion charges are quite sensitive to variations in age. Since a slight change in the age distribution will have a significant effect on an average conversion charge based on a model office by age, it seems desirable to vary the charge by age group. This would mean tabulating the conversions by age group and applying a different factor to each group. Since the *1960 Reports* give no breakdown of experience by age for ages over 65, we had to guess at the pattern of charges for ages 65, 75, 85, and 95. Reason would indicate (as does the experience at younger ages) that the percentage extra mortality declines as the age advances. On the other hand, anyone willing to pay the prohibitive annual premium for a whole-life policy at age 95 must feel that he is on his death-bed. Therefore, we assumed that the conversion charge at age 95 is the face amount less the first premium (about $600), and the charges for ages 65, 75, and 85 were obtained by passing a second-degree curve through the corresponding figures for ages 45, 55, and 95.

It is perhaps of interest that our average amount at risk on group conversions at time of death, based on the incidence of mortality by duration shown in the *1960 Reports*, is about $800.

Mr. Levinson notes that the weighted average reserve shrinks by about $7\frac{1}{4}$ per cent per year, which provides a convenient practical method for calculating reserves each year. Another method which is especially suitable is as follows: If $l'_{[x]+t-1}$ in the denominator of the formula on page 459 of the paper is replaced by $l'_{[x]}$, then the reserve in the tth year can be expressed as a percentage of the original conversion charge. It is necessary only to know the amount originally transferred to the ordinary line for group conversions in a given calendar year in order to determine the reserve to be held for the conversions in a later year. Periodically, checks can be made to determine how closely actual terminations adhere to the pattern assumed in the original calculations and whether or not an adjustment is necessary to allow for deviations from that pattern.

It is interesting to note from Table 3 in the paper that the effect of calculating conversion charges on the "theoretical basis" is to defer some of the extra mortality to later years as compared to the "crude basis." For example, in the case of ages 25–34, 55.6 per cent of the charge calculated on the "theoretical basis" is for extra mortality in years one through five while the percentage is 57.6 per cent on the "crude basis." It follows that reserves calculated on the "theoretical basis" will be slightly conservative.

GUY W. PICKERING:

Mr. Levinson has written a very thought-provoking paper. However, I cannot agree with one of his conclusions. He states: "It is preferable to

account for the financial implications of group conversions by treating excess mortality and expense savings separately."

If a company did as he suggests, there would be additional administrative expense in keeping track of the effect of savings or of extra expenses from year to year. He does not mention how the effect of withdrawals might be involved if cash values differ from asset shares. While it is true that in the renewal years there is a saving because of the nonpayment of the renewal commissions, on the other hand, this is offset to a certain extent by the very small average size of group conversion policies. Table 1 gives a comparison of the average size of group conversion policies in our own company compared with the corresponding average size for standard insurance.

TABLE 1

AVERAGE FACE AMOUNT PER THOUSAND

| AGE GROUP AT ISSUE | GROUP | | STANDARD PLANS |
	Whole Life	20-Payment Life and 20-Year Endowment	
Below 25........	$2,000	$1,500	$ 5,400
25–34...........	4,500	2,000	6,500
35–44...........	5,000	2,000	7,650
45–54...........	3,500	2,000	9,500
55–64...........	2,500	2,000	10,000
65 and over.....	1,500	1,500	10,000

In our own company, which is a mutual company, we made a study in 1960 to determine the charges which the ordinary branch should make to the group branch on group conversion policies. We also wished to determine the extra reserves to be carried by the ordinary branch for these conversions.

Our approach was based on the premise that at the end of the twentieth policy year, the asset share on a converted policy should be equal to that on a standard policy.

While, theoretically, extra reserves are probably required after the twentieth policy year, the amounts would be small, and the extra administrative costs of keeping track of these extra reserves indefinitely would not seem warranted.

Our procedure was first to calculate asset shares on converted policies based on the mortality and withdrawal experience based on the 1947–53 Intercompany Group Conversion Mortality and Withdrawal Experience

Study given in the *1954 Reports* of the Society. The *1960 Reports* were not then available. However, a comparison indicates that the mortality in the *1954 Reports* was, in general, somewhat higher than for reports in 1960 and that the withdrawal rates were slightly lower. The mortality rates were translated from a percentage of the expected mortality to rates of mortality without any attempt to grade them. For the age groups in our study, we assumed, as did Mr. Levinson, that the mortality rates apply at central ages 20, 30, 40, etc.

