

LOSS-OF-TIME HEALTH INSURANCE RESERVES
BASED ON THE 1964 COMMISSIONERS
DISABILITY TABLE

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INTRODUCTION

THE National Association of Insurance Commissioners in December, 1964, adopted a report of the Industry Advisory Committee recommending that a new disability table be used primarily as a minimum reserve standard for active lives insured under noncancelable or guaranteed renewable health insurance policies providing for loss-of-time benefits for disability due to accident or sickness. For nearly 25 years, the Conference Modification of Class III Disability Table has been in use although many companies hold much higher reserves than the required minima indicated by that table. The Joint Committee on Health Insurance appointed a subcommittee, known as Task Force 4, to study the problem of reserves for accident and health insurance. The final report of the Task Force, including basic tables of net annual claim costs for hospital and surgical expense insurance, was adopted by the NAIC at its December, 1956, meeting. The Task Force 4 report was concerned mainly with reserves for hospital, surgical and medical expense benefits and had suggested a temporary continuation of the Conference table as the minimum reserve standard for loss-of-time benefits.

While it is anticipated that regulations of most states will require the new table to be used for active lives subsequently issued, it is likely that many companies will find it convenient and practical to value all of their existing business on this new Commissioners Disability table. In the case of disabled lives, it has been recommended that the new table be used for the claims of *all* individual health insurance policies.

It is the intention of this paper to outline the characteristics of the table, to discuss the factors which influence reserve considerations, and to describe suitable methods of determining active and disabled life reserves for the types of benefit provisions now most generally offered. It is hoped that the discussion of this paper will include suggestions for the valuation of new types of benefits which may be presently in the course of introduction.

STATISTICAL BASIS

In 1962, the NAIC appointed a committee to evaluate the Conference Modification of Class III Disability Table for active life reserves under noncancellable loss-of-time policies. This NAIC committee then appointed an Industry Advisory Committee to provide actuarial assistance in such an evaluation and make recommendations for up-to-date reserve standards.

The fairly large volume of experience for the years 1958-1961, as analyzed by the Society of Actuaries' Committee on Experience under Individual Health Insurance, was reviewed by the Industry Advisory Committee. In addition to the material published in the 1961 and 1962 Reports Numbers of the Society, special tabulations were obtained from the Committee for use in constructing continuance tables. These data pertained to the first fifty-two weeks of disability—the period of prime importance to any company operating in the loss-of-time health insurance field. The net annual claim costs for accident and sickness disability, as derived from these tabulations, are shown in Appendix II, Part 1, of the Committee's Report. The data for accident and sickness are combined in Part 1 of Appendix I of the Report; this material is available in Volume III—"Committee Recommendations and Basic Tables" of the Volumes published by the Health Insurance Association of America in 1965, providing Monetary Values at $2\frac{1}{2}$ per cent and 3 per cent, based on the 1964 Commissioners Disability Table. The section of the Committee's Report covering the reserve standards for various types of loss-of-time policies and disabled lives has been reproduced as Appendix B of this paper.

The basic rates of admission and continuance provided by the Society's Committee were examined with particular reference to age, sex and occupation. Here, as throughout their analyses, it should be kept in mind that the objective of the Advisory Committee was to review each segment of the disability claim experience from the standpoint of reserve requirements; they were concerned with net valuation premiums, rather than with the type of net premiums that a particular company would consider desirable in preparing its gross premium rates. For example, in calculating rate-book premiums, consideration must be given to the fact that short-term disability claim costs for the more arduous occupations are much higher than for the "white-collar" occupations throughout the range of ages at which coverage generally is issued. This is true even when coverage is on a "nonoccupational" basis, in view of the longer

duration of disability experienced before resumption of heavy manual and/or outdoor activity.

Beyond age 55, there is some indication that those who have, for many years, been able to perform the outdoor, manual, or hazardous duties of the so-called "blue-collar" occupations (Occupational Group II of the Society's Morbidity studies) are more rugged physical specimens than the lives in the "white-collar" occupations (Occupational Group I of the Society's Morbidity studies.). Thus, although claim costs for the blue-collar occupations are substantially higher during the younger ages compared to those for professional and self-employed lives, the differential tends to decrease with attained age, becoming a minimum at the age group that has the most important bearing on the accumulation of active life reserves—ages 52–62. Since few of these policies are issued to lives aged 55 or over, the bulk of the active lives persisting to ages 52–62 will be in their "ultimate" policy durations where an important difference in claim costs is unlikely to exist except, perhaps, for policies with very short elimination periods. Although much of the experience on blue-collar occupations was acquired under "commercial" types of policies, it was believed highly probable that experience under guaranteed renewable policies would tend to confirm present indications. Under such circumstances, the slope of the claim-cost curve should be less steep for the blue-collar occupational group, resulting in a lesser need for accumulation of active life reserves than in the case of the white-collar occupational group.

In health insurance, occupation, *per se*, is outweighed in importance by other considerations which greatly affect the slope of the curve of claim costs which governs the need for accumulation of reserves. As all companies engaged in this business are aware, the most important actuarial considerations include:

1. *Underwriting standards.*—The high claim costs of short-term disability coverage for many blue-collar occupations require occupational duties to be defined very specifically; many companies have fairly rigorous eligibility requirements for long-term guaranteed renewable coverage. The need for restrictive riders based on previous unsatisfactory medical history is generally greater than for professional applicants. It is quite possible, as a result of cautious underwriting and policy design, for a company to anticipate better experience for lower-grade occupations on such policies, especially above age 45, than other companies have had with short-term "Commercial" policies. The intercompany experience is more likely to be a guide rather than a standard for "expected" rates.

2. *Persistency*.—This ever important factor in the determination of premium rates is of particular significance in connection with blue-collar occupations. Companies with long experience in this field take into consideration the likelihood of marginal workers being less persistent, because of their financial inability to continue paying the relatively high premiums of long-term coverage. On the other hand, the skilled and more highly paid workers are better able to keep their policies in force. In the building trades, for example, the "contractor" may work less and less with the tools of his trade as his business prospers and, by the time his policy has been in force ten years or more, he may be spending his full time at office and supervisory duties. The expert tool or die maker may open his own shop. The quality of such risks from the occupational standpoint tends to improve with persistency.

In view of the preceding, it should not be surprising that the Advisory Committee came to the conclusion that separate reserve tables, even for broad occupational groups, were neither necessary nor warranted. If the problem were one of determining office gross premiums by occupational class at least four subdivisions might be necessary. Such subdivisions of reserve tables would be impractical even if they had valid auxiliary use as guideposts in the calculation of office premiums. In health insurance, variations in age gradation that might arise between different occupational classes decrease in significance as each company appraises the forces of competition, methods of field prospecting, anticipated lapse rates and underwriting standards to which its premium calculations must be tailored.

The Committee found that variations in claim cost between male and female lives, as shown by the experience for the business and professional women accepted for loss-of-time coverage, would not justify the construction of a separate reserve table. Many of the generally accepted views of female mortality and disability rates, derived from experience under life insurance and its waiver of premium benefit during disability, have little or no application to the benefits of noncancellable loss-of-time coverage offered to career women. From recent studies of medical expense coverage, it has become clear that the very high claim costs incurred during the childbearing years tend to decrease after age 45 and, by age 65, the experience is better than that for males.

Unmarried females comprise a much larger proportion of the loss-of-time policies offered to women than in the case of life or medical expense insurance and, for them, the metamorphosis of the claim experience toward that of males may be expected to begin even prior to age 45. Standards of underwriting are high, maternity disability is excluded and

coverage usually is not renewable beyond age 55 or 60. Hence, inferences drawn from any type of health insurance coverage of housewives are not applicable. The problem of determining the slope of the disability curve by age for this relatively small proportion of the business was thought to be best resolved by adopting conservative values that would be suitable for a composite determination of reserves for male and female lives.

CONSTRUCTION OF BASIC TABLES

Termination rates for disabilities continuing into the second year derived from data submitted by about a dozen of the largest companies engaged in the long-term loss-of-time field were examined. As in the case of many previous studies of various types of disability coverage, it appeared that there is a significant difference in the termination rates of the second 12 months, depending on whether payments cease at or continue beyond the end of the second year. This situation is somewhat parallel to that observed with Group insurance temporary disability coverage for 13- and 26-week maxima.

Since the Committee was concerned primarily with determining actuarially sound reserves for long-term coverage of five years or more, it could not rely on data based mainly on the two-year coverages that accounted for the bulk of the business sold prior to 1960. Although the termination rates derived from these data influenced the Committee in its later graduations, particularly for ages 55 through 65, recent data were sought from life insurance records for disabilities lasting between one and five years. Several of the larger companies supplied such data and it was found that there had been no important departure from the 1930-1950 termination rates during the second and later years of disability for Benefits 2 and 3 as tabulated in the 1952 Reports section of the *Transactions*.

Successful underwriting of noncancellable loss-of-time policies requires careful attention to medical history, to the use of impairment riders and to other measures that will ensure a lower rate of disability and fewer cases per thousand of original exposure entering the second year of disability than might be acceptable under other forms of coverage. Heavy acquisition costs and high lapse rates make such cautious underwriting imperative. However, in the second and later years, very little, if any, difference is likely in the continuation of such claimants, regardless of the type of coverage under which they are then qualifying for benefits or the nature of the original contract (i.e., life insurance waiver of premium, long-term group, etc.) under which loss-of-time indemnity was

provided. The really long-term disabilities resulting from blindness, insanity, arthritis, or spinal injuries are unlikely to be affected by economic conditions, insuring clauses or whenever, or however, incurred. It is the nature of the disability rather than the type of policy, occupation or sex of the claimant that rules out a return to gainful employment after two or more years of benefit payment.

DETERMINATION OF NET VALUATION PREMIUMS

Values of S_x and H_x are shown on pages 28-100 and 115-187 of Volume III of the tables of Monetary Values published by the Health Insurance Association of America. Values of K_x may readily be obtained from summation of the H_x 's. The net valuation premiums shown in those volumes were developed by an electronic computer. Programs for the calculation of net premiums and mid-terminal reserves for active lives, as developed for the IBM 1620 Computer, are included in Appendix A of this paper.

These computer programs should prove useful to actuaries who may need to develop net premiums for some special plans not included in the published volumes. It is likely that more time would be required to develop such a program for any one particular plan, than would be consumed in making a direct manual calculation. It should be noted that some modification might be required when using a computer that is incompatible with the 1620 Fortran (with Format) system.

Terminal reserves for a particular benefit B for coverage to age y for whatever durations are needed for such special plans may be obtained manually by means of the formula

$$\left({}^B P_{x+t:\overline{y-x-t}|} - {}^B P_{x:\overline{y-x}|} \right) \ddot{a}_{x+t:\overline{y-x-t}|}.$$

It is believed that the published volumes contain all the values needed for every type of policy offered by most of the companies engaged in this business.

RESERVE METHODS

A. ACTIVE LIFE RESERVES

The recommendations of the Industry Advisory Committee (shown in Appendix B) call attention to the desirability of considering the aggregate reserve for all policies rather than attempting to determine individual equity for any particular policy. The wide variety of situations existing at the longer policy durations makes it difficult or impossible to determine the share of the total reserve that should be allocated to any small sub-grouping of the persisting policies. Considerations of special

hazards or impairments excluded by riders would make such an allocation even more difficult.

