



SOCIETY OF ACTUARIES

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## CREATIVITY RESEARCH ON ACTUARIES

by Dean C. Daww

*Editor's Note: We are greatly indebted to Dr. Daww and to the Journal of Creative Behavior for permission to publish this summary of Dr. Daww's report which appeared in the Journal. Dr. Daww is a consulting psychologist and is currently an associate professor at De Paul University's College of Commerce. He was recently Director of Personnel Research for the CNA Financial Corporation. Copies of the complete report may be obtained on request from Dr. Daww at the Human Resource Development, Inc., 520 No. Michigan, Suite 520, Chicago Ill. 60611.*

An actuary is a person who applies the theory of probability and statistics and the principles of finance to the problems of insurance, pensions, social security, vital statistics, and related fields. In the field of insurance, the actuary works with the probabilities of events such as death, sickness, disability, retirement, unemployment, property destruction and so forth. He must combine these probabilities with the principles of finance and administration to determine premiums, reserves and other financial particulars which provide the basis for the sound and efficient operation of the company and the protection of the policyholder.

Since most authorities agree that one may be judged creative if he can invent original and useful processes or devices, the subject of creativity in actuaries is of interest to insurance executives. They have shown increasing interest, for example, in research which has shown how creativity tests can isolate the personalities necessary to invent useful processes or original devices—that is, to identify those persons who can be expected to meet unusual events that

(Continued on page 6)

## SOCIAL SECURITY

We are glad to learn from the Department of Health, Education and Welfare that Charles A. Siegfried has been appointed to the Advisory Council on Social Security. This Council is appointed every four years in accordance with the terms of the Social Security Act. The Council will report to the Congress no later than Jan. 1, 1971 on all aspects of the Social Security program.

Robert J. Myers, *Comparison of Actual Experience under HI with Estimates of Various Organizations*, Actuarial Note No. 50, pp. 3, Social Security Administration, Washington.

This note compares actual experience under the Medicare program for the first full year of operation with the cost estimates that were made early in 1965 by the Social Security Administration (SSA), the Blue Cross Association (BCA), the insurance industry, and, to a lesser extent, the American Hospital Association (AHA). The note concludes that the estimates prepared by the BCA and the insurance industry were relatively close to the actual experience, more so than the ones prepared by the SSA. The principal weakness in the SSA estimates is considered to be the low utilization rates that were used for both in-patient hospital and extended care facilities benefits, the difficulty arising primarily because of placing too much dependence on data obtained from surveys of Old-Age, Survivors, and Disability Insurance beneficiaries.

Robert J. Myers and William D. Ritchie, *Mortality of the Aged before and after Medicare*, Actuarial Note No. 51, pp. 2, Social Security Administration, Washington.

This note analyzes the annual death rates of the United States population aged 65 and over for fiscal years 1961-68. The note concludes that the trend in these death rates does not, as yet, reflect any

(Continued on page 7)

## MORE ABOUT THE "PRICE" THEORY

by Joseph M. Belth

*Editor's Note: Dr. Belth is Professor of Insurance in the Graduate School of Business at Indiana University. We are glad to welcome him as a contributor.*

Mr. William Gould's article (*The Actuary*, March 1969) reports in some detail on his analysis of the level-price method. Although he shows an understanding of the mechanics of the method by performing the calculations, some of his references to my work suggest a lack of understanding of some of the subtleties of the method. The purpose of this article is to discuss those aspects that appear in need of clarification.

Mr. Gould's example involved the sixth year's price per \$1,000 of protection for two policies, each of which was a ten-year endowment issued at age 50. Both policies had the same premium: Policy A had cash values equal to net level reserves, Policy B had cash values that were "somewhat less," and the cash value *increase* in the sixth year was the same for the two policies. He concluded from his analysis that there is a "major defect" in the level-price method, in that "the formulae do not take proper account of significant differences in the savings elements of the two policies."

Apparently Mr. Gould missed an important point. The circumstances under which the yearly prices per \$1,000 of protection will duplicate or approximate the tabular mortality rates are described on pages 83-85 of my book, *The Retail Price Structure in American Life Insurance*. One of the necessary conditions is the use of cash values that are equal to net level reserves. Cash values that are "somewhat less" should not be expected to produce yearly prices per \$1,000 of

(Continued on page 5)

## Professional Conduct

(Continued from page 4)

are both pertinent to the question of proper transmittal of actuarial reports. These *Guides* have, in the Committee's opinion, been designed to assure the maximum practical safeguards against the misinterpretation or misuse of actuarial findings or recommendations. Thus, *Guide 10* provides for the inclusion in an actuarial report of such underlying data as are essential to the findings or conclusions reported. The key test is whether another actuary, unfamiliar with the situation, would find the information sufficient to appraise the conclusions.

