CONTINUATION OF DISCUSSION OF PAPER PRESENTED AT THE EASTERN SPRING MEETING

THE NEW STANDARD ORDINARY MORTALITY TABLE

CHARLES M. STERNHELL

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W. HAROLD BITTEL:

At this time I should like to add a few comments to my discussion of this paper and the related informal discussion topics at the Eastern Spring Meeting. Objections have been raised to this new table as a statutory standard for calculating minimum extended term insurance values, both from the standpoint of actual adverse mortality experience and because of the lack of any provision for the expense of handling this benefit.

Recent studies indicate that there is not likely to be any loss from mortality under this benefit if advantage is taken of the right to use 130% of the rates of mortality for its calculation. The expenses in connection with this benefit arise from the need to keep records, principally for the valuation of liabilities included in the yearly valuation certificate. In the New Jersey Department we have cooperated with our domestic companies in working out procedures which keep the expense of this record-keeping at a minimum. I feel certain that all of the other Insurance Departments would also be willing to do all they can in this connection if this is or becomes a serious problem for their domestic companies.

There is another approach to this problem—if it really is a problem in any company. I had not realized that so many companies were so precise in their allocation of earnings and expenses, especially in determining allowances to terminating policyholders. Actually, it would seem to be entirely in order to charge the expenses of maintaining policies under extended term insurance to all policyholders where all or nearly all of them have this option as a nonforfeiture benefit in their policies. This procedure has been and is being followed generally in connection with settlement options and some other benefits.

ANDREW C. WEBSTER:

I should like to take the opportunity of putting before this meeting a question which has been puzzling me a great deal since I read Mr. Sternhell's paper. In the comparison made between the 15 large com-

panies in Table 12 the range of the actual to expected mortality was within fairly narrow limits. In the comparison made between the 33 companies in Table 13 the range was extremely wide, upwards of 50 points of variation. If these mortality results reflect the underwriting of the companies I should like to know what is wrong with the under-writing of the 15 large companies, one of which is the Mutual of N.Y. Apparently we are not doing as well as some of the other companies, though a little better than those at the bottom of the table.

I do not know whether the author of the paper has as yet a complete explanation but it is to me an interesting point.

Now if the supervisory authorities are going to apply a standard of mortality to determine whether a company is sound or not, what standard will they use with the 33 companies, one of which has an actual to expected ratio of 69% and another an actual to expected ratio of 112%?

(AUTHOR'S REVIEW OF DISCUSSION)

CHARLES M. STERNHELL:

I wish to thank those who discussed my paper at the Eastern and Western spring meetings. Their discussions add considerably to the value of the paper.

Mr. Guertin's discussion explains why the paper was written and describes the part played by the Society's Special Committee on New Mortality Tables.

Mr. Bittel's discussion explains the reasons underlying the recommendation by the Commissioners' Subcommittee that the margins included in the final mortality table should not be such as to produce mortality rates in excess of those developed in recent population mortality tables. His discussion also includes some remarks on the appropriateness of the new mortality table as a basis for the calculation of extended term insurance values.

Mr. Miller's discussion includes some interesting analyses of group life insurance mortality on the basis of Mortality Table X_{17}. As I have not had any experience in the group field, I will not attempt to comment on his conclusion that a separate group insurance mortality table is required.

Mr. Gundy's discussion indicates that the mortality experience on policies issued at standard rates to persons resident in Canada is only slightly lower, in the aggregate, than the mortality level reflected by Mortality Table X_{18}. Canadian mortality appears to be higher than Mortality Table X_{18} at ages under 30 and lower than Mortality Table X_{18} at ages 30 and over. It is interesting to note that Canadian male

population mortality rates are generally related to U.S. white male population mortality rates in a similar manner—*i.e.*, higher at the younger ages and lower at the older ages. While Mr. Gundy points out some of the known differences in the basic data, it is also possible that his mortality comparison reflects, to some extent, the effects of unknown differences in the basic data, such as differences in the distribution of exposures by duration or sex. Table 2 of my paper clearly indicates that the mortality rates at durations 6 to 15 are significantly lower than those at durations 16 and over.