Since the total reserve is not intended to be a summary of individual equities or funds earmarked for specific classes of policies, it was felt that there should be no requirement for computing deficiency reserves where gross premiums for certain ages or plans are lower than the tabular net premiums. Nevertheless, particularly when an actuary is valuing the policies of a company no longer active in the business, a situation may exist which would indicate that the required minimum reserve for some policies should be increased by means of a deficiency reserve. As ever, it will be the duty of the actuary to make certain that the total liability of a company is valued as soundly as possible.

The Committee report mentions the actuarial desirability of preliminary term valuation methods, drawing a parallel with their very appropriate use in life insurance. Actually, the average lapse rates of individual health insurance during the first two policy years are so high that a two-year preliminary term reserve basis is even more appropriate than in the case of life insurance. The anti-selection that often evades the underwriters often produces high early claim rates which, when combined with the lapse problem, would have made it necessary to devise such a method if life insurance actuaries had not already originated it.

In considering the valuation method to be adopted in preparing the Annual Statement, a company has some degree of latitude as far as accounting methods are concerned although the alternatives recommended by the Committee are actuarially equivalent.

1. Many companies traditionally use a reserve equal to the mean of the terminal reserve at the end of the current and preceding policy years and show the result in the Statement line "Additional reserves for guaranteed renewable policies." The *pro rata gross unearned premium reserve* is shown in Part 2B of the Underwriting and Investment Exhibit of the Fire and Casualty Blank or Exhibit 9, Part 1, line 1 of the Life Blank. Casualty companies naturally prefer showing the gross unearned premium reserve on the same basis for all lines of business. This was the method required by the regulations based on the NAIC report of June 1941. In the Task Force 4 report, alternative methods were provided for but it is not believed that companies which were well established in the business were inclined to make changes in their accounting methods.

The reserve tables published by the Health Insurance Association of America in June 1965 show the mid-terminal reserves and the net valuation premiums separately rather than as a combined total. The tradi-

tional reserve method may therefore be followed without adding or subtracting net premiums from the tabulated values.

2. In recent years, since the adoption of the Task Force 4 report, some companies have been computing a mean reserve, adding one-half of the valuation net premium to the mid-terminal reserve. These valuation premiums are shown in Sections I and II of Volumes I and II of the published tables. When this is done, the mean reserves should be diminished by valuation net deferred premiums.

The Committee recommendations provide for groupings of policies by ages, years of issue and average amounts of indemnity. For companies without electronic computer facilities, these permissive methods should be very helpful in obtaining satisfactory over-all totals without an undue expenditure of time at the year-end.

Relation to Present Minimum Requirements

In the case of those companies which have been using reserve factors equivalent to, for example, 150 per cent of the Conference Modification of the Class III Reserve Table, sampling methods (illustrated in Table A) should provide a reliable indication of the approximate over-all increase needed to base all of their reserves on the new table. In the Annual Statement, such reserves for policies issued prior to the effective date of the 1964 Commissioners Disability Table could be described as a percentage of those required by the Conference Modification of the Class III table. It should then be a simple matter for old business reserves to be adjusted upward to the new basis over a two- or three-year period without disturbing existing valuation procedure. When such voluntary adjustment has been accomplished, a changeover to the newly published reserve values should reduce the amount of time required for the complete valuation of all policies. In making such a changeover it might be found desirable to adjust several years of issue at each year-end, as, for example, a block of business corresponding to a particular policy edition.

Reserve Adjustments

The introductory section of the HIAA reserve volumes provides fairly detailed valuation instructions with regard to the basic total disability benefits contained in individual health insurance policies. It will be of interest to consider the problems facing the actuary when valuing some of the auxiliary benefits or special premium arrangements to be found in many of these policies.

1. *Waiver of premium.*—In general, where the policy provides for waiver of premium during disability, there is a requirement that the

insured be disabled for at least ninety days, regardless of the elimination period of the policy. The formula for the net premiums for waiver of \$1 of either net or gross premium to age 65 would be exactly the same as for a monthly income benefit to age 65 with a three-month elimination period. However, the net premiums and the reserve factors would be per \$1,200 of annual premium waived rather than per \$100 of monthly income benefit.

TABLE A
COMPARISON OF NET LEVEL PREMIUM RESERVES
ON THE 1964 COMMISSIONERS DISABILITY TABLE
COMBINED WITH THE 1958 CSO TABLE
AND THE CONFERENCE MODIFICATION OF THE CLASS III DISABILITY TABLE
COMBINED WITH THE 1941 CSO TABLE, BOTH AT 2½% INTEREST
(Age 40 at Issue, Coverage to Age 65, One-Month Elimination Period
Mid-Terminal Reserves per \$100 Monthly Indemnity)

POLICY YEAR	MAXIMUM DURATION FOR ACCIDENT AND SICKNESS									
	5 Years					10 Years				
	1964 Commissioners			Class III	Ratio (3)+(4)	1964 Commissioners			Class III	Ratio (3)+(4)
	Acc. (1)	Sick. (2)	Total (3)			Acc. (1)	Sick. (2)	Total (3)		
3.....	\$ 8	\$ 39	\$ 47	\$27	174%	\$11	\$ 46	\$ 57	\$30	190%
5.....	13	69	82	46	178	20	80	100	52	192
10.....	25	132	157	85	185	38	148	186	88	211
15.....	32	163	195	97	201	48	164	212	84	252

In most cases, commissions are not payable on waived premiums; if they are, the gross premium should be assumed to be waived.

2. *Partial disability.*—The claim cost of partial disability benefits resulting from accidental injury does not necessarily show the same proportional increase with advancing age as does the total disability benefit. In many cases partial disability is closely related to the less important fractures which do not interfere importantly with the performance of occupational duties in the case of office and professional workers. Where a constant premium is charged, regardless of age, for the partial disability benefit, there would be no need to make any increase in the active life reserve on account of this benefit. Where company experience indicates a variation by age (often in occupations requiring considerable manual dexterity), a suitable addition to the active life reserve should be made.

Where benefits for partial disability are available only following seven days or more of total disability benefits as may be the case with policies offered to persons engaged in more arduous or more hazardous occupations, suitable adjustment should be made in the reserve calculation on the basis of the company's assumptions used in the determination of net premium.

Where partial benefits are provided for sickness disability, it should be assumed that the cost of such benefits varies with age in the same manner as total disability benefits. If the benefit is in the nature of a "rehabilitation" benefit payable to all long-duration claimants, adjustment in the net valuation premium should be made to make allowance for the full duration provided for such a benefit as an extension of the maximum period covered for total disability, adjusted according to the percentage payable.

3. *Retroactive benefits.*—This may involve any conventional benefit with an additional benefit equal to the disability payments that would have been made during the elimination period; for retroactive benefits such as this, it is expected that the elimination period would be of the longer duration (i.e., at least thirty days).

The additional reserve for the retroactive lump sum payment may be calculated by the conventional difference in premium formula by referring to the additional premiums for this benefit as they appear on page 252 of the published tables.

4. *Half-benefit after a specified duration.*—Where a step rate benefit of two units is payable during the first t years of disability reduced to one unit from the end of the t th year to age 65, the reserve can be obtained by combining the reserve for one unit of benefit provided for a maximum benefit duration of t years with the reserve for an equal unit for a benefit period terminating at age 65.

5. *Modified premium payment plan.*—Following is an example of the calculations to be made where the premium for each of the first three policy years is 90 per cent of the ultimate premium payable each year thereafter until age 65:

a) The ultimate premium is

$$P_x = \frac{K_x - K_{65}}{(N_x - N_{65}) - .1(N_x - N_{x+3})}$$

b) The terminal reserve at duration t , where $t < 3$, should be calculated retrospectively:

$${}_tV_x = \frac{.9P_x(N_x - N_{x+t}) - (K_x - K_{x+t})}{D_{x+t}}$$

c) The terminal reserve at duration t , where $t \geq 3$, should be calculated prospectively:

$${}_tV_x = \frac{K_{x+t} - K_{65}}{D_{x+t}} - P_x \cdot \ddot{a}_{x+t | \overline{65-x-t}|}$$

Care must be taken to make the appropriate adjustments when the preliminary term method is used.

6. *Aggregate indemnity limitations.*—Some of the older types of non-cancellable policies contain a provision for limiting the total indemnity payable over the life of the policy. A two-year benefit might be provided for each unrelated disability, subject to a maximum of five years' benefit for all claims. It would seem reasonable to disregard this limitation for policies where less than the basic benefit has been paid and the claimant has recovered.

In the case of policies where benefits have been paid for the full two-year period and the policyholder is still disabled, it is not believed that there is any need for an active life reserve. Relatively few of such cases continue to pay premiums and there was generally no provision for waiver of premium. Where full recovery has taken place, the few policies so involved may be valued on the basis of a further two-year maximum (or the remaining duration if less).

In my company, we have had instances where lives disabled for ten years or more have continued to pay premiums on lifetime benefit policies. Despite the very substantial disabled life reserve, we continued to set up an active life reserve since we were concerned with the adequacy of our total reserve on this closed block of business. The new disability table will provide generally for a conservative total reserve making such practices unnecessary.

7. *Incidental benefits.*—There are occasional instances of additional benefits payable for rare and unusual occurrences. Often, such a sales feature is included without any possibility of accurate actuarial determination of its eventual cost. If, in the opinion of the actuary, such a benefit will have a cost which increases with age, an appropriate percentage increase should be made in the active life reserve factors.

For illustration, consider a provision doubling the benefit in the event of disability resulting from accidental injury occurring in a public conveyance or a burning building. While the duration of such a disability may be affected by age, certainly the incidence rate should have no relationship to the age of those in acceptable occupations. I would not recommend any addition to the active life reserves for such a benefit. In the case of additional indemnity payable for blindness, paralysis or cancer,

the active life reserve should be increased by the same percentage adjustment that was made in determining the company's net premiums.

B. DISABLED LIFE RESERVES

The termination rates of the new table for disabilities continuing beyond one year are the same as those of the 1930-1950 experience for Benefits 2 and 3 combined, published in the 1952 Disability Study of the Society. There should be very little difference in the total reserve for longer-duration claims from that now computed from Class III annuities. In the case of claims with less than two years of disability at the valuation date, the companies with a large volume of loss-of-time claims should have acquired sufficient data on which to base their claim reserve values. Volumes I and II of the published tables provide tabulated values for durations of less than two years as a guide to companies lacking reliable data of their own.

For best results, it is necessary to analyze a detailed follow-up of a company's own experience, as provided for in Schedule O of the Annual Statement, to produce suitable reserves for its short-duration claims. For lives disabled between six and eighteen months, it might be possible for a company to need reserves as much as 50 per cent larger than those of another company offering apparently similar benefits. Significant variations in the persistency of recognized disability may be derived from different definitions of disability or limitations on the activity of the policyholder during the period for which payments will be allowed. Many policies provide that the policyholder must be unable to perform the duties of *any* and *every* occupation in order to qualify for benefits after one year of disability; prior to that point, benefits would be payable for a disability affecting only the policyholder's own occupation. In other cases, disability may be defined as a condition which would prevent the insured from engaging in an occupation for which he was reasonably fitted by education or training. Often, after the first six months of disability, there is a requirement that the disabled policyholder be confined to his home. The Committee's recommendations have made it possible for the actuary to exercise considerable freedom in his determination of claim liabilities where disablement has continued less than two years.