Our regular unit costs and other expense factors were adjusted to reflect the savings in expense because of nonpayment of commissions and of the absence of underwriting. The average size on converted policies as shown in Table 1 were used in translating the unit cost per policy per $1,000 face amount. The calculations were made for the whole life, twenty-payment

TABLE 2

COST OF CONVERSION PER $1,000 FACE AMOUNT

Age at Issue	Whole Life	Twenty-Payment Life	Twenty-Year Endowment	Weighted Average
Below 25.........	$ 34.00	$ 52.00	$ 33.00	$ 38.00
25–34............	12.00	41.00	25.00	19.00
35–44............	30.00	60.00	47.00	37.00
45–54............	80.00	90.00	91.00	84.00
55–64............	140.00	158.00	161.00	145.00
65 and over.......	198.00	198.00*	198.00*	198.00

* Assumed to be same as for whole life.

life, and twenty-year endowment plans. The interest rate used was $3\frac{1}{2}$ per cent.

The resulting asset shares on a converted policy at the end of twenty years, when subtracted from that on a standard policy for the same plan and age at issue, gave, in effect, a pure endowment value. The single premium which had to be charged at issue, based on the mortality and withdrawal rates of converted policies, to produce the extra asset share, or pure endowment, at the end of twenty years gives the single premium cost of the group conversion. Table 2 shows the results of our study.

Tests for individual calendar years and for groups of years indicated that for a particular age at issue, for all plans of insurance combined, there was little variation from year to year in the conversion charge per $1,000 face amount. However, for all plans and ages combined there was considerable variation. As a result, it was decided that the cost of conversion paid to ordinary by group would be based on age groupings, all plans combined, as shown in Table 2.

Having determined the single premium "charge for conversion" needed at issue of a converted policy, asset shares on these policies were readjusted so that, when compared with the asset shares on standard policies, the extra reserves to be carried by the ordinary department could be obtained. These are valued annually by age group at issue and duration. The resulting extra reserves do not decrease in a straight line but remain practically level for several years.

GARNETT E. CANNON:

One of the significant disclosures of Mr. Levinson's valuable paper is the high mortality cost of conversions made at advanced ages. Recent trends in group insurance practice have made available to individuals large amounts of insurance at these advanced ages. It is well known that health deteriorates fast and, at these high ages, often suddenly. This combination of circumstances would seem to infer that even greater adverse selection than presently shown may be indicated. Some means should be found to guard against excessive cost from this source.

PAUL H. JACKSON:

Mr. Levinson is to be congratulated on his fine and thorough exposition of group conversion costs. It is certainly clear that the mortality in the period immediately following conversion is extremely heavy at all ages. There may be some question, however, as to whether this is entirely due to self-selection on the part of the terminating employees.

In most companies individual life agents are given the opportunity to submit medical evidence and an application for insurance to be issued in lieu of a group conversion. It is no doubt true that most of the unhealthy lives among terminating employees can be expected to self-select and buy a converted policy. Still when we hold up the issuance of a conversion policy to permit an agent to offer a regular policy for larger amounts, term insurance, double indemnity, waiver of premium, and other special features subject to medical evidence, it can only have the effect of removing from the general body of conversion policyholders many of the risks that would produce standard mortality. The upshot is that the cost of conversions is even higher than it otherwise would be. This also means that the actual level of mortality on conversion business for any particular company can be strongly influenced by the activity, or nonactivity, of that company's agency force in seeking to substitute regular business for conversion business.

If the excess mortality is to be covered by a separate extra charge made to the group division, it seems only fair, as Mr. Levinson pointed out, to

recognize the expense savings as an offset. I am surprised, however, that he should apparently feel that the underwriting expense to determine insurability and the receipt of commission might be a legitimate charge against conversion business.

Let us look at the expense credit for a moment. If we start with the question, "What are the specific expense savings on conversion business?" we can determine the exact credit directly. On the other hand, if we start with the question, "What specific expenses are actually incurred in the writing of conversion business?" we can determine the exact expense directly. Unfortunately, the exact credit plus the exact expense so computed will fall far short of the expense charge for regular business. This is due to the law of oversight.

