The Actuary

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The Actuary
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COMMITTEES

Editor's Note: This is another report on the operations of the Society's Committees. Mr. Biggs is Chairman of the Committee on Review.

Committee on Review

by John H. Biggs

A good scholarly journal is characterized first by its excellent papers and discussions. An important secondary characteristic of such a journal is the material included in its book review section. In this material the members of the profession have the chance to comment on the various new texts in their field and on a broad ranging variety of texts that impinge on their subject. The principal job of the Committee on Review is to make sure that the *Transactions* includes a complete and lively series of book reviews on actuarial and other mathematical texts. Responsibility for the Society's library is also vested in this committee.

We recently defined for the Society's Board of Governors the following purposes for our committee:

1. We should be sure to obtain competent reviews of all significant actuarial texts.
2. We should identify texts which are not of an actuarial character but of interest to a significant number of actuaries. We should obtain reviews or digests of these texts.

   (The underlying purpose of both (1) and (2) is to make the book review section of the *Transactions* useful, educational, and interesting to the members of the Society.)
3. Since the *Transactions* is a part of every actuary's "research data base" we should make sure that reviews, references, and digests form a complete and comprehensive source.

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The Board of Governors has received numerous enquiries about the Society's position in the Equity Funding situation. The Board has appointed an investigating Committee to keep in touch with developments and with the various authorities conducting investigations. The Committee will report back to the Board when the final results of the various investigations are available. Because of the many complexities in the situation it will likely be some time before these investigations are completed.

Thomas P. Bowles, Jr.
President

PENSIONS

Congressman John N. Erlenborn of Illinois, ranking Republican on the General Subcommittee on Labor of the House Education and Labor Committee, is pleased to announce appointment of

RUSSELL J. MUELLER, F.S.A.

Actuary and Minority Legislative Associate for the Pension Task Force.

Mr. Mueller is interested in receiving individual comments from concerned actuaries on any of the pension reform bills now pending before Congress. These comments will be considered as the Task Force continues its studies into the vesting, funding, and plan termination insurance areas. Copies of the Subcommittee Report, *Estimates of the Cost of Vesting in Pension Plans*, by Professor Howard E. Winklevoss of the Wharton School, are available upon written request to Mr. Mueller at: House Pension Task Force, 112 Cannon House Office Building, Washington, D. C. 20515.

DISABILITY AND PROBABILITY

by Robert L. Whitney

Jack Moorhead has urged me, partly in my capacity as Chairman of the Committee on Experience under Individual Health Insurance, to comment on the sales promotion statements that follow the format of:

> "For a man age 35 there is a 50-50 chance that he will be disabled for at least 90 days continuously before he reaches age 60."

With the help of many members of the Committee, particularly Jim Olsen and Ben Helphand, the following is what I have learned.

An early use of the above type of probability statement appeared in an article by Robert A. Brown, Volume III (1953), of the *CLU Journal*:

> "A further study of the hazard of disability based on the 1952 Society of Actuaries report reveals that, of a thousand persons who are age 35, 33% of them will suffer a long term disability (three months or longer) before 65."

The methodology used to determine the 33% involved starting with a radix of 10,000 individuals at age 35 and applying q_x and r'_x to obtain the numbers dying and the numbers becoming disabled during each of the years of ages between 35 and 65. The mortality basis for this double decrement table was the 1946-49 Ultimate Basic Table. The disability rates were the Benefit 2 rates shown on page 94 of the 1952 Report of Mortality and Morbidity Experience. The methodology used here is quite reasonable and practical. Refinements might have been introduced in applying the r'_x to reflect the effect of multiple disabilities. I am inclined to agree with Ben Helphand, who was responsible for the

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Deaths

Larry T. Steele
David P. Eakins
Julian A. S. Lamb
Lloyd G. Current

Disability and Probability

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calculation, that the effect of this refinement would have been negligible.

(At one time, I thought of running a series of calculations on a computer which essentially would check this assertion. It is now questionable whether I will follow through on this . . . and I believe this article will be of interest, without such a theoretical check).

A few years later, another actuary made an independent calculation with the same rates of disability, but with the 1958 CSO Mortality Table being used for rates of mortality. This resulted in a probability of 25.4% for an insured age 35 becoming disabled for at least 90 days before age 60. This is consistent with the nearly 33% probability for disability before age 65.