In addition to the definitions of disability mentioned above, further problems will arise in connection with the claims under policies where the company has reserved the right to cancel or refuse renewal. While such an insuring clause may not have any direct bearing on the definition of disability covered under the policy, it will be found that a large proportion of these "Commercial" policies either have a maximum duration of

two years or less for sickness disability or they may provide only for accident coverage. There is a wide area for actuarial judgment in the case of short-duration disability claims. Hopefully, only a very small proportion of the total number in course of settlement will have lasted beyond two years.

As mentioned above, Section III of the published reserve volumes provides tables (see pages 254-258) for claims for less than two years of disablement but it should not be inferred that the actuary can use such tables directly without making a careful review of the nature of the dis-

TABLE B
RESERVES FOR DISABLEMENT OF LESS THAN TWO YEARS
1964 COMMISSIONERS DISABILITY TABLE
AGE 27 AT DISABLEMENT—3% INTEREST
\$100 MONTHLY INDEMNITY

DURATION OF DISABILITY IN MONTHS AT VALUATION DATE	5-YEAR MAXIMUM			2-YEAR MAXIMUM		
	Tabular Factors 1964 Table	Experience Factors as % of 1964 Table		Tabular Factors 1964 Table	Experience Factors as % of 1964 Table	
		Accident			Sickness	
		Comm.*	Noncan.		Comm.*	Noncan.
3.....	\$ 824	50%	90%	\$ 501	82%	96%
6.....	2,499	33	62	1,167	51	81
9.....	2,499	38	72	1,019	55	85
12.....	2,712	40	75	551	89	131
15.....	2,712	42	81	551	91	134
18.....	2,712	44	88	551	81	81
21.....	2,712	45	90	551†	40	40

* Commercial policies are those renewable at the option of the company.

† If elimination period was thirty days, maximum remaining payment could not exceed \$400; if ninety days, \$600.

ability coverage provided under each policy form of the particular company for which he is making a valuation. For the well-standardized types of noncancellable loss-of-time policies, these tabulated values should serve as a conservative measure of liability, especially where the company's own experience is scanty. It is to be hoped that those contributing to the discussion of this paper may include some reference to the values they may be using currently for short-duration claims. Table B shows results of a recent follow-up of Metropolitan claims indicating possible percentages of the tabulated values of the 1964 Commissioners Disability Table that might be used at short durations.

It should be noted that if reserves were being set up for claims open at June 30 the factors could be reduced considerably for claims with less than four months of duration. The type of claim incurred in the winter months is far more persistent than the spring or summer claim, at least in the northern states.

Under paragraph 2(c) of Section II of the Committee's recommendations, it is specified that it is the duration of disablement that should determine the reserve value rather than the period during which payments have been made, following an elimination period. While there is some possibility that claims under policies with a very long elimination period will involve larger amounts of indemnity and consequent possibility of malingering, it will be found that, for the overwhelming majority of the policies in force, the future liability for claims lasting two years or more will not have been influenced by the original elimination period. The original date of disablement must always be considered the date on which the liability was first incurred.

Other Claim Liabilities

The very comprehensive discussion in Mr. Bragg's paper on "Health Insurance Claim Reserves and Liabilities" (*TSA*, XVI, Part I, 17) makes it unnecessary to define the types of liabilities to be considered under this heading. Reference should be made to the section of that paper devoted to the "Development Method" for suggestions on preparing the claim run-offs needed for determination of factors suitable for the particular company involved. Pages 118-23 of the Society of Actuaries textbook *Health Insurance Provided through Individual Policies* should also be consulted for a thorough exposition of methods and principles. The discussion that follows will be confined to adjustments in reserve liabilities for special types of benefits.

Partial Disability

The majority of loss-of-time policies provide a six-month maximum period with 40-50 per cent of the monthly indemnity payable for partial disability due to accidental injury. Quite often this benefit becomes payable after a very short period of total disability. Where accident benefits are not payable on the first day, it will be found that the period of total disability rarely exceeds a one-week elimination period in the case of simple fractures. It will be found that there is a considerable variation between occupational classes in the average duration of such disability. Manual occupations, such as dentists, butchers and building-tradesmen, obviously require a longer period of recovery from a finger or wrist fracture than required for office or executive occupations.

Claims for partial disability following less than three months of total disability may be grouped without regard to age or sex, but a separate factor should be determined for at least two groupings of occupational classes. In my own company, policies with provision for partial disability are not offered to blue-collar risks; even so, building "contractors" tend to claim that inability to work with the tools of their trade constitutes more than partial disability, despite anything stated in the application. A reserve factor of six weeks of indemnity should cover the liability for the better occupational classes; this should be doubled for other classes.

Where payment of the total disability benefit has continued for more than three months and partial benefits have been approved for further payment, it will be conservative to use the same reserve as for total disability until the claimant definitely accepts such payments. Only when there is clear evidence that the claimant is nearly ready to resume full employment should the possibility of return to total disability be ignored. On the assumption of one recurrence in ten cases, for long-term disability claims that have entered upon a partial status, a liability of 10 per cent of the applicable reserve for total disability on each claim should be added to the maximum amount of partial benefit remaining to arrive at a conservative total reserve.

Relatively few policies provide partial disability benefits for sickness. When included, the maximum period may run from 6-10 weeks. It is recommended that an average factor equal to six weeks of such indemnity be used. Where the benefit is in the nature of a "rehabilitation benefit" to be payable when the maximum period for total disability indemnity has been exhausted, the full remaining period of payment should be used to determine the liability for existing claims. For claimants totally disabled for two years or more, it should be assumed that the entire amount of rehabilitation benefit will be claimed and the discounted values should be added to the tabular disabled life reserve. The period to be discounted might be approximated by taking the annuity value raised to the nearest half-year.

Litigated Claims

Where a dispute exists as to the continuation of total disability, the disabled life annuity to be used may be based on the elapsed time between the date disability and the date of the last payment. This use of "paid" duration for resisted claims will result in a slightly lower but duly conservative total reserve.

Due and Accrued Liability

A study should be made of the average period of indemnity for which payment is due and has not been mailed out by December 31. When benefits are payable every four weeks during continuation of claim, it will be found that slightly over three weeks' indemnity is due and accrued on open claims. This amount should be added to the tabulated disabled life annuities for all but litigated claims. Where experience factors are used during the first two years of disability, this "due and accrued" allowance should always be added.

Pending and Unreported Claims

The Society textbook *Health Insurance Provided through Individual Policies* calls attention to the desirability of estimating the number of unreported claims instead of an average amount, such as might be suit-

TABLE C
END-YEAR CLAIM LIABILITY FACTORS
EXPRESSED AS A PERCENTAGE OF THREE MONTHS' PAID CLAIMS

COVERAGE	PENDING		UNREPORTED	
	Accident	Sickness	Accident	Sickness
Noncancellable.....	35%	55%	25%	70%
Commercial.....	45%	40%	60%	50%

able for a large volume of group insurance. Since the liability for claim adjustment expense is best calculated on the basis of unit cost per claim, the estimated number is helpful in determining both liabilities. Expressed as a percentage of the number reported in November and December, due allowance will be made for a sudden influx of claims because of an epidemic situation near the end of the year.

Table C shows some representative claim factors that have produced good results for the Schedule O filed by my company.

Although the members of the Advisory Committee were generally quite anxious to obtain more data on long-duration claims, there was a definite indication that each member would prefer to have such data contributed by other than his own company. The very substantial amounts that would be payable on these long-duration claims are not a very pleasant prospect for any actuary. Indeed, many actuaries must have serious misgivings concerning the current trend of issuing as much as

\$500 to \$1,000 of monthly indemnity payable to age 65. A maximum claim could easily involve payment of over \$300,000.

Individual noncancellable loss-of-time coverage is underwritten with great care and due concern over the total amount available to any one life, especially in the case of companies that learned during the thirties just how costly this type of insurance may be. While there is no doubt that medical science has eliminated a great deal of permanent disability arising from tuberculosis, diabetes, and certain sight impairments, there is still good reason to be cautious in underwriting long-term disability under any type of policy.

Unless a concerted sales effort is made to get a wide spread of risk and suitable reinsurance arrangements are made, the anti-selection to be expected may be sufficient to cause unfavorable financial results, even if our presently favorable economic conditions continue. It is hoped that the reserves required by the new 1964 Commissioners Disability Table will help to keep this business on an actuarially sound foundation.

APPENDIX A

1620 FORTRAN (WITH FORMAT*) PROGRAM CALCULATION OF NET LEVEL ANNUAL VALUATION PREMIUMS

```

DIMENSION AD(45),S(43),AH(43),AK(43),BD(43),AP(45),AN(43)
DO 1 I=1,43,5
1 READ 2,AD(I),AD(I+1),AD(I+2),AD(I+3),AD(I+4)
2 FORMAT(5F7.0)
DO 7 I=1,43
7 BD(I)=(.5*(AD(I)+AD(I+1)))      +.5+10000000.-10000000.
AN(43)=AD(43)
DO 8 I=1,42
J=43-I
8 AN(J)=AN(J+1)+AD(J)
AP(44)=0.
AP(45)=AP(44)
13 DO 3 I=1,43,5
3 READ 4,S(I),S(I+1),S(I+2),S(I+3),S(I+4),IBB,IMEP
4 FORMAT(5F8.5,I2,I4)
DO 5 I=1,43
5 AH(I)=S(I)*BD(I)+.5+10000000.-10000000.
AK(43)=AH(43)
DO 6 I=1,42
J=43-I
6 AK(J)=AK(J+1)+AH(J)
DO 9 I=1,43
AP(I)=AK(I)/AN(I)+.00005+1000.-1000.
II=I+21
9 PUNCH 10,IBB,IMEP,II,S(I),AH(I),AK(I),AP(I)
10 FORMAT(I2,I4,I3,F9.5,F9.0,F10.0,F8.4)
DO 25 I=1,45
25 AP(I)=AP(I)*100.
DO 11 I=1,45,5
11 PUNCH 12,AP(I),AP(I+1),AP(I+2),AP(I+3),AP(I+4),IBB,IMEP
12 FORMAT(5F7.2,27X,I3,2X,I4)
GO TO 13
END

```

The regular commutation symbols have been represented above as follows:

$$Dx = AD \quad Sx = S \quad Kx = AK \quad (Nx-N65) = AN$$

$$Dx+\frac{1}{2} = BD \quad Hx = AH \quad Px = AP$$

Other Coding:

IBB = Branch: Accident or Sickness

IMEP = Used for plan maxima and elimination periods

* With other Fortran variations some adjustments may be necessary.