It seems clear to me, particularly since I work in group insurance, that a strong argument can be made in favor of using marginal expense rates for conversion business. For example, a large portion of an insurance company's annual expense is tied up in the recruiting of new life agents, the production of new business, agents' conventions, advertising, etc. It seems most inequitable to charge conversion business with a "fair share" of this type of expense, since most policies finally issued on a conversion basis represent orphan business and receive little if any service. As another example, premium rates for regular business contain a loading for profit, or in the case of mutual companies a contribution to contingency reserves and company surplus funds. An argument can be made that any profits that develop should appear in the group division's statement rather than in the individual policy portion of the annual statement. Then again there might be some actuaries, perhaps even in my own company, who would disagree on this point.

Let us look at the interest assumption. A strong argument can be made for using a higher rate of interest for conversion business than for regular business (or rather a rate closer to current investment yields). The combination of heavy early mortality, a high termination rate, first-year expense savings, and a lump-sum conversion charge tends to concentrate most of the financial transactions in the early policy years. An interest rate considered reasonable for use with regular business which might remain on the books for twenty years on the average would appear to be unduly conservative, under present investment conditions, for conversion business which might remain on the books only five years on the average.

We in the Aetna Life Insurance Company are in the somewhat unusual position that conversion policies account for about 15 per cent of our current individual policy issues by number of policies and about 5 per cent by amount. Our life agency department makes full use of our large

volume of group business, and the potential business to be written in lieu of conversion, in the recruiting of new agents. Our life agents use the group conversion mechanism to develop contacts that result in additional life business to our company over and above any business issued in lieu of group conversions. If sufficient value were placed on this boundless opportunity, we might even be able to eliminate the conversion charge entirely and thus vastly simplify our internal accounting procedures.

<div align="center">REA B. HAYES:</div>

Last year we had considerable discussion at Union Central Life about this same problem and alternative theoretical approaches to it. Karl Stover and I discussed this subject at some length and argued along the following lines:

The profit to the company on normally issued business is

$$P\ddot{a}_{[x]} - A_{[x]} , \qquad (1)$$

where P again represents the premium which the company might assume adequate in its dividend formula, and the single premium for life insurance and for premium annuity could be based on withdrawals as well as deaths in order to get a realistic picture. Similarly, the profit to the company on converted lives is

$$P\ddot{a}'_{[x]} - A'_{[x]} , \qquad (2)$$

where the primed functions represent similar single premiums on the converted lives.

The cost of insuring converted lives at standard rates is therefore

$$P(\ddot{a}_{[x]} - \ddot{a}'_{[x]}) + A'_{[x]} - A_{[x]} . \qquad (3)$$

In order to compare our formula with the Levinson formula, we made the following simplifying assumptions so that the mathematics was readily manageable but, of course, worthless to the group and ordinary people so far as results are concerned. We assume all standard lives subject to 1941 CSO q_x and all converted lives to 150 per cent of the same q_x. Take all functions at $2\frac{1}{2}$ per cent interest and assume valuation on same table. Our formula to produce total loss to the company would be set forth in Table 1.

P is taken as the net premium because this is the Terrific Mutual Life Insurance Company which makes no profit on its standard business. It is essentially this loss of premium element which causes the rate to climb by attained age. The mortality loss is relatively constant.

Under these assumptions, the Levinson formula on page 452 of his paper reduces to

$$\sum_{n=1}^{\infty} \frac{v^n l'_{x+n-1}}{l'_x}(q'_{x+n-1} - \tfrac{2}{3} q'_{x+n-1}) \cdot \frac{\ddot{a}_{x+n}}{\ddot{a}_x}$$

or

$$\sum_{1}^{\infty} \frac{1}{3} \frac{C'_{x+n-1}}{D'_x} \cdot \frac{\ddot{a}_{x+n}}{\ddot{a}_x}.$$

Now by using $C'_{x+n-1} \cdot \ddot{a}_{x+n}$ as a special commutation column and summing it to the end of the mortality table and calling this final summed result Z_x, Levinson's formula becomes

$$\frac{Z_x}{3\,D_x\,\ddot{a}_x}.$$

By actually evaluating the above formula, we obtained results within a few pennies of the total loss shown in our table showing that under these