Mr. Mayerson's discussion points up the fact that comparisons of the mortality experience of different companies can be very misleading unless they are based on a realistic mortality table, such as Mortality Table X_{18}. As indicated above in my comments on Mr. Gundy's discussion, even comparisons on the basis of Mortality Table X_{18} may be misleading if companies have different distributions of their exposures by duration or sex.

In order to clear up Mr. Mayerson's question about my reference to a "U-shaped pattern of margins," I should like to point out that my paper merely states that the analysis of variations in individual company mortality rates indicated that a "U-shaped pattern of margins" might be appropriate. While the preliminary margins agreed upon by the Special Committee reflected this U-shaped pattern, the margins finally adopted in the construction of Mortality Table X_{17} do not reflect this U-shaped pattern but are based on the use of a flat 15% margin at ages 52 to 92, inclusive.

Mr. Mayerson is quite correct in pointing out that the new mortality table is a mixed table rather than one based solely on the experience of male lives. In fact, there was no information available as to the relative proportions of male and female lives included in the experience underlying the new mortality table. A subcommittee of the Special Committee is currently investigating the relationship between male and female mortality.

Mr. Webster's discussion raises a very interesting question. He points out that the spread between the lowest and highest mortality ratios on the basis of Mortality Table X_{18} is only about 10 points (94% to 104%) for the 15 large companies in Table 12 of my paper while it is about 50 points (65% to 115%) for the 33 other companies in Table 13 of my paper. He wonders why the mortality ratios of some of the 33 companies are so much lower than the lowest mortality ratio among the 15 large companies.

As pointed out in my paper, the data submitted by the 33 companies

were generally not exactly homogeneous with the data available for the 15 large companies. Each of the 33 companies was requested to note appropriate exceptions where its data did not exactly correspond to the data available for the companies that contribute to the annual mortality studies of the Society. An analysis of these exceptions indicated that they might be responsible for the low mortality ratios of Companies 1, 3, and 4 in Table 13 of my paper. Elimination of these three companies would reduce the spread between the lowest and highest mortality ratios in Table 13 to about 40 points (75% to 115%).

In view of the facts that Table 13 covers the experience of 33 companies while Table 12 covers the experience of only 15 companies and that many of the companies included in Table 13 have significantly smaller exposures than any of the 15 large companies included in Table 12, it would be reasonable to expect a wider spread between the mortality ratios in Table 13 than between those in Table 12 solely on the basis of statistical theory. Another significant factor that may account for the wider spread in Table 13 than in Table 12 is the fact that some of the companies included in Table 13 operate in relatively limited geographical areas while practically all of the 15 large companies included in Table 12 operate over the entire country. Differences in the distribution of exposures by sex may also be partly responsible for the wider spread in Table 13.

Another important factor that may account for some of the low mortality ratios in Table 13 is the distribution of exposures by duration. Some of the companies included in Table 13 may have a considerably higher proportion of their duration 6 and over exposures at durations 6 to 15 than the 15 large companies included in Table 12. While Table 12 indicates that the aggregate mortality experience of the 15 large companies on the basis of Mortality Table X_{18} is 100.0% at durations 6 and over, an analysis by duration based on the data in Table 1 of my paper indicates a mortality ratio of 86% for durations 6 to 15, inclusive, and a mortality ratio of 104% for durations 16 and over. It is clear that the distribution of exposures by duration may have a significant effect on the mortality ratio of a particular company. This may account, to a large extent, for the fact that 18 of the 33 companies included in Table 13 have lower mortality ratios on the basis of Mortality Table X_{18} than the company with the lowest mortality ratio among the 15 large companies included in Table 12.

Mr. Buck's discussion provides an extremely valuable supplement to my paper by developing a set of select mortality rates for Mortality Table X_{18} to cover the experience during the first five policy years. Mr.

Buck discusses three possible ways of developing these select mortality rates. I am in complete agreement with his choice of the third method which adheres closely to the actual experience in the first five policy years even though it produces a sharp discontinuity between the mortality rates for the fifth policy year and the ultimate mortality rates shown in Mortality Table X_{18} for policy years 6 and over.