APPENDIX A—Continued

1620 FORTRAN (WITH FORMAT*) PROGRAM
CALCULATION OF MID-TERMINAL ACTIVE LIFE RESERVES

```

DIMENSION A(45),P(45),TV(15)
S=10000000.
DO 1 I=1,40,5
  1 READ 100,A(I),A(I+1),A(I+2),A(I+3),A(I+4),IZ
100 FORMAT(5F9.5,18X,11)
  5 DO 10 I=1,40,5
  10 READ 200,P(I),P(I+1),P(I+2),P(I+3),P(I+4),IBB,IMEP
200 FORMAT(5F7.2,27X,13,2X,14)
  PUNCH 3,IBB,IMEP
  3 FORMAT(I2,I4)
  KL=1
  M=15
  K=0
  L=1
  IAGE=0
  ICTR=0
  JCTR=0
  MCTR=0
  LCTR=0
  KCTR=0
  J=0
12 DO 15 I=1,15
15 TV(I)=0.
  DO 40 I=1,M
  K=K+1
  TA=.5*((P(K)-P(L))*A(K)+(P(K+1)-P(L))*A(K+1))
  IF(TA) 30,20,35
20 TV(I)=TA
  GO TO 40
30 R=-.5
  GO TO 38
35 R=.5
38 TV(I)=TA+R+S-S
40 CONTINUE
  IAGE=L+21
  IA=TV(1)
  IB=TV(2)
  IC=TV(3)
  ID=TV(4)
  IE=TV(5)
  IR=TV(6)
  IG=TV(7)
  IH=TV(8)
  IJ=TV(9)
  IK=TV(10)
  IL=TV(11)
  IM=TV(12)
  IN=TV(13)
  IO=TV(14)
  IP=TV(15)
  GO TO (69,71,72,73,74,68,76,77,78,79,67,81,82,83,84),KL
41 ICTR=ICTR+1
  IF(ICTR-23) 50,50,55

```

APPENDIX A—Continued

```

50 J=J+1
   K=J
   L=L+1
   GO TO 12
55 JCTR=JCTR+1
   IF (JCTR-14) 60,60,65
60 J=J+1
   KL=KL+1
   K=J
   L=L+1
   M=M-1
   GO TO 12
65 KCTR=KCTR+1
   IF(KCTR-1) 900,70,75
70 K=15
   KL=1
   L=1
   J=15
   M=15
   GO TO 12
75 IF(KCTR-9) 80,80,85
80 J=J+1
   K=J
   L=L+1
   GO TO 12
85 LCTR=LCTR+1
   IF(LCTR-14) 90,90,95
90 J=J+1
   KL=KL+1
   K=J
   L=L+1
   M=M-1
   GO TO 12
95 MCTR=MCTR+1
   IF(MCTR-1) 900,105,110
105 K=30
   KL=8
   L=1
   J=30
   M=8
   GO TO 12
110 IF(MCTR-8) 115,115,5
115 J=J+1
   KL=KL+1
   K=J
   L=L+1
   M=M-1
   GO TO 12
69 PUNCH 4, IAGE,P(L), IA, IB, IC, ID, IE, IR, IG, IH, IJ, IK, IL, IM, IN, IO, IP
   GO TO 41
71 PUNCH 4 ,IAGE,P(L), IA, IB, IC, ID, IE, IR, IG, IH, IJ, IK, IL, IM, IN, IO
   GO TO 41
72 PUNCH 4 ,IAGE,P(L), IA, IB, IC, ID, IE, IR, IG, IH, IJ, IK, IL, IM, IN
   GO TO 41

```

APPENDIX A—Continued

```

73 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG,IH,IJ,IK,IL,IM
   GO TO 41
74 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG,IH,IJ,IK,IL
   GO TO 41
68 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG,IH,IJ,IK
   GO TO 41
76 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG,IH,IJ
   GO TO 41
77 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG,IH
   GO TO 41
78 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR,IG
   GO TO 41
79 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE,IR
   GO TO 41
67 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID,IE
   GO TO 41
81 PUNCH 4 ,IAGE,P(L),IA,IB,IC,ID
   GO TO 41
82 PUNCH 4 ,IAGE,P(L),IA,IB,IC Note: This program was prepared for the purpo
   GO TO 41 of publishing reserve volumes printed directly
83 PUNCH 4 ,IAGE,P(L),IA,IB from the tabulation. The program may be
   GO TO 41 shortened considerably for office use, where
84 PUNCH 4 ,IAGE,P(L),IA the columnar arrangement, printing of zeros,
   GO TO 41 and unnecessary decimal places would be of no
4 FORMAT(I4,F7.2,15I4) consequence.
900 STOP
    END