TABLE 1

AGE	MORTALITY LOSS						PREMIUM LOSS		TOTAL LOSS
	A_x	A'_x	$A'_x - A_x$	$\ddot{a}_x$	$\ddot{a}'_x$	$\ddot{a}_x - \ddot{a}'_x$	P	$P(\ddot{a}_x - \ddot{a}'_x)$	
30......	413.80	461.80	48.00	24.034	22.066	1.968	17.217	33.88	81.88
40......	502.64	554.33	51.69	20.392	18.272	2.120	24.649	52.26	103.95
50......	602.03	654.93	52.90	16.317	14.148	2.169	36.897	80.03	132.93
60......	704.62	754.42	49.80	12.111	10.069	2.042	58.181	118.81	168.61

conditions the Levinson formula and our suggested formula are mathematically equivalent. We leave a more elegant mathematical proof to some of our aspiring students.

We do claim for our method that it is mathematically simpler to evaluate the different elements, and it does give an interesting separation of the cost into two parts. It has the additional advantage that the experience premium used could be on a basis different from the valuation net premium and in that case would produce different results from the Levinson formula. In general, it may be considerably easier to apply for the smaller company which wishes to compute its group mortality costs on any assumed table for converted lives and any other table for regularly issued lives.

W. RULON WILLIAMSON:

As one who perhaps made the first slender study on the cost of group conversions, and incorporated comments thereon in the Fellowship lec-

tures, over many years, I am particularly interested in Mr. Levinson's unique paper. Mr. Cammack's early papers carried the policy year experience for a select period of ten years. The Committee on Group Mortality has carried it for twenty years. With an improving standard mortality, it is not surprising that the percentage of actual to expected mortality should have risen so drastically.

In reviewing Mr. Levinson's references, I find that I said in *TASA*, XXXIV, 91: "Were these contracts viewed in the same fashion that we view the Ordinary Contract, a figure of nearly $100 per $1000 would follow." Later on the same page I added in reference to "the company with which I was then connected": "This company, during its entire handling of the business, has already sustained losses which are getting dangerously near 2 per cent of the accumulated premiums." (Mr. Cammack noted that part of this strain was due to disability.) At that time (1933) I noted the "slowing down of the growth of the group premium receipts." *That* trend has been dramatically reversed. But Mr. Levinson's figure of a little over $100 is not very far from my "nearly $100."

A week ago on the trail I talked with a group agent who said that he always took two applications for the terminating employee—one to give him commission should the life be acceptable and one to get the converted policy if he should be declined or rated. This method was noted by Mr. Cammack years ago. There seem to *be* expenses of acquisition on the group conversion under this system that might reduce the credit being allowed for smaller expense applications.

When the long-time secretary of the Carnegie Foundation for the Advancement of Teaching wrote his report on *The Fruit of an Impulse*, he also was dealing with a situation of "salvage." A perpetual trust had been formed in 1905 by Andrew Carnegie to give free pensions to subsequently retiring professors in about one hundred "non-sectarian colleges." Within a few years it was evident that the endowment would be inadequate for the purpose envisioned, and adding new "prospects" for the gratuitous pensions stopped in 1918. A year ago, after forty-three years from this "cut-off," the outgo was about double the originally planned half-million of interest income in the active system.

The impulse that started group conversions was the conviction of the New York State superintendent of insurance that there would be a significant group of people who would become uninsurable between the issuance of the group certificate and the termination of the certificate or of the contract, or who might have been "uninsurable on normal Ordinary practice from the start." There has also been, aside from the privileges of conversion, continuation of protection through various disability clauses.

There has been an unknown volume of replacements through the issuance of ordinary insurance regularly through the dual application system. There is a much larger residue who continue under none of these privileges. Only by compulsion would this group be protected. In this group there must be many substandard lives.

But the superintendent's "impulse" has flowered into a paternalistic system which *does* issue insurance to a large group of persons who seem to have averaged over 1,000 per cent substandard at the start. Moreover, it seems to be paid for by the persons covered, save for the figure variously estimated at $50–$100, at different times and by different methods. This practical philanthropy avoids the OASI situation of the major part of the windfalls to those less in need of them—a system that has now reached $12 billion, annually, of tax money, and expects an increase therein of 50 per cent in the next six years. The group getting the conversion windfall seem clearly motivated by alert self-interest—*enlightened self-interest* is the phrase more used.