Table 2 of my paper indicates that a similar sharp discontinuity would have occurred even if the Special Committee had decided upon a 15 year select period instead of a 5 year select period. The mortality rates at durations 14–15 are significantly lower at every attained age than the mortality rates at durations 16 and over. There is obviously no blending of the select mortality rates at durations 14–15 into the ultimate mortality rates at durations 16 and over. The differential between the mortality rates at durations 14–15 and those at durations 16 and over is actually considerably greater at most ages than the corresponding differentials at shorter durations.

In order to illustrate this feature of the basic data more clearly, ratios of actual to expected deaths were calculated on the basis of Mortality Table X_{18} for various policy year durations. The exposures for each of the first five policy years were obtained from the intercompany mortality experience between 1950 and 1954 policy anniversaries, as described in Mr. Buck's discussion. The exposures for the sixth and later policy years were obtained from Table 1 of my paper, separately for each of the four duration groups shown therein. In calculating expected deaths for each of the first five policy years, the attained age was assumed to be the central age of the quinquennial issue age group plus the policy year duration minus one. In calculating expected deaths for each of the four subsequent duration groups, the central age of each quinquennial attained age group was appropriately adjusted for each duration group as indicated in my paper. The ratios of actual to expected deaths are shown below:

Policy Year Durations	Ratios of Actual to Expected Deaths on Basis of Mortality Table X_{18}
1	46.9%
2	58.5
3	66.0
4	71.0
5	73.2
6–8	78.9
9–13	86.2
14–15	94.6
16 and over	104.4

These ratios appear to increase sharply by duration during the first four policy years and much more slowly thereafter. The average increase per policy year is only about two percentage points from the fifth to the fifteenth policy year. There is still a sharp discontinuity at the fifteenth policy year, with the ratio for durations 16 and over about ten percentage points higher than the ratio for durations 14–15.

An analysis of New York Life mortality experience between 1953 and 1955 policy anniversaries indicates a similar discontinuity between mortality rates at durations 16 to 20 and those at durations 21 and over. Ratios of actual to expected deaths on the basis of ultimate mortality rates for durations 21 and over are shown below:

Policy Year Durations	Ratios of Actual to Expected Deaths on Basis of Mortality Rates at Durations 21 and over
1	53.5%
2	63.2
3	78.3
4	58.4
5	76.2
6–10	86.2
11–15	86.1
16–20	90.2
21 and over	100.0

In my opinion, the explanation of this phenomenon lies in the fact that ultimate mortality rates currently experienced on business issued prior to 1930 are still significantly higher than ultimate mortality rates currently experienced on business issued after 1930. This may reflect a significant improvement in underwriting and medical examination techniques in the early 1930's which has produced a class of standard business with lower ultimate mortality rates than those experienced on business issued prior to 1930. It may also reflect a significant change in the distribution of new business by sex after 1930.

In general, the significant discontinuity in mortality rates does not appear to be a function of duration but rather of year of issue. From various mortality studies which I have reviewed, it appears that the mortality rates experienced on business issued in the 1920's and prior years are significantly higher than the mortality rates experienced on business issued in the 1930's and subsequent years. This effect shows up in successive calendar years and appears to persist indefinitely. In other words, barring a war or epidemic, it appears that business issued after 1930 will

never experience the high level of ultimate mortality rates shown for durations 16 and over in Table 2 of my paper.

In this connection, it is interesting to note that the data for durations 16 and over include a large volume of experience on business issued prior to 1930. In fact, some of the business included in the data for durations 16 and over was probably issued prior to 1900, as there is no specified limit on the earliest year of issue included in the intercompany ultimate data. The first published intercompany experience for durations 16 and over, which covered the experience between 1939 and 1940 policy anniversaries, included business issued as early as 1864 (*TASA* XLII, 147).

This suggests the thought that ultimate experience mortality rates for currently issued business should, perhaps, exclude the experience on business issued prior to 1930 and be based on the experience at durations 6 to 20, or durations 6 to 25, instead of on the experience at durations 6 and over.

In any event, it appears that the decision of the Special Committee to base ultimate mortality rates on the experience at durations 6 and over was a conservative one and that the mortality data do not indicate any natural blending of the select into the ultimate mortality rates at any particular longer duration, such as ten, fifteen, or twenty years.