```

Code items used above are defined as follows:

```

IBB = Branch, Accident or Sickness
IMEP = Used for plan maxima and elimination periods
A = Annuities
P = Net Level Annual Valuation Premiums
TV = Mid-Terminal Reserve Factors

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APPENDIX B

RESERVE STANDARDS FOR INDIVIDUAL HEALTH
INSURANCE POLICIES

(AS CONTAINED IN REPORT OF INDUSTRY ADVISORY COMMITTEE)

I. Active Life Reserves.

1. General.

Active life reserves are required for all in force policies and are in addition to any reserves required in connection with claims. For policy Types A, B and C, described below, the minimum reserve should be determined as specified herein. It should be emphasized, however, that these are minimum standards and higher, adequate reserves should be established by the insurer in any case where experience indicates that these minimum standards do not place a sound value on the liabilities under the policy. For policy Type D, the reserve should be the gross pro rata unearned premium.

2. Types of individual health insurance policies.

- A. Policies which are guaranteed renewable for life or to a specified age, such as 60 or 65, at guaranteed premium rates.
- B. Policies which are guaranteed renewable for life or to a specified age, such as 60 or 65, but under which the insurer reserves the right to change the scale of premiums.
- C. Policies in which the insurer has reserved the right to cancel or refuse renewal for one or more reasons, but has agreed implicitly or explicitly that, prior to a specified time or age, it will not cancel or decline renewal solely because of deterioration of health after issue; however, policies shall not be considered of this type if the insurer has reserved the right to refuse renewal provided the right is to be exercised at the same time for all policies in the same category, unless premiums are based on the level premium principle.
- D. All other individual policies.

Notes:

- (a) The above does not classify "franchise" as a type of policy. Such policies are frequently written under an agreement limiting the insurer's right to cancel or refuse renewal. Usually the right is reserved to refuse renewal of all policies in the group or other categories such as those ceasing to be members of the association, and this would place such policies in Type D in accordance with the last clause under C above. However, if premiums are based on the level premium principle or if the renewal undertaking for the individual meets the requirements for Type A, B or C, the franchise policy should be so classified for reserve purposes.

- (b) A policy may have guarantees qualifying it as Type A, B or C until a specified age or duration after which the guarantees, or lack of guarantees, may qualify it as Type A, B, C or D. In such case, the policy in each period should be considered for reserve purposes according to the type to which it then belongs.
- (c) Where all of the benefits of a policy, as provided by rider or otherwise, are not of the same Type (A, B, C or D), each benefit should be considered for reserve purposes according to the type to which it belongs.

3. Reserve standards for policies of Type A, B or C.

- (a) Interest. The maximum interest rate for reserves should be the maximum rate permitted by law in the valuation of currently issued life insurance.
- (b) Mortality. The mortality assumptions used for reserves should be according to a table permitted by law in the valuation of currently issued life insurance.
- (c) Morbidity or other contingency:
 - (i) Total disability due to accident or sickness. The minimum standard should be the 1964 Commissioners Disability Table.
 - (ii) Hospital Expense Benefits. The minimum standard should be the 1956 Inter-company Hospital Table.
 - (iii) Surgical Expense Benefits. The minimum standard should be the 1956 Inter-company Surgical Table.
 - (iv) Accidental Death Benefits. The minimum standard should be the 1959 Accidental Death Benefits Table.
 - (v) All other benefits. The insurer should adopt a standard which will produce reserves that place a sound value on the liabilities under such benefit.
- (d) Negative Reserves. Negative reserves on any benefit may be offset against positive reserves for other benefits in the same policy, but the mean reserve on any policy should never be taken as less than one-half the valuation net premium.
- (e) Preliminary Term. The minimum reserve shall be on the basis of two-years preliminary term.
- (f) Reserve Method. Mean reserves diminished by appropriate credit for valuation net deferred premiums. In no event, however, should the aggregate reserve for all policies valued on the mean reserve basis, diminished by any credit for deferred premiums, be less than the gross pro rata unearned premiums under such policies.
- (g) Alternative Valuation Procedures and Assumptions. Provided the reserve on all policies to which the method or basis is applied is not less in the aggregate than the amount determined according to the applicable standards specified above, an insurer may use any reasonable assumptions as to the interest rate, mortality rates, or the rates of morbidity or other contingency, and may introduce an assumption

as to the voluntary termination of policies. Also, subject to the preceding condition, the insurer may employ methods other than the methods stated above in determining a sound value of its liabilities under such policies, including but not limited to the following: (i) the use of mid-terminal reserves in addition to either gross or net pro rata unearned premium reserves; (ii) optional use of either the level premium, the one-year preliminary term, or the two-year preliminary term method; (iii) prospective valuation on the basis of actual gross premiums with reasonable allowance for future expenses; (iv) the use of approximations such as those involving age groupings, groupings of several years of issue, average amounts of indemnity; (v) the computation of the reserve for one policy benefit as a percentage of, or by other relation to, the aggregate policy reserves, exclusive of the benefit or benefits so valued; (vi) the use of a composite annual claim cost for all or any combination of the benefits included in the policies valued.

For statement purposes the net reserve liability may be shown as the excess of the mean reserve over the amount of net unpaid and deferred premiums, or, regardless of the underlying method of calculation, it may be divided between the gross pro rata unearned premium reserve and a balancing item for the "additional reserve."

II. Claim Reserves—Present Value of Amounts not yet due on Claims (also called "Disabled Life Reserves" in the case of insurance providing loss of time benefits for disability due to accident or sickness).

1. General.

Reserves are required for claims on all health insurance policies, whether of Type A, B, C or D, providing benefits for continuing loss, such as loss of time or hospitalization.

2. Claim reserve standards for total disability due to accident or sickness.

- (a) Interest. The maximum interest rate for reserves should be the maximum rate permitted by law in the valuation of life insurance issued on the date of the health insurance.
- (b) Morbidity. The reserve should be established in accordance with the 1964 Commissioners Disability Table, except that for unreported claims and resisted claims and, at the option of the insurer, claims with a duration of disablement of less than two years, reserves may be based on the individual insurer's experience or other assumptions designed to place a sound value on the liabilities. Reserves based on such experience or assumptions should be verified by the development of each year's claims over a period of years along the lines of Schedule O.
- (c) For policies with an elimination period, the duration of disablement should be considered as dating from the time that benefits would have begun to accrue had there been no elimination period.

- (d) A new disability connected directly or indirectly with a previous disability which had a duration of at least one year and terminated within six months of the new disability should be considered a continuation of the previous disability.
3. Reserve standards for all other claim reserves.
- (a) Interest. The maximum interest rate for reserves should be the maximum rate permitted by law in the valuation of life insurance issued on the date of the health insurance.
- (b) Morbidity or other contingency. The reserve should be based on the individual insurer's experience or other assumptions designed to place a sound value on the liabilities. The results should be verified by the development of each year's claims over a period of years along the lines of Schedule O.
4. Valuation procedures.
The insurer may employ suitable approximations and estimates, including but not limited to groupings and averages, in computing claim reserves.

INDUSTRY ADVISORY COMMITTEE ON RESERVES FOR
INDIVIDUAL HEALTH INSURANCE POLICIES

RICHARD W. ERDENBERGER	DAVID ROBBINS
JARVIS FARLEY	JOSEPH C. SIBIGTROTH
BEN J. HELPHAND	PAUL E. SINGER
THOMAS H. KIRKPATRICK	EDWIN L. BARTLESON, <i>Chairman</i>
EDUARD H. MINOR	

November 12, 1964

DISCUSSION OF PRECEDING PAPER

ABRAHAM HAZELCORN:

Having recently had the task of preparing loss-of-time rates for a client, we were chagrined that subdivisions of information were not made which could have been used as guideposts in the calculation of gross premiums. Admittedly, the purpose of the 1964 Commissioners Disability Table would not have been furthered by using refined subdivisions for reserve tables. We would therefore like to know whether it is possible to benefit from the information which no doubt exists in further detail for broad occupational groups.

One approach that we recently used in calculating gross premium rates for noncancellable loss-of-time policies was to make a profitability study. We began with the average premium rates of several companies for what appeared to be substantially similar benefits. We then calculated the present value of book profits (as expressed, roughly, in Mr. James Anderson's paper for ordinary life insurance, *TSA*, XI, 375). For mortality we used the 1959-60 Select and Ultimate Table. For morbidity and reserves we used the D Table, since the 1964 Commissioners was not available to us at that time. We used 4 per cent interest, the commission rates intended by the client, a premium tax of 3 per cent, Linton B withdrawal rates, expenses per policy of \$80 in the first year and \$12.50 each renewal year, an average size of \$300 per policy, and a discount rate for book profits of 4 per cent.

With these assumptions we analyzed the present value of profits for a two-year indemnity period with a fourteen-day sickness and zero-day accident elimination period at issue ages 25, 35, and 45. The profit was highest at age 25, was negative at 35, and was approximately three times as negative at age 45. For a five-year sickness and lifetime accident indemnity period with a thirty-day elimination period, the same pattern of decrease in present value of book profit by age existed, with, however, a positive present value at age 35 and a negative one at age 45.

For an indemnity period to age 65 for sickness and lifetime for accident and a thirty-day elimination period, we found a relatively high level profitability. This indicated that profitability is greater for a long-term indemnity period than for a five-year or lesser indemnity period; for the elimination periods used, the maximum profitability is at the very young ages with reduced profitability beginning at or after age 35.

We recalculated the present value of book profits by changing the

single assumption of average size. With the change of average size from \$300 per policy to \$600, we had a positive present value of book profits throughout. The level of increase in profits was fairly stable.

Mr. Minor has made some statements about female experience which we feel are significant. He mentioned the fact that the higher female claim costs during the childbearing years tend to decrease after 45 and that by 65 female experience is better than male. He also calls to our attention the difference in claim costs and pattern of claim costs between unmarried females and housewives.

GERALD A. LEVY:

Mr. Minor has presented a timely paper in which I believe all actuaries responsible for the valuation of health insurance will find many valuable ideas. As a health actuary for a reinsurance company, I was particularly

TABLE 1

DURATION SINCE DISABLEMENT	BENEFITS AT FIVE YEARS		BENEFITS TO AGE 65		LIFETIME BENEFITS	
	Liability	Incurred Claim	Liability	Incurred Claim	Liability	Incurred Claim
6 months-1 year.	\$25,600	\$31,600	\$ 66,800	\$ 72,800	\$ 71,900	\$ 77,900
4-5 years.	2,900	56,900	114,700	168,700	128,500	182,500
Total surplus charge after 10 years.	0	\$56,900	\$112,700	\$226,800	\$135,400	\$249,400

interested in his reference to the substantial liability associated with the long-term disability claim, under this new valuation table. This is one of the principal reasons why a company reinsures its disability business. Below I have elaborated somewhat on the effect on surplus of a long-duration claim. If thoughts turn to reinsurance because of these potentially large claim costs, then the selection of retention limits may be of concern. I have also outlined some of the factors which influence the choice of retention limits and related the health insurance retention limit to the life retention. Also presented are details about eleven companies showing their retention limits. My final comments cover a related area to Mr. Minor's observations on reserves, that is, the effect that the form of reinsurance has on the reinsurance reserve deduction.

Claim Reserves

In Table 1 are year end unaccrued claim reserves under a few hypothetical cases with long-term benefit periods, assuming an age at dis-

ablement of 37 and \$1,000 of monthly income. The total charge against surplus after one, five, and ten years of a claim is also shown. The substantial number of dollars involved does show the need for caution in pursuing the high-income, long-benefit type of business. The claim reserve on long-term benefits reaches a maximum value at about eight years after the date of disablement. At the time of maximum liability, the company under a long term claim has paid out about \$100,000.

Retention Limits

The selection of a retention limit usually depends on the reasons for seeking reinsurance, the financial structure of the company, and its scope of operations. The mathematical aspects are included in that branch of the Theory of Risk known as Ruin Theory. However, before any mathematics can be applied to the related questions of retention limits and security loadings, a number of subjective decisions must be made, taking account of capital and surplus, premium volume and profits, expenses and expense loadings, and so forth. My observation is that the mathematical approach is not often used. A major determinant is the nature and geographical spread of risk which a company actively pursues. When a company's main source of business is one region, or one industry, or one type of risk, this fact suggests selection of lower retention limits. What competition does is also considered. Another factor is the underwriting competence, using competence in the most general sense which also includes both experience and ability.

Retention schedules can be very complicated even with only a few variables. For example, it is logical to vary retention by benefit period to retain a relatively constant liability. However, ten different benefit periods could generate up to ten retention limits. Then add another variable, say, substandard classification, and it is not too hard to see how easily this can become a very costly monster to administer. Therefore, in practice, we usually find simply expressed retention schedules. For example, the benefit-period aspect may be recognized by setting a lower retention for periods of five years or more than for the shorter benefit periods of less than five years. Sometimes a lower retention limit will be used for substandard business.

Because so many subjective factors enter the choice, much judgment is needed to blend these into a retention-limit schedule. I have not come across any simple solutions when retention limits or changes in retention limits are needed. However, it may be of interest to observe the choice made by a number of companies. Table 2 lists eleven companies with their disability (expressed as a monthly income) and life retentions, their assets, their capital and surplus. All these companies had a dis-

ability premium volume below two million, and all except Companies A, D, and J were below one million. It appears that life retentions tend to vary from about $\frac{1}{2}$ per cent to 1 per cent or more of capital and surplus. Let us consider that a comparable A&H incurred claim value for a long term benefit for each \$100 of monthly income has an equivalent present claim value of about \$10,000. Then the health retention as a ratio to the life retention seems to be about $\frac{1}{2}$ to over 1 times the life retention. My own preference is for the A&H retention as a ratio of the life retention to be not greater than $\frac{3}{4}$. Health business is open to greater influence

TABLE 2

COMPANY	RETENTION		CAPITAL AND SURPLUS	ASSETS
	A&H	Life		