Mr. Levinson's "saucer curves," his convenient $7\frac{1}{4}$ per cent annual decrement in reserve, his use of "a theory of mortality classes" in his smoothing curves surely held this reader's attention.

Finally, any term insurance program faces the dissatisfaction of the man who feels cheated when the low early cost of protection shifts into the rising, but normal, cost at higher ages. The fraternals, the veterans, government employees covered under assessment plans, and OASI itself—all have their seamy side. Group conversions to those that get them must seem much less seamy.

FREDERICK S. TOWNSEND:

Valley Forge Life reviewed the *TSA 1960 Reports*, performed calculations relating to the cost of additional mortality under group conversions, and derived results which are similar to those presented in this paper. We performed these calculations because of a particular problem in our company which I shall not bother to describe at this time. I only mention the fact so that it is known that I agree with the methods outlined by Mr. Levinson and that I sympathize with his results. My remarks will be directed toward practical considerations which do not agree with the theoretical nature of this paper.

The conversion charges calculated in the paper run from $46.16 at age 30, up to $218.42 at age 60. Mr. Levinson accepts the fact that it is not feasible to charge a group policyholder such a staggered scale of conversion charges and thus calculates an average conversion charge of $104.42. Although not specifically mentioned, I am sure that a primary reason for

calculating a uniform conversion charge for all ages is due to the fact that competition charges a uniform amount at all years for conversions, an amount which is considerably below the theoretical charge for age 60 and older ages. This being the case, a uniform conversion charge, which differs greatly from the narrow range of competitive charges, is also unsatisfactory for competitive reasons. Although the conversion charge may not be an important competitive feature to the prospective group policyholder if other features of the plan are exceptional, such a conversion charge may, in the long run, have an adverse effect on agency morale. Where the rest of the insurance industry is closely tied to a conversion charge of, say, $65.00, a change of $104.42 in a company's retention formula will seem out of place.

Since conversions at the normal insuring years are being made to the regular ordinary policy forms offered by the company, credit for commissions and expense savings should be given to the group policyholder to reduce the charge. In our own case, assuming Mr. Levinson's distribution of conversions which produced the conversion charge of $104.42, on commission savings alone we would recognize a savings of $31.70 in the first policy year, which would reduce the conversion charge to $72.70, exclusive of renewal commissions and other expense savings. It does not seem reasonable to charge group policyholders with conversion charges that are uncompetitive as related to current industry standards, unless the distribution of conversions under certain types of business are such that the conversion charge would be in extreme excess of current industry standards.

With respect to the conversion charges assessed within the company against the group department, the same argument of commissions and expense savings leads me to believe that the charge for group conversions as shown in the Gain and Loss Exhibit should logically be the same charge as assessed to the group policyholder.

It is once we get inside the ordinary operation itself that it is really proper to consider the breakdown of the conversion charge, measuring the mortality cost and the savings element in two different respects. It is not theoretically proper to set up a net conversion charge as a mortality reserve. The theoretical reserve of $104.42 should be established, but it does not need to come from the group department or the group policyholder. It must be remembered that mortality is an expense, commissions are an expense, and the cost of medical examinations and related information is an expense. Therefore, the entire mortality reserve of $104.42 should be set up within the ordinary department, but only $65.00 should come from the group department. With the issue of any new policy in the ordinary

department, there is normally incurred commission expense and certain issue expenses. It could properly be assumed that these expenses do occur on group conversions as well as on ordinary issues, but such expenses could be debited directly to commission and medical selection accounts and credited to the mortality reserve account, thus supplementing the net conversion charge so that the sum of the two are equal to the new reserve for additional mortality under group conversions. If a company were to operate by this theory, the initial reserve for additional mortality will be independent of the conversion charge established by the group department.

Needless to say, the valuation of reserves is simplified by use of the linear amortization of reserves over a twenty-year period. If a company's valuation is performed on a computer derived from individual policy records, it is much easier to calculate the level reducing reserve factor for the proper policy duration. Also, this is generally an accepted and readily understood method in various state insurance departments, where any change in method to an even slightly more complicated procedure, though easily explainable, may not receive ready acceptance.