*Guide 11* is designed primarily to assure that the information called for in *Guide 10* will, in fact, be communicated to the client, and that the client will be in a position to verify his understanding of the report directly with the actuary who prepared it, or with another actuary equally well qualified to explain the report. It also serves to give assurance to the actuary that his conclusions and recommendations are properly interpreted and applied.

*Actuary Acting for an Insurance Company.* When an actuary advises an insurance company on premiums, dividends, reserves and related matters, the client is the company, its policy-making executives and in some situations its board of directors, whether or not he is an employee of the insurance company. Thus, in such circumstances, the member should satisfy himself that the persons who requested his report are fully cognizant of the significance of his findings.

*Actuary Acting for a Policyholder of an Insurance Company.* When an actuary prepares a report for a policyholder (or a prospective policyholder), which contains actuarial costs or forecasts that are in the nature of recommendations rather than guarantees fully supported by the insurance company, *Guides 10* and *11* are fully applicable, since in this situation the policyholder is the client. For example, in offering recommendations as to contributions under a deposit administration pension contract, the actuary responsible, whether an employee of the insurance company or an outside consultant, should make certain that he is personally

identified as the source of the recommendation, that his report is not abridged or edited en route to the client, and that his availability to answer any questions regarding the report is known. This should apply whether or not there is an explicit recommendation of contributions, and whether or not the report states clearly the extent to which company guarantees are involved.

*Actuary in Relation to Non-Insured Pension Plans.* When an actuary prepares a report including cost or contribution figures in relation to a non-insured pension plan, *Guides 10* and *11* apply. Thus, if the report is delivered by a non-actuarial associate of the member, or through a bank or trust company, the Committee believes that the member should recognize the risk of misinterpretation or misuse, and he should guard against it by application of the procedures indicated by *Guide 11*. As a special case of the foregoing, it is the opinion of the Committee that a member should not become a party to any arrangement whereby a bank, investment advisor, insurance broker or other separate person or organization will use reports prepared by the member, unless the member is identified and it is clearly understood and agreed that the member's responsibility is to the employer whose plan or proposed plan is the subject of the report and that the provisions of *Guide 11* will be strictly observed. □

## "Price" Theory

(Continued from page 1)

protection that duplicate or approximate the tabular mortality rates. Contrary to Mr. Gould's assertion, the formulae take proper account of differences in the savings elements of the policies.

With identical premiums and cash value increases, the policy with the smaller cash values naturally shows the lower yearly price per \$1,000 of protection in the sixth year. Because of the smaller savings element, the policyholder forgoes less interest and enjoys more protection in that year. This characteristic of the level-price method, far from being a defect, is one of the strengths of the method.

Mr. Gould described as "another serious defect" the fact that the yearly price of protection "quite arbitrarily includes

the entire yearly expense of the policy." If it were necessarily true that the level-price method allocates all of the expenses to the protection element, I would argue that this is a characteristic rather than a defect of the method. But the fact is that the method does not necessarily allocate all of the expenses to the protection element. It depends upon the way in which the analyst views and selects the interest rate to be used in the price calculations. In my book, I suggested the use of a "net" rate of interest that the policyholder would earn with safety comparable to that found in life insurance. The word "net" was used to designate a rate net of income taxes, but it could just as easily be viewed as a rate net of expenses as well. In other words, the use of a lower interest rate would reduce the price of protection by allocating some of the expense factor to the savings element.

Mr. Gould pointed out that the level prices "are very strongly affected by the particular choices of assumed rates of interest, mortality, and lapse," implying that there is something wrong with the level-price method for that reason. In my opinion, the results of any sound technique for measuring the price of protection in the life insurance contract—a long-term financial instrument—will be strongly affected by the assumptions made. Conversely, any technique that is insensitive to the assumptions will not be satisfactory.

Mr. Gould discussed two other illustrative ten-year endowments issued at age 50—Policies C and D. Policy C with the higher cash values had a lower price per \$1,000 of protection than Policy D in the first policy year, and Policy D had lower prices per \$1,000 of protection in policy years 2 through 10. Mr. Gould suggested that Policy C was "obviously preferable from the policyholder's viewpoint, since it has higher cash values than Policy D with no difference in premiums." He went on to say that, if level prices were calculated with zero interest, zero mortality, and zero lapse, Policy D would show the lower level price, and that similar results would obtain if only interest or if only interest and mortality were used in the calculations. He then stated that the level price for Policy C would be less than for Policy D only with the introduction of lapse rates into the calcula-

(Continued on page 6)

## "Price" Theory

(Continued from page 5)

tions. He admitted that the level prices "are not obviously wrong in this example," but he added that "this result is merely an accident of arithmetic."