A.....	\$300	\$ 15,000	\$ 1,800,000	\$ 5,200,000
B.....	300	75,000	8,700,000	125,300,000
C*.....	100/\$200†	25,000	4,500,000	62,800,000
D.....	200/ 300†	50,000	5,100,000	53,700,000
E.....	300/ 500†	50,000	3,800,000	39,500,000
F.....	300	25,000	1,700,000	12,400,000
G.....	200	40,000	6,800,000	57,700,000
H.....	100/ 300†	25,000	2,500,000	32,000,000
I§.....	100/ 400†	10,000	500,000	600,000
J.....	200+50% excess	200,000	73,600,000	753,500,000
K.....	200	50,000	3,600,000	30,900,000

* This company is highly regional, and its business is mainly written in one industry.

† Lower retention is for longer benefit periods, say, of five years or more.

‡ This company varies its retention by occupational classification.

§ This company, also, reinsures retained amounts after two years of claim under extended elimination period reinsurance.

from uncontrollable outside forces—such as economic cycles, social benefits, technological changes—all of which affect working habits and so forth; these exert a considerable influence on the level of future claim cost. This greater unpredictability suggests that a lower comparable retention limit should be used in health insurance than in life.

The method of reinsuring health benefits used most often is coinsurance; however, there are also at least three alternative reinsurance methods being used. These are attained age risk reinsurance, extended elimination period, and modified coinsurance. A discussion of each of these follows.

Coinsurance

Under this method the reinsurer assumes a specified share of the ceding company's contracts on a case-by-case basis or on a block of business. The active reserve on the reinsured portion should be calculated

on the same valuation basis as is used for the entire case or block. However, when groupings, percentage adjustments to reserves, and other approximations are used in determining total reserves, I suggest that such approximations be tested before they are applied to reinsured business. Normally, the reinsured volume of business is relatively small in comparison to the total portfolio, with different issue-age and benefit characteristics. For example, the reinsurance may include a larger percentage of medically impaired lives with an older average issue age and larger benefit amounts. The medically impaired lives could be issued with a waiver in which we would normally not make any reserve distinction. Otherwise they could be issued with a percentage increase in the gross premium. This type of business would usually have a percentage increase in reserve. Certainly the determination of all liabilities is important, since they directly affect surplus.

This also includes the reinsurance reserve; we would not want to create or deplete surplus by use of an inappropriate reinsurance reserve deduction. Some state insurance laws embody this principle by requiring that the reinsurance reserve deduction be determined similarly to the gross reserve. The New York Code, Section 77, is cited as an example of this.

Attained Age Risk Reinsurance Method

This is reinsurance covering the main morbidity element for one year. It is similar to life reinsurance on a yearly renewable term basis. The reinsurer charges its premiums at the attained age of the insured. Hence, no additional reinsurance reserve is accumulated. Only a deduction for the unearned gross reinsurance premium is allowed. If a company uses mean reserves instead of an unearned gross premium reserve plus a mid-terminal reserve, then the appropriate offset would be one-half of the net one-year term premium at the attained age on the valuation basis used to value retained business. Often a good approximation to this unearned premium reserve (net or gross) is a percentage of incurred gross reinsurance premiums.

Extended Elimination Period Reinsurance Method

This reinsurance basis is sometimes classified as an excess claim or, more generally, a nonproportional reinsurance method. The coinsurance and attained age methods are excess amount or proportional reinsurance methods. Under the extended elimination method, the reinsurer enters a claim after the ceding company has been paying the claim for a predetermined period, for example, one, two, three, or five years. Some state insurance laws (for example, New York, Section 74) allow only

the unearned gross or net reinsurance premium as an offset to active life policy reserves when nonproportional reinsurance methods are used. In other states, which allow a deduction for all active reinsurance policy reserves, special reinsurance reserves at long elimination periods will also be an offset to the mid-terminal or mean reserves. These special reserves should be calculated using methods consistent with the other reserves of the ceding company. The incidence of future claim cost on long elimination periods is flatter, and hence a much lower reserve is to be expected.

Modified Coinsurance Method

This is a proportional reinsurance method in which the ceding company initially retains the assets generated by this business, including those assets from the reinsured portion also. Any surplus drain during the early policy years is also transferred to the reinsurer. There are no reinsurance reserve deductions from either the active or disabled reserves. The ceding company has the entire reserve. The reinsurer pays to the ceding company its share of the increase in policy and other claim reserves through the reserve adjustment. The reserve adjustment can be considered as miscellaneous income to the ceding company.

Disabled Reserves under All Methods

The reinsurance deductions for accrued and unaccrued claim reserves should be calculated using methods consistent with those for calculating the reserve on gross business. Only the extended elimination period method requires special reinsurance claim reserves whose factors differ from those used to calculate the reserves held by the ceding company. This results from the reinsurer's entering a claim several years after the ceding company. Special claim reserve factors are needed during the extended elimination period to provide for a claim annuity beginning several years after the date of disablement discounted back to the valuation date. Excess claim reserve factors can be calculated from the published source by taking the difference in factors at the appropriate benefits.

ANTHONY J. HOUGHTON:

Mr. Minor should be commended for his very fine paper and the Committee for its development of the 1964 Commissioners Disability Table. The basic values and reserves are presented in a very usable form, thus increasing their value.

The only feature of the new table that I found disturbing was the separation of the claim costs into the accident portion and the sickness portion. As I understand the construction of the table, the disability experience for the first year of disability was derived from intercompany

experience using combined accident and sickness claims. This combined experience was graduated as a continuance table for quinquennial ages and extended for the second and later years of disability by use of termination rates from the 1952 Disability Study. The Committee then analyzed the underlying experience to determine the portion of the claims which was due to accident for each age. The accident factor was then used to develop a separate accident continuance table. The total number of claims which persisted at least eight days per 100,000 lives exposed was multiplied by the accident factor to produce the number of accident claims lasting at least eight days. The continuance table was then continued, using the same termination rates as had been used in the combined disability continuance table. This method produces the same proportion of accident claims to sickness claims for every waiting period. The method also produces the same average duration of disability for both accident and sickness claims. When the accident and sickness maximum benefit periods are the same, the relative proportion of accident claims is of little importance. However, when the accident maximum indemnity period is longer than the sickness indemnity period, the split between accident and sickness claims is very important. Many companies, of course, issue lifetime accident benefits combined with one-, two-, or five-year sickness maximum benefit periods.

Several sources of information suggest that accident claims become relatively less frequent as the elimination period increases from seven days to three months and longer. The 1964 Commissioners Disability Table uses factors of 33.0 per cent at age 40, decreasing to 25.1 per cent at age 49 as the portion of accident claims at all durations of disability. While these factors seem satisfactory as the relative cost of the first year of disability following a seven-day elimination period, they may be a little low as a relative frequency of eight-day claims and quite high as a relative frequency of one-year claims. The 1952 Disability Study analyzed claims by cause with respect to relative frequency and persistency. Tables 15 and 17 show the following data for age 40-49:

BENEFIT PERIOD	ACCIDENT CLAIMS AS A PERCENTAGE OF TOTAL CLAIMS				
	1	2	3	4	5
1.	3.5%	11.5%	11.3%	10.7%
2.	2.6	10.3	8.7	10.2	11.7%
3.	2.1	10.8	9.3	7.9	7.7
4.	2.3	11.4	10.0	5.2	9.3

BENEFIT PERIOD	RATIO OF PERSISTENCY OF ACCIDENT CLAIMS TO TOTAL CLAIMS			
	1	2 and 3	4	5
1 and 2	1.31	0.52	0.66	0.44

The Department of Health, Education, and Welfare indicates in their March, 1965, publication, *Disability Applicants, 1963 Selected Data*, that 4.4 per cent of approved claims in 1963 for males 35-49 were caused by accidents. Of course, the OASDI definition of disability, in addition to requiring a six-month waiting period, also required that the disability be judged permanent.

The Committee on Experience under Individual Health Insurance shows in Table 6 of the 1961 and 1963 *TSA Reports* the relation of accident claims to total disability experience for the first year of disability. Table 6 shows that the average duration of accident claims for ages 40 and over is less than for total claims on policies with a seven-day elimination period.

Perhaps when the Committee prepared the 1964 Commissioners Disability Table, it might have been preferable to develop an accident continuance separately from a sickness continuance table and then combine the two continuance tables later. It would be quite interesting if the Committee could indicate from the actual data reported to the inter-company study the proportion of accident claims with at least eight days of disability which did persist to the end of the first year of disability and similar figures for sickness disability.

I would again like to congratulate Mr. Minor for an excellent paper which, in addition to discussing the Commissioners 1964 Disability Table, included many valuable remarks on some of the lesser-known aspects of disability income insurance.

STUART F. CONROD:

Mr. Minor is to be congratulated for his very fine paper which traces the steps taken in developing the 1964 Commissioners Disability Table and outlines its principal characteristics.

In outlining the statistical basis of the new table, Mr. Minor states that the Industry Advisory Committee was concerned with developing net valuation premiums rather than the type of net premiums that a particular company would consider desirable in preparing its gross premium rates.

It is unfortunate, however, that such an unrealistically low level of

net valuation premiums is provided by the table. This is not only true for short-term benefit plans but for long-term benefits as well.

For example, Table 1 shows a comparison of the 1964 Commissioners Disability Table net valuation premiums under the five- and ten-year benefit plans with those used by our company for current issues.

It is all very well to point out that the net premiums produced by the table are valuation net premiums and hence do not represent true net premiums which can be used as a basis for computing gross premiums. Such words of warning are liable to be overlooked by a company newly entering the noncan field with the result that the tabular net premiums

TABLE 1
NET VALUATION PREMIUMS PER \$100 MONTHLY INDEMNITY

AGE AT ISSUE	COVERAGE TO AGE 65—1-MONTH ELIMINATION—2½% INTEREST					
	5-Year Benefit			10-Year Benefit		
	1964 C.D.T. (1)	110%— 150% Conference* (2)	Ratio (1) to (2) (3)	1964 C.D.T. (1)	110%— 150% Conference* (2)	Ratio (1) to (2) (3)
25.....	\$18.95	\$25.45	74%	\$23.20	\$31.68	73%
35.....	25.68	31.61	81	31.65	39.57	80
45.....	36.70	41.88	88	45.17	51.70	87
55.....	53.77	55.73	96	62.59	62.02	101

* 110 per cent first-year disability (graded 1 per cent per age above 45) plus 150 per cent subsequent years of disability (graded 2½ per cent per age above 45), combined with 1941 C.S.O. Mortality.

might be used as a basis for calculating gross premiums for a particular occupational class.

In the section of his paper dealing with construction of basic tables, Mr. Minor states that since the Advisory Committee was concerned *primarily* with determining actuarially sound reserves for long-term coverages of five years or more, it could not rely on data based mainly on the two-year coverages that accounted for the bulk of the business sold prior to 1960.

It seems strange that the Committee's primary concern should be in establishing sound minimum reserves for a segment of the business, which in many companies is only a very small segment of the total loss-of-time business currently being issued. For example, in our company less than 2 per cent of our loss-of-time policies issued in the first nine months of 1965 were for benefits of five years or longer, and there are

undoubtedly many other companies in which the percentage is less than 10 per cent of the total issues.

Naturally, the Committee should be concerned with establishing adequate minimum reserves for both long- and short-term benefits, but, in view of the difference in claim termination rates between long- and short-term benefits, this can only be done for one at the expense of the other if a single disability table is applicable to both. It would appear logical to have two separate disability tables—one for long-term and the other for short-term; otherwise, an adequate minimum standard for long-term benefits becomes a somewhat stringent minimum standard for short-term benefits.

In the report of the Industry Advisory Committee, which is reprinted on pages 4-11 of Volume III of the 1964 Commissioners Disability Table, the Committee states that the table is based on data on the first year of disability for claims incurred in the years 1958-61 contributed by seventeen companies to the Society of Actuaries Committee on Experience under Individual Health Insurance.

The slope of the net annual claim costs by age under the Commissioners Table appears to be much steeper than that of either the 1955-59 or the 1960-61 Intercompany Experience, as can be seen in Charts I and II. These charts have been taken from the reports of the Society Committee; I have superimposed the net annual claim costs under the Commissioners Table.

A comparison of mid-terminal reserves for a one-year benefit with reserves under the Conference Table and two modifications thereof is shown in Table 2.

In his comments on active life reserve methods, Mr. Minor mentions the appropriateness of the two-year preliminary term method to compensate for lapses. Of course, a company can greatly reduce its reserve liability by adopting a phantom (or pretend) method such as two-year preliminary term.

Mr. Minor discusses various accounting methods for showing the reserve liability in the annual statement.

In recent years some of the companies that specialize in noncancellable disability benefits have included the pro-rata unearned premium reserve in line 2 of Exhibit 9, Part 1, and have changed the word "Additional" to read "Active life."

There is some advantage for tax purposes in being on a mid-terminal plus net unearned premium reserve basis rather than a mean reserve basis because of supplementary benefits that are frequently included in policies.

CHART I

TOTAL DISABILITY LOSS-OF-TIME EXPERIENCE—ANNUAL CLAIM COSTS PER \$1 MONTHLY INCOME BENEFIT: 1955-59 EXPERIENCE

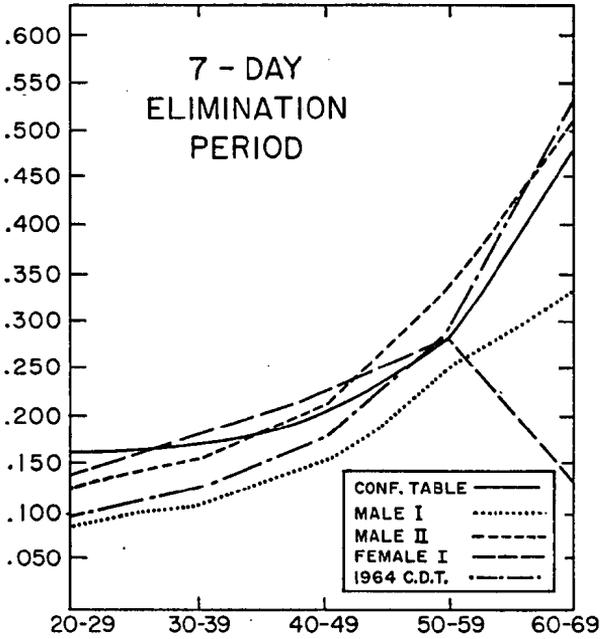
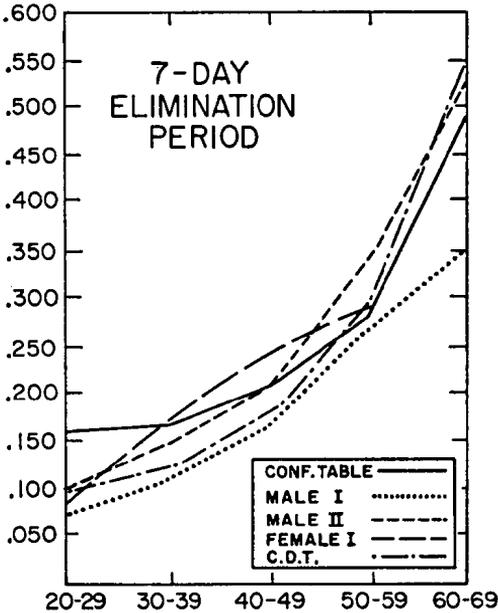


CHART II

TOTAL DISABILITY LOSS-OF-TIME EXPERIENCE—ANNUAL CLAIM COSTS PER \$1 MONTHLY INCOME BENEFIT: 1960-61 EXPERIENCE



In his discussion of partial disability under the section entitled Reserve Adjustments, Mr. Minor states that where a constant premium for partial accident is charged, regardless of age, there would be no need to make any increase in the active life reserve because of this benefit. The mere fact that premiums are a flat amount for all ages has nothing to do with reserve requirements. Reserves are theoretically required if a company's experience indicates an upward claim cost by age, irrespective of whether premiums are flat or graded.

TABLE 2
COMPARISON OF NET LEVEL PREMIUM RESERVES
ON THE 1964 COMMISSIONERS DISABILITY TABLE
WITH THOSE OF CONFERENCE TABLE AND TWO MODIFICATIONS THEREOF
(Mid-terminal Reserves per \$100 Month Indemnity; Coverage
to Age 65—2½ Per Cent Interest—One-Year Benefit)

Age at Issue	Policy Year	1964 C.D.T. (1)	Conference (2)	Ratio (1) to (2) (3)	110 Per Cent Conference (Graded) (4)	Ratio (1) to (4) (5)	125 Per Cent Conference (Graded) (6)	Ratio (1) to (6) (7)