Since the author's calculations are probably intact, I hope that he will take the opportunity to supplement his paper by showing the reserves for Table 7 at other than quinquennial durations. In any event, I congratulate the author on his concise and exact presentation of theory with respect to the cost of additional mortality under group conversions.

(AUTHOR'S REVIEW OF DISCUSSION)

LOUIS LEVINSON:

I am grateful to those who have added to the interest of this paper by their discussions. I appreciate especially the supplementation of valuable additional data by several of those discussing the paper. The volume of discussion is complimentary, but it makes difficult as detailed reply to the points made as they deserve. I hope to comment on the principal points contained in the discussions and bespeak the charity of those whose discussions do not appear to be adequately recognized.

Mr. Wood is right in his assertion that data relating to withdrawal and select mortality by sex are included in the study upon which the paper is based. In defense of my indicating otherwise, I can simply point out that the mortality data for females in the study are shown in abbreviated form and that the exposure is relatively small; but, nevertheless, I believe that the information given would have sufficed to draw reliable conclusions as to comparative male and female experience. I am happy that the oversight is repaired very satisfactorily in the material generously supplied by

Mr. Lew. His figures show excess group conversion costs separately for males and females based approximately on the assumptions I had used.

That variations among companies, other than from statistical fluctuation, occur in the mortality under group conversions is brought out by Mr. Holsten. This point is well taken. Differences in commission practices and in underwriting standards for both ordinary and group business, among other influences, may well affect the quality of the lives converting group to ordinary.

The question as to what expenses are properly attributable to the ordinary policies issued on conversion of group is raised by Mr. Holsten and also by Mr. Jackson. This problem is one facet of a general subject of tremendous dimensions in life insurance theory and practice. I certainly did not intend to suggest definitive treatment in this regard in the paper. As a matter of fact, as far as the charge for group conversions is concerned, the resolution of this question by any company must be achieved whatever method of accounting for such conversions is used.

I appreciate Mr. Holsten's citing for the record Mr. Elley's comments on the subject of group conversions in *TSA*, II. Several others at that meeting in 1950 contributed useful information on the same and related points.

Mr. Jackson points out that some lives, on termination of their group coverage, provide evidence of insurability in order to acquire a larger amount of insurance than is available on conversion or to purchase supplementary coverage, such as disability. He feels that the mortality among the lives converting would be lighter if these were included, and I would agree. However, I suspect that not many among such lives would be classed as conversions even if no additional coverage were involved: I believe that, among all companies which pay a new commission under these circumstances, there is generally a very high degree of "activity" among agents to take these lives out of the body of conversion policy-holders.

The proportions of the exposure on group conversions in the several age groups indicated by Mr. Campbell in the Metropolitan's experience would suggest heavier weighting at the older ages than I had used. If the experience of the other contributing companies is similar to that of the Metropolitan, the weightings employed in my paper should have to be somewhat heavier relatively for the 55–64 year age group. This would increase the over-all average cost for extra mortality.

In response to Mr. Campbell's inquiry as to mortality ratios for ages beyond those shown in Table 5, I am pleased to comply in the following

tabulation. This table shows mortality ratios by attained ages at quin-
quennial durations beyond the twenty-year figures given in Table 5:

GROUP CONVERSIONS: MORTALITY RATIOS (TO 1946–49 SELECT BASIC TABLES)

ATTAINED AGE	AGE GROUP			
	25–34	35–44	45–54	55–64
50.......	150% (21)*			
55.......	133 (26)			
60.......	117 (31)	120% (21)*		
65.......	109 (36)	111 (26)		
70.......	108 (41)	109 (31)	115% (21)*	
75.......	107 (46)	107 (36)	111 (26)	
80.......	106 (51)	105 (41)	107 (31)	110% (21)*
85.......	105 (56)	101 (46)	102 (36)	104 (26)
90.......	102 (61)	102 (51)	103 (41)	103 (31)

* Policy years in parentheses.