When the 1964 Commissioners Disability Table came along, other actuaries went through their own calculations following the above outlined methodology. When table X_{18} was used for mortality rates, the probability for an age 35 person being disabled at least 90 days before age 65 came out to 46%. When the 1958 CSO Mortality Table was used, the probability was reduced slightly to 45%. When Prudential Ordinary Male Mortality Rates were used, the probability derived was 45.5% for disability before age 65; for a person age 35 being disabled at least 90 days before age 60, the probability is 35.3%.

There have been a number of publications that have referred to a probability in the order of 68% or 69% for one person age 35 becoming disabled for at least 90 days before age 65. It has been determined that the basis for this assertion is the information shown on page 13 of Volume III of the Commissioners Disability Table. The information shown there is the number of lives disabled from date of disablement per 100,000 active lives exposed at each quinquennial age. This is fundamentally incorrect because if you start with a radix of 100,000 lives at the beginning age, you obviously will have fewer lives exposed at each succeeding age. In any event, the arithmetic for this erroneous method works out as follows:

$$\frac{5\,[i_{37}+i_{42}+i_{47}+i_{52}+i_{57}+i_{62}]}{100{,}000}$$

$$=\frac{5\,[981+1257+1676+2239+3110+4427]}{100{,}000}$$

$$=\frac{5\,[13690]}{100{,}000}=68\%\ \text{(ages 35 to 65)}$$

$$\text{or } \frac{5\,[13690-4427]}{100{,}000}=46\%\ \text{(ages 35 to 60)}$$

The 46% "answer" shown above may well be the basis for the 50-50 chance stated at the outset of this letter.

The probabilities derived from the above incorrect method have also been carried over to use in multiple life situations. For example, a number of disability buy-out promotional statements refer to the probabilities of at least one individual among two businessmen or among three businessmen becoming disabled. Obviously, any error involved in a one life basis would be compounded if carried over to multiple life situations.

Beyond the methodology, it is important to consider whether the 1964 Commissioners Disability Table is appropriate. The data used in this table for the first year of disability comes directly from 1957-61 inter-company experience. This includes experience from *all* occupational classes with a heavy proportion with elimination periods of zero or seven days. However, the sales literature using these probability type statements is generally aimed at the better occupational classes and frequently at professionals who usually purchase a longer elimination period. Special studies have shown that the frequency of disabilities lasting 90 days or more is higher under policies with short elimination periods than under policies with long elimination periods. With the above in mind, suggestions for appropriate disability rates for the population to which the sales promotion statements are being made have ranged from a factor in the range of 30% to 40% to a factor in the range of 50% to 60% of the 1964 CDT. In addition, it was noted that current experience at higher attained ages may not have matured and could have a high proportion of select experience. This relates not only to the traditional better health from approved applicants but also to the possibility of limited exposure to the temptations of early retirement, which could be a function of the length of time a policy has been in force as well as attained age.

Considering these suggestions, a series of calculations were made, two of which are reported here. The first used a multiple of the 1964 CDT which was 40% up to age 50 and increasing by 2% thereafter. The second used a factor of 55% increasing by 1.5% after age 50. In both calculations, the 1955-60 Basic Select and Ultimate Tables were used for mortality rates.

The first basis ("low") resulted in probabilities of 27.3% and 18.3% for a person age 35 being disabled at least 90 days before ages 65 and 60, respectively. The second basis ("high") resulted in corresponding probabilities of 32.7% and 23.1%. The 18.3% and 23.1% probabilities are a far cry from the 50-50 chance quoted at the outset with regard to a lengthy disability before age 60. It is interesting that the 32.7% matches the "nearly 33%" calculation made by Ben Helphand over 20 years ago.

I hope this article will be of interest to those who have occasion to deal with statements about the probability of lengthy disabilities. □

1973 YEAR BOOK

The names of the following individuals were inadvertently omitted from the lists in the Year Book.

Committee on Continuing Education and Research

Committee on Retirement Plans

Donald F. Campbell*
Richard C. Keating*

**Liaison Representatives from the Conference of Actuaries in Public Practice*

Committee on the Alternate Route (Special)

Ernest R. Vogt

Actuarial Meetings

June 4-5, Middle Atlantic Actuarial Club (Spring Meeting)

June 14, Baltimore Actuaries Club

June 21-22, Actuaries Club of Southwest (Spring Meeting)

July 12, Baltimore Actuaries Club