25.....	{ 5	\$ 38	\$22	173%	\$ 29	131%	\$ 40	95%
	{ 10	81	49	165	66	123	90	90
	{ 15	120	76	158	103	117	143	84
	{ 20	151	99	153	137	110	194	78
35.....	{ 5	44	30	147	41	107	58	76
	{ 10	88	60	147	85	104	122	72
	{ 15	120	83	145	121	99	177	68
	{ 20	133	92	145	135	99	200	67
45.....	{ 5	45	32	141	48	94	72	63
	{ 10	78	55	142	82	95	123	63
	{ 15	82	55	149	82	100	123	67
	{ 20	12	9	133	13	92	19	63

NOTE.—The Conference and Modified Conference reserves are for zero elimination period (compared with seven days elimination for 1964 C.D.T.), which has only a very slight effect on reserves. 1941 C.S.O. Mortality basis. The percentages (110 and 125) are graded after age 45 (1 and 2.5 per cent per year, respectively). For benefits exceeding one year, 150 per cent morbidity (graded 2½ per cent per age after 45) is used to modify disability after first year.

The presence of partial disability in policies affects the experience on total disability. It would appear preferable not to have a general rule and to leave the determination of active life reserves for partial disability to the individual companies.

The active life reserves for straight accident policies under the new table are, in my opinion, much too high, particularly those for the life-time accident benefit. This undoubtedly came about by allocating the

total net annual claim costs into accident and sickness portions, which are graded by attained age but independent of the length of benefit.

Presumably, the same claim termination rates have been applied to both accident and sickness, which has the effect of exaggerating the morbidity slope of straight accident. The recovery rate on accident claims is much higher than that on sickness during the first year or year and a half.

The active life reserves on the two-year accident benefit are at least 50 per cent greater than the reserves on the basis used by our company, and on the lifetime benefit they are several times our reserves; we consider our reserves adequate.

Mr. Minor gives an excellent and thorough résumé of methods used in setting up claim reserves and claim liabilities. He expresses the hope that those contributing to the discussion of his paper will include some reference to the values their companies are currently using for short-duration claims.

The accompanying tabulation shows the factors used by our company

MONTH INCURRED (1964)	RESERVE PER \$1 MONTHLY INDEMNITY		
	Accident	Short-Term Sickness	Long-Term Sickness
December.....	\$2.60	\$3.00	\$ 3.50
November.....	2.80	3.50	4.50
October.....	3.00	3.75	6.00
September.....	3.20	4.00	8.00
August.....	3.40	4.25	10.00
July.....	3.60	4.50	12.50
June.....	3.80	4.75	15.00
May.....	4.00	5.00	17.50
April.....	4.40	5.25	20.00
March.....	4.80	5.50	23.00
February.....	5.40	5.50	26.00
January.....	6.00	5.50	30.00

in determining our 1964 reserve on noncancellable loss-of-time in-force claims. The same reserve is set up under accident claims regardless of whether the claim is for total or partial.

On claims more than one year old (from date of disablement), Class III tabular reserves were set up.

In Table C, Mr. Minor shows the factors currently being used by his company for pending and estimated unreported claims at year end. In our company we use 50 per cent of three months' paid claims to estimate our liability for unreported claims. For pending loss-of-time claims in

process of settlement, we set up a reserve of \$1.30 per \$1 M.I. on accident claims, \$2.10 per \$1 M.I. on short-term sickness claims, and \$4.00 per \$1 M.I. on long-term sickness claims.

I heartily agree with Mr. Minor's statement at the end of the first paragraph immediately following Table C about the serious misgivings of many actuaries concerning the current trend of issuing as much as \$500 to \$1,000 of monthly indemnity payable to age 65. If a maximum claim could easily involve a payment of over \$300,000, just think of the maximum claim that could result from a \$750 or \$800 monthly indemnity lifetime accident claim, which amount of indemnity is within the present issue limits of a number of companies. When times are good, there is a tendency to throw caution to the winds.

Again I wish to congratulate Mr. Minor on the splendid paper he has presented. The numerous criticisms in my discussion are not a criticism of his paper but are related to what I think are certain shortcomings in the 1964 Commissioners Disability Table itself.

E. PAUL BARNHART:

I would like to join others in expressing my indebtedness to the members of the Advisory Committee for their work on the 1964 Disability Table and to Ed Minor for his very valuable supplementary paper on this vital matter. The ratios shown in Mr. Minor's Table A, comparing reserves on the new table to the 1926 Class III values, abundantly demonstrate how utterly outmoded the old standard has become! With some of the ratios attaining 250 per cent and more, those companies that were "conservatively" using as much as 175 per cent of the 1926 standard may be not a little surprised to find that reserve strengthening, even from that level, will be the outcome of changeover to the new standard.

I would like to comment on just a few points in Mr. Minor's paper. Under "Reserve Adjustments," item 2, "Partial disability," he states that "where a constant premium is charged, regardless of age, for the partial disability benefit, there would be no need to make any increase in the active life reserve on account of this benefit."

I quite agree with this where only partial disability is concerned, but this may carry an implication for some readers that it is the fact of "a constant premium, regardless of age" that makes a reserve unnecessary. This is, of course, emphatically not the case. In general, the charging of a flat premium for all ages in no way weakens the necessity of active life reserves, which should still be maintained on the basis of the proper age-graded valuation net premiums, if these in fact increase with age.

When the benefit is one that thus increases in cost, the flat gross

premium presumably involves a subsidy of the older issue ages by the younger, and the excess in the flat premium charged at the younger ages has to serve as the source of this subsidy, which in part should be regarded as applied toward financing the higher valuation net premium required at the older ages. Any attempt to arbitrarily modify the underlying valuation net premium, simply because the gross premium scale happens to be flat, would be a highly questionable procedure. There are a good many examples of such flat premiums in existence on guaranteed renewable policies requiring reserves, especially in the field of hospital benefits. The need for proper reserves in such instances ought to be more fully recognized.

In the same section, item 6, "Aggregate indemnity limitations," Mr. Minor says, "In the case of policies where benefits have been paid for the full two-year period and the policyholder is still disabled, it is not believed that there is any need for an active life reserve. Relatively few of such cases continue to pay premiums and there was generally no provision for waiver of premium." It seems to me that on those policies that *do* remain in force through continued payment of premium, a reserve is still in order. With a five-year aggregate limit, there is still a potential three more years of benefit, and this would appear to me to require a reserve almost as much as the case of a two-year policy that has no aggregate limitation.

I found Mr. Minor's Table B, comparing the Metropolitan's experience factors on "commercial" with "noncancellable" disabled life reserves, to be extremely interesting and quite startling. If I understand this correctly, it shows, for example, that under a five-year maximum benefit and after twenty-one months of disability, the noncan experience factor is 200 per cent as great (90 per cent of the 1964 Table) as the commercial factor (45 per cent). I find it amazing that such a difference exists after twenty-one full months, and I wonder if Mr. Minor could provide any elaborating comment concerning so sharp a difference and any apparent reasons for it. In particular, I am curious as to whether any differences in the definition of total disability exist between the two types of contract or whether other differences in provisions may account for this.

JAMES J. OLSEN:

Mr. Minor's paper climaxes the very important contribution he has made as chairman of the committee responsible for the derivation of active and disabled life reserve factors based on the 1964 Commissioners Disability Table which are shown in the volumes published by the Health Insurance Association of America.

In order to determine the difference in the reserve factors between the two Occupational Classes I and II used by the Society's Committee on Experience under Individual Health Insurance, I derived a graduated set of annual claim costs for a total disability benefit (sickness and accident combined) having a maximum duration of benefits of one year with a seven-day elimination period. The annual claim costs for each of Occupational Classes I and II are based on the average of the experience shown in Table 5, page 107, of the *1961 Reports Number* and in Table 5, page 122, of the *1963 Reports Number*. It was assumed that the central ages for age groups 20-29, 30-39, 40-49, 50-59 and 60-69 would be 25, 35, 45, 55, and 62. The annual claim costs, per \$100 of monthly income benefit for each of Occupational Classes I and II and the 1964 Commissioners Disability Table, are shown in Table 1 for the central ages.

TABLE 1
TOTAL DISABILITY BENEFIT LIMITED TO A ONE-YEAR
MAXIMUM BENEFIT PERIOD AND WITH A SEVEN-DAY
ELIMINATION PERIOD

AGE	ANNUAL CLAIM COST PER \$100 MONTHLY INCOME BENEFIT		
	Occupational Class I	Occupational Class II	1964 Commissioners Disability Table
25.....	\$ 7.800	\$11.200	\$ 9.814
35.....	10.700	15.000	12.350
45.....	10.000	20.900	17.958
55.....	25.800	33.800	29.313
62.....	35.600	51.400	45.754

The net level annual premiums and the mid-terminal reserves based on the annual claim costs combined with the 1958 CSO Table at 2½ per cent are shown in Table 2 for certain ages and durations.

On the basis of Table 2, the reserves are always higher for Occupational Class II than for Class I. Whether this is also true for other elimination periods and for longer benefit durations is not evident. Furthermore, the intercompany experience is based on a combination of data from all companies and most of the Occupational Class I experience may be primarily from one group of companies and Occupational Class II experience from another group of companies and, therefore, a company with a large volume of business might very well obtain higher reserve factors for Occupational Class I. I would conclude that one reserve table is appropriate for all occupational classes and both sexes.

occupation. On the other hand, if the insured changes to a less favorable occupation, we do not have the right to reclassify him. Under these circumstances, it is not entirely clear whether the lives in a particular occupational class tend to improve, although I am inclined to agree that the worse risks tend to have poor persistency. As an example of this, on our policies providing accident benefits only, the annual claim cost is approximately twice the ultimate cost in the first policy year, gradually decreasing until it becomes ultimate at about the fifth policy year. The only logical explanation seems to be that the poor risks also have poor persistency.

It has generally been considered appropriate to assume that the net cost of similar total disability benefits for females is approximately 150 per cent of those for males. Consistent with this assumption, active life reserves should also be 150 per cent. We have been valuing female benefits on the basis of 150 per cent of male factors. We have come to the conclusion, based on the relatively small amount of intercompany data on females, that, although the morbidity costs are generally higher for females than males, the slope of annual claim costs is less steep for females than for males and, although premiums for females should be higher, the reserves for females should be no higher than for males. Therefore, at the end of 1965, on similar benefits we will use the same reserve factor for females as for males.

I believe that this is the first time that a Fortran computer program has been included in the *Transactions*, and this should prove very helpful to many persons. We use a 1401 Fortran program to calculate net premiums and mid-terminal reserves which is much shorter than the one used in Appendix A of the paper. The program we use is shown as Appendix A of this discussion.

Mr. Minor indicates that the published values are based upon mid-terminal reserves and that, since the valuation net premiums are also shown, the mean reserves can be obtained by adding one-half of the valuation net premiums to the mid-terminal reserve. However, in calculating mean reserves, it is very important to use the following instructions which are included in the published volume.

The reserve factors shown for active lives are mid-terminal factors. Companies valuing their active life benefits on the basis of mean reserves should add one-half of the net premium to the mid-terminal reserve factor. The total net valuation premium so used must include the net premium for benefits for which mid-terminal reserves are held as well as the net premium for subsidiary benefits under which no mid-terminal reserves are held.

The method of calculating the active life reserve for the waiver of premium benefit as described in the paper is theoretically accurate, but

we use a different method which we find is more practical. Our waiver of premium benefit provides for waiver of premiums while benefits are payable except no premiums are waived during the first ninety days of benefit. We maintain, in our records, a monthly basis premium which is the premium for a particular mode divided by the number of months for that mode. We simply add the monthly basis premium to the amount of monthly income benefit and apply the applicable mid-terminal reserve factor for the monthly income benefit to obtain the active life reserve.

On some of our policies, we have a partial disability benefit for accident and an additional benefit for specified travel accident. These subsidiary benefits are considered to produce claim costs which are relatively flat by age, and, therefore, we do not hold active life mid-terminal reserves on these benefits.

On policies providing aggregate indemnity limitations, it would seem prudent to value these policies as if the aggregate indemnity limitation did not exist, but, in any event, it should be ignored as long as the remaining aggregate indemnity is equal or larger than the maximum for one disability. As a practical matter, even if the aggregate indemnity period remaining became less than the maximum for one claim, it would be cumbersome to derive an appropriate factor because the remaining duration could be a constantly decreasing one.

Many of the problems described under the Disabled Life Reserve section of the paper disappear, or at least are minimized, when the Developmental Method is used for determining the reserves for claims incurred within one year or two years of the valuation date, since the over-all reserve factor applied to some base—we use the cash claim payments of the last thirteen weeks of the year—takes into account the reserve for total disability, partial disability, travel accident, waiver of premium, and resisted claims. The number of pending claims incurred one or two years prior to the valuation date should be very small, and it should not be too difficult to individually handle such claims.

At the present time, we make a seriatim valuation of all claims incurred prior to the current valuation year, but we are considering whether we might change this to two years prior to the current valuation year.

Mr. Minor indicates that, where total disability has existed for more than three months and the insured is now eligible for partial disability benefits, he would recommend holding a disabled life reserve in excess of the maximum amount of the future liability for partial disability benefits. Presumably, the reason for this is because of the possibility that the claimant will have a recurrence of total disability. Since a recurrence of a disability can occur whether a policy does or does not have partial

disability benefits, it does not seem consistent to hold a higher reserve for total disability benefits on a policy with partial disability benefits than for a policy without partial benefits.

Claims for partial disability, where total disability was incurred at least one year prior to the valuation date, are valued in my company on the assumption that the maximum unaccrued liability is the total maximum amount of partial disability payable less the payments which have already accrued.

Mr. Minor suggests that resisted claims be valued on a basis that will produce lower reserves than if they were not resisted. For a company with a few very large resisted claims, this would not be a very conservative practice. In my company, we value all resisted claims, with a date of incurral at least one year prior to the valuation date, identically the same as claims that are not resisted. The amount of accrued liability is much greater on resisted claims.

APPENDIX A

1401 FORTRAN PROGRAM