In the investigation by the Committee on Group Insurance Mortality,
all types of termination, including term extensions, were counted as with-
drawals. The method of hybrid classes used in the paper assumes that the
mortality among the lives withdrawing, in an experience such as this, is
lighter than among those who continue. This method does not explicitly
take any recognition of the mortality experienced once withdrawal takes
place, but the nature of the post-withdrawal experience is forecast, one
might say, by the quality of the lives which constitute the withdrawing
subgroup. If the proportion of term extensions to the other modes of with-
drawal is small, the average rate of mortality within the withdrawal sub-
group before and after termination may still be reasonably well character-
ized by the particular "y age" employed, even though the mortality of
the lives electing extensions is heavier than those withdrawing in some
other way.

The mortality experienced on term extensions, then, is recognized as an
element in the aggregate experience among the withdrawing lives. No
special computations were made to assess the additional extra cost de-
veloped on extensions; the method used tacitly assumes that for all with-
drawing lives the value at time of termination is as sufficient to provide
all terminal benefits as the value on corresponding standard policies.

The size of the addition Mr. Campbell cites for extra mortality on term
extensions ($5.09 per $1,000 insurance at time of conversion) surprised me.
I would say that a figure at this level indicates not only that there is a
heavy rate of death among those electing term extensions but that the
proportion of extensions among those withdrawing is materially higher

than occurs under standard policies. If this situation is shared by the experience of the other contributing companies, an increase in the over-all extra mortality cost would be called for.

The discussions of Mrs. Oldenkamp and of Messrs. Campbell, Vogel, Pickering, and Townsend all point up some contrast with the accounting methods advocated in the paper. I shall comment on some of the particular points raised below; but, in order to gain some perspective of the basic accounting—and actuarial—questions involved, I should like to describe the general alternatives we are concerned with. Assuming that there are determinable values for the extra mortality cost (let us say for the sake of argument, $100 per $1,000 of insurance converted) and for the savings in expense arising from the nonpayment of commissions and the realization of certain other economies (let us say $35 per $1,000 of insurance converted) it appears that there are three alternatives:

First.—Charge the group department with the net excess of the expected extra mortality cost over the anticipated expense savings—that is, a sum in the magnitude of $65 per $1,000 of converted insurance—and credit the same amount to the ordinary department. The amount credited to the ordinary department—$65—is also set up as a reserve liability. These transactions having been completed, no further flow of value occurs between the two departments—the ordinary department credit in Mr. Campbell's word is "nonparticipating." When the time at which expenses for such policies otherwise disbursed in the ordinary department arrives, there is, in effect, a recovery by the ordinary department of part of the deficit it originally incurred. This method is probably the oldest and most common in current use; it is the procedure to which Mrs. Oldenkamp and Messrs. Vogel and Pickering refer in their discussions (the method referred to by Mr. Vogel is "nonparticipating" in Mr. Campbell's sense).

Second.—Charge the group department with the aforementioned $65 and credit the ordinary department with the same amount; the reserve, however, would initially be set up for $100 per $1,000 to cover the full extra mortality expected. These transactions are also "nonparticipating," as in the foregoing alternative method. Mr. Campbell and Mr. Townsend describe procedures resembling this arrangement.

Third.—Charge the group department with the full estimated extra mortality cost (say, $100 per $1,000 insurance) and credit the ordinary department with the same amount; establish a reserve initially in the same amount. In the matter of expense savings, follow the natural sequence of events. Charge to the ordinary department *as they would otherwise be incurred* the expenses which would have been incurred in that department and credit these savings at such points to the group department. This method is the one described in the paper.

There are shortcomings, unquestionably in all three methods. Mr. Campbell, for example, expresses the opinion that the third of the above alternatives, the one I had proposed, is expensive and may be confusing. Mr. Pickering also believes that the expenses to be incurred would be high. Mr. Townsend seems to feel that it would be improper to charge the group department with more than the net amount (say, $65 per $1,000) even though the full reserve (say, $100 per $1,000) is set aside.

I readily acknowledge that there may be some practical problems in the implementation of what I consider the least objectionable procedure. I believe that in the first and second methods the criticisms are more significant. The reserve is actuarially computable—a sum in the magnitude of $65 appears to be inadequate; in any case, the ordinary department suffers an immediate loss because it may not take credit in an asset account for the still to be realized expense savings. Complexities resulting include distortions in various expense ratios (including such computations as New York Schedule Q) and in the Gain and Loss Exhibit (in tabular cost, for example).

