

SOCIETY OF ACTUARIES

Article From:

The Actuary

March 1986 – Volume No. 20, Issue No. 3

P.O. Box 19253

Seattle, WA 98109

Tel: (206) 281-9151



DAVID S. WILLIAMS JOSEPH W.S. YAU Competition Editor......CHARLES G. GROESCHELL

Editor Emeritus......ANDREW C. WEBSTER

Published monthly (except July and August) by the SOCIETY OF ACTUARIES, 500 Park Boulevard, Itasca, IL 60143. Richard S. Robertson, President, Richard V. Minek, Secretary, Michael B. McGuinness. Treasurer, Anthony T. Spano, Director of Publications, Nonmember subscriptions: students, \$4.50; others, \$5.50.

The Society is not responsible for statements made or opinions expressed herein. All contributions are subject to editing. Submissions must be signed.

EDITORIAL

The public, if it thinks of actuaries as expert at anything, may attribute to the profession some expertise in the length of human life. There is surely *some* basis for this confidence. Actuaries have learned how to collect mortality data, to construct mortality tables, and to calculate life expectancies. But what do they know about mortality in a wider sense? Is the actuary truly a mortality expert?

Suppose the actuary were asked, "Upon what factors does human mortality depend? and why? and how much?" Were he to take this complicated question seriously, and give it his best try, the actuary might come up with a classification of mortality variables as a basis for at least a partial answer.

Age: Above about age 40 age can be viewed as one measure of loss in "vitality", whereby this vague term is meant resistance to disease, the ability to regenerate, or simply the capacity to stay alive. But chronological age is far from the perfect measure. Older but healthier persons have more of these vital forces than the younger sick. Viewing mortality as importantly a function of age, actuaries must expand their concept of age beyond the easily-arrived-at birthday age and into the confusing world of "developmental," "equivalent", or "rated" age.

Genetic Influences: After age, the next most important mortality factor may be the male-female distinction. Gender seems to be the genetic factor with the most impact, but there are others. Remarks like "he comes from long-lived stock" may be scientifically insufficient, but they have more than a grain of truth. Tendency toward several of the life threatening diseases has been proven to be genetic. Genetic influences may be hard to quantify, but they certainly exist.

Environmental Factors: From one part of the world to another, mortality rates vary markedly by what is loosely called public health — sanitation, nutrition, control of contagious disease. Within a geographical area variations arise from individual choice or personal habits — smoking, exercise, diet, use of drugs, even defensive driving. Some occupations have high mortality tendencies, related to accident, exposure to toxins, or unusual stress. Environmental influences too are difficult to quantify, or even to separate from the genetic.

Time: Rates of mortality are lower than formerly. We are likely to attribute the changes to environmental factors, though we cannot be sure. For whatever reason mortality rates are not static, and we treat them as such at our peril.

All in all, actuaries have *some* concept of what affects human mortality, and *some* idea of why and how much. Mortality turns out to be a rather intractable phenomenon for study purposes, because of the large sample sizes needed for creditable results, the length of the observation period, and the difficulty in controlling the factors not under study.

Are actuaries experts in human mortality? In the sense of "do they have it well analyzed?" the answer must be no. But in another sense actuaries may qualify. At least they know why they don't know, and why it is so difficult to find out.

A NEW FEATURE?

The January editorial (asking for fresh ideas for this newsletter) has in spired a response suggesting that *Th*. *Actuary* start a column to which readers contribute short articles describing practical business problems in their everyday work. Problems may be of a technical or actuarial nature, or about management or communication. Solutions might be described, suggested, or solicited. Each article would be held to 300 words.

We think highly of this idea. An example appears below under the title PROBLEM. What might this new feature be called? How can readers improve upon the basic idea? How is readership response best handled?

PROBLEM

An actuary is helping a non-profit retirement home still in its initial planning stage. The general plan is to finance the cost of the physical plant by the *sale* of housing units to residents, charging for all other expenses and services through a monthly service charge There is, however, concern whether enough buyers can be attracted to make this condominium-type financing suc cessful. The initial sales price s is seen to be an obstacle.

The planners are considering two alternatives to the sale of units, neither of which would affect the monthly service charge, but both of which would modify the financing of the physical plant. Alternate (a) is the so-called lifelease arrangement, where the resident pays an entry fee *e* entitling the resident(s) to the use of the unit for as long as he, she or the survivor of a couple lives. Alternate (b) might be called the rental arrangement, wherein acquisition costs are charged as an addition *a* to the normal monthly service charge.

The planners ask the actuary to establish the relationships between the sales price s, the entry fee e, and the additional monthly charge a.

The actuary suggests that e=s[1-(l+i)⁻ⁿ] and $a=s \cdot i$, where *i* is the monthly interest rate in real terms (after inflation) and *n* is the average length (in months) of the life lease.

What do readers think of thi analysis? How would they determine . and n?

C.L.T.