### Not An "Accident of Arithmetic"

There is nothing "obvious" in this complex area. Since Policy C had a substantially lower price per \$1,000 of protection in the first policy year and higher prices thereafter, the question of how the level prices of the two policies would compare must depend upon the assumptions used in computing the level prices. The reason for the "not obviously wrong" result when lapse rates were introduced is that positive (as opposed to zero) lapse rates have the effect of giving greater emphasis to the yearly prices in the early policy years, thus making the policy with the lower first-year price more likely to have the lower level price. This is not an "accident of arithmetic," but rather is part of the basic logic of the level-price method.

Mr. Gould believes that prospective price measurements should be based on the assumption that the policyholder will survive to the end of the period of analysis. In my opinion, such an assumption is inappropriate, particularly in the context of life insurance. A person buys life insurance because he is uncertain about surviving; if he assumes that he will survive, why should he buy life insurance at all? It would seem that a reasonable price-measurement technique should utilize probabilities of death and survival in order to assist the buyer in making an intelligent purchase decision.

Mr. Gould described the level-price formulae as "inherently objectionable," as "providing incomplete comparisons," and as producing figures that are "obviously fallacious." He then closed that portion of his diatribe with the flat statement that "it would be irresponsible to accept them as valid or meaningful indices of cost." Since none of the alleged "defects" is in fact a defect, and since his various illustrations do nothing more than illustrate the symmetry and consistency of the level-price method, I submit that his accusations concerning the method are groundless. □

## Creativity Research

(Continued from page 1)

might occur in industry or education, or in life itself, which fully covers the insurance business.

Actuaries themselves feel that, since the social and financial world is always changing, they are continually meeting new problems for which they must be versatile, ingenious, and aggressive. Casualty actuaries, for example, often have to deal with unexpected situations (such as hurricanes) where the data are inadequate, techniques are new, issues are not clearly defined, and political or regulatory influences are involved. They feel that their work places more demands on creativity because so little can be anticipated, each situation presenting a new challenge.

Life actuaries, on the other hand, believe that their job requires more discipline and meticulous craftsmanship to create more formal systems that are exactly reproducible by different men. They are faced with relatively predictable situations—death, for example, which happens with far greater statistical frequency than does the birth of destructive hurricanes.

Using the criterion of statistical infrequency of choice, the author found that the career of actuary itself was a "more creative one" than many others. He found, too, in other research that actuaries score much higher on all measures of the "Torrance Tests of Creative Thinking" than both electronic data processing computer specialists and underwriters.

The chart below compares results on originality and elaboration for 69 actuaries, 86 programmers, 65 systems analysts, and 38 underwriters. The differences are statistically significant.

	Originality	Elaboration
Actuaries	109.13	76.65
Programmers	95.87	61.80
Systems Analysts	97.89	65.85
Underwriters	90.00	63.03

In his research, the author has described good elaborators as those who are able to take an idea or task and spell out the detail. They can embroider a simple idea to make it fancy and attractive. Original thinkers, on the other hand, are those who are more able to get away from the obvious and break away from the beaten path. As innova-

tors, they see relationships and think of ideas and solutions different from others. Analyzing the results of his research, the author found that, interestingly enough, life and casualty actuaries do not differ in originality; however, life actuaries are significantly more creative in elaboration than their casualty peers.

Obviously, in casualty and life actuarial careers the demands of the job determine who remains and who succeeds. A high response to originality is apparently necessary to casualty actuaries; and, if life actuaries do not have or develop strong elaborative abilities, they do not long remain in that type of work. In some cases, highly creative people have a turnover rate more than twice as high as low creatives.

Further comparison of these two groups of actuaries—using the "Cattell Sixteen Personality Factor Inventory" and the "Pearson and Maddi Similes Preference Inventory"—confirms other research which indicates that highly creative individuals are much more affected by their feelings and emotions, experiencing them closer to the surface. That is, low creatives tend to submerge their feelings in order to attain greater calm and maturity, to keep in closer touch with reality.

The implications for management seem clear. More extensive research needs to be done on the use of selection instruments (the SPI in particular). A person scoring high on creativity tests would be predictably a greater risk for repetitive kinds of work. Furthermore, the climate of a particular company may have much to do with high turnover rates. If, for instance, highly creative people are more emotionally labile, unhesitatingly expressing their feelings, managers may tend to lose patience with what appears to be emotional instability and, hence the more creative may feel that the environment is not sufficiently nurturant . . . that it is, in fact, frustrating and inhibiting.

So far as the management of actuaries is concerned, the major question becomes: How best can we manage original thinkers in contrast with elaborating thinkers? In the broader context of managing any creative individuals, the question becomes: Under what conditions do which methods work best with which kinds of men in what organizations? □