Some of the problems arising in the first two methods can be corrected by subsidiary accounts. I am happy that the "broadsheet" account maintained by the Prudential described by Mr. Vogel has been made available by him to students of this subject. While this account apparently entails considerable administrative attention, I am sure it yields results commensurate with the effort. The reserve liability established for extra mortality on group conversions (initially for $65, say) is apparently thought of a little differently from the usual reserve, as may be concluded from Mr. Vogel's statement that reserve factors rise abruptly immediately after issue "owing to the concentration of commission and expense savings."

Mr. Townsend correctly assumes that the reserves shown in Table 7 for quinquennial durations decrease substantially during the first five-year interval. They do not decline, however, as rapidly as he apparently believes as is shown in the following year-by-year values for this period:

End of Policy Year	Present Values of Future Extra Mortality per $1,000 of Insurance Originally Converted (Weighted Averages—Ordinary Life)
0	$104.42
1	100.99
2	92.42
3	85.72
4	79.70
5	74.39

Mrs. Oldenkamp and Mr. Pickering both describe well-thought-out procedures for evaluating the present worth of the net of the mortality and expense factors. I have some reservations with respect to the employment of these net values for reserve purposes and in some accounting situations, as is indicated by what I have said before in this reply. However, I believe that the over-all financial effect is satisfactorily measured by computations of this kind.

The method I described did not, in fact, take into consideration the effect on the result of the relatively heavy rate of withdrawal which Mr. Pickering comments on. This effect combined with the very low average size policies he calls attention to might well have an important bearing on the real expense savings developing on group conversions.

I am grateful for the valuable material with respect to the mortality experience under group conversions which Mr. Lew presented in his discussion. His tables showing the effects on the excess mortality cost of group conversions of variations in mortality rates, withdrawal rates age distribution, and plan distribution are most illuminating. The most substantial changes in extra mortality costs, Mr. Lew shows, are brought about by variations in the rate of mortality among lives covered under group conversions. Mr. Lew calls attention to the necessity for keeping an eye on the trend in the level of mortality under group conversions and on the trend in age distribution. While lesser effects are exerted by variations in other factors, it may be wise to watch trends in them as well.

Mr. Hayes demonstrates the similarity in the nature of single premiums computed from tables of substandard mortality with those developed from the present value formula I had used. The results, I would expect, would come reasonably close, but the reserve levels are different, and withdrawals of these differing reserves would introduce differences in the results. In actual practice, I doubt that much work could be saved by Mr. Hayes's method. Preprepared tables could not be used; it would be necessary to compute special select functions in any event.

The present values shown in Mr. Collins' Table 1 (for the cost of extra mortality only) are consistent with the corresponding values shown in Table 1 of my paper. I believe they would be quite close if the five-year age difference were corrected for. Mr. Collins, observing that the proportionate relationship in the extra mortality for years 1 through 5 to that for years 1 through 20 is lower on the graduated basis than on the crude basis attributes the difference to a tendency of my method to defer some of the extra mortality to later years. I do not believe this to be the case. If similar comparisons are made with the values for years 1–15, it will be found that the ratios are much closer and, in two cases out of the

four, opposite from the relationship Mr. Collins notes. The reason for the phenomenon Mr. Collins comments on is the tendency for the crude death rates for years 16–20 to be relatively low, as the graphs in Chart A indicate. These low levels, in my opinion, are fluctuations not representative of the character of the experience. (I had pointed out in the paper that for this reason the rates for the years 16–20 were omitted.)

Mr. Williamson's comments on the background of the statutory requirement for the group conversion privilege is a most interesting note on the history of group insurance. In view of the differences in the scope of coverage and, I suspect, in the methods used and in the experience levels, the closeness of the figure he had developed in 1933 as a measure of the extra mortality with mine may be largely a happy coincidence. Mr. Williamson's 1933 discussion on Mr. Cammack's paper is quite comprehensive and very informative reading.

Mr. Cannon's remarks are well taken and are supported by the references to the weighting at the older ages commented on by Mr. Campbell. It would unquestionably be in order to think of even higher mortality costs on group conversions if a heavier proportion of such cases at the older ages were experienced.