```

C      CALCULATION OF NET LEVEL VALUATION PREMIUMS
      —TERM TO AGE 65
C      JOB ENDS WHEN NO MORE CLAIM COSTS ARE LEFT
      DIMENSION DX(45), SX(43), HX(43), AKX(44), DX2(43),
      ANX(44), PX(45)
C      ZERO ARRAYS
      DO 1 J = 1, 307
1      DX(J) = 0.
C      READ DX, CALCULATE DX2 AND NX
      READ 91, DX
      DO 2 I = 1, 43
      DX2(I) = 0.5 * (DX(I) + DX(I+1))
      J = 44 - I
2      ANX(J) = ANX(J+1) + DX(J)
C      READ SX, CALCULATE HX, KX, AND PX
3      READ 92, (SX(J), J = 1, 43), IBB, IMEP
      DO 4 I = 1, 43
      J = 44 - I
      HX(J) = SX(J) * DX2(J)
      AKX(J) = AKX(J+1) + HX(J)
4      PX(J) = AKX(J) / ANX(J)
C      PUNCH RESULTS
      DO 5 I = 1, 43
      IJ = I + 21

```

APPENDIX A—*Continued*

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5  PUNCH 93, IBB, IMEP, IJ, SX(I), HX(I), AKX(I), PX(I)
   DO 6 I = 1, 41, 5
   K = I + 4
6  PUNCH 94, (PX(J), J = I, K), IBB, IMEP
   GO TO 3
C  FORMAT STATEMENTS
91  FORMAT (5F7.0)
92  FORMAT (8(5F8.5/), 3F8.5, 16X, I2, I4)
93  FORMAT (I2, I4, I3, F9.5, F9.0, F10.0, F8.4)
94  FORMAT (2P5F7.2, I30, I6)
   END

   The regular commutation symbols have been represented as
   follows:
   Dx = DX, Sx = SX, Hx = HX, Kx = AKX, Dx+1/2 = DX2
   (Nx - N65) = ANX, Px = PX
   Branch: Accident or Sickness = IBB
   Plan maxima and elimination periods = IMEP

C  CALCULATION OF MID-TERMINAL ACTIVE LIFE RE-
SERVES—TERM TO AGE 65
C  JOB ENDS WHEN NO MORE PREMIUM CARDS ARE LEFT
DIMENSION AX(45), PX(45), MTR(15)
READ 93, AX
1  READ 94, (PX(I), I = 1, 45), IBB, IMEP
   PUNCH 91, IBB, IMEP
C  CALCULATE RESERVES
   DO 6 K = 1, 3
   PRINT 90
   M = 15 - K/3
   IJ = (K-1) * 15
   IL = 58 - 15 * K
   DO 6 N = 1, IL (Note - IL = Number of ages calculated)
   DO 4 I = 1, M (Note - M = Number of policy years calculated)
   IK = I + IJ + N - 1
   TA = 0.5 * ((PX(IK) - PX(N)) * AX(IK) + (PX(IK+1) -
     PX(N)) * AK(IK+1))
   IF(TA) 2, 2, 3
2  MTR(I) = TA - 0.5
   GO TO 4
3  MTR(I) = TA + 0.5
4  CONTINUE
   IAGE = N+21
   PRINT 92, IAGE, PX(N), (MTR(I), I = 1, M)

```

APPENDIX A—*Continued*

PUNCH 92, IAGE, PX(N), (MTR(I), I = 1, M)
 M = IL + 1 - N
 IF (M-15) 6, 6, 5
 5 M = 15
 6 CONTINUE
 GO TO 1
 C FORMAT STATEMENTS
 90 FORMAT (1H1)
 91 FORMAT (I2, I4)
 92 FORMAT (I4, F7.2, 15I4)
 93 FORMAT (5F9.5)
 94 FORMAT (8(5F7.2/), 5F7.2, 27X, I3, 2X, I4)
 END

Code items used above are defined as follows:

IBB = Branch: Accident or Sickness
 IMEP = Used for plan maxima and elimination periods
 AX = Annuities
 PX = Net Level Annual Valuation Premiums
 MTR = Mid-terminal Reserve Factors

(AUTHOR'S REVIEW OF DISCUSSION)

EDUARD H. MINOR:

Mr. Hazelcorn's comments on the difficulties of calculating premiums on the basis of a valuation table should serve as a reinforcement of the warning given with regard to the need for directing major attention to underwriting and persistency. As outlined in my discussion of premium calculation in *TSA*, XIV, Part 2, D395, separate calculations must be made for each central age on a select basis with a much higher allowance for withdrawals than indicated by the Linton B rates.

The higher level of profitability for longer term disability policies mentioned by Mr. Hazelcorn as compared with five-year plans arises from the availability of a greater excess of gross premium over morbidity costs in the earlier years when initial expenses are being amortized.

Mr. Levy's discussion is an extremely valuable addition to the paper in view of the general lack of actuarial exposition of reinsurance needs in health insurance.

Mr. Houghton and Mr. Conrod have directed their discussions to the characteristics of the Commissioners Table. It should be kept in mind that the directives of the National Association of Insurance Commissioners placed special emphasis on the need for developing a modern

reserve basis for long-term-disability coverage. This may be a small segment of the business in some companies, but there are definite signs of an increasing demand for such coverage under both group and personal contracts.

The questions raised with regard to the percentage of total reserve applicable to accident coverage result more from the ability of actuaries to control antiselection based on physical condition and medical advances that hasten recovery from or prevent sickness disability than from a substantial increase in accident claim cost. We cannot control the frequency and since, as Mr. M. M. Dawson pointed out in 1916, the persistency of lives seriously disabled by accidental means approaches that of annuitants, the ratio of accident to sickness claim costs will probably continue to increase.

The problem might be lessened if companies would reconsider the desirability of having a maximum duration for accident claim payments exceeding that for sickness. The retirement age might well be made the limit for all disability benefits.

Mr. Barnhart and Mr. Conrod mention the necessity of reserves for partial benefits even if the gross premiums are flat for all ages. Usually these benefits relate to fracture cases resulting in partial accident disability and there is a U-shaped curve of claim costs. Many actuaries may feel it desirable to hold reserves for policies issued at ages 40 and over. My suggestions had been influenced by the likelihood of negative reserves for ages 18-34 at issue balancing out the positive reserves at attained ages 50 and over. I do not believe that there is any excess in the gross premiums for the younger ages (both accident-prone and non-persistent) than can be used to subsidize the partial disability costs of older lives.

Mr. Barnhart requested further comment on the difference between Metropolitan's commercial and noncancellable reserve factors for twenty-one months of accident disability. The bulk of our commercial in force is on blue-collar risks, whereas our noncancellable policies consist mainly of Occupational Group I lives. The ability of these lives to obtain re-employment in less arduous work often is greater than for the office worker. Also, our average age and size of policy are somewhat lower on commercial coverage.

Mr. Olsen has provided us with some very helpful calculations with respect to possible subdivision of reserve factors by occupational class. His further remarks as to active life reserves for female risks as well as alternate methods of calculating mid-terminal reserves are worthy of careful study. Inasmuch as Mr. Olsen was very deeply involved in com-

pilation and construction of the original table and, later, the publishing of the reserve volumes, his discussion is of major importance to all those interested in this subject.

The program which Mr. Olsen has provided, in Fortran II language, will be very helpful to those having a 1401 computer that is geared to take such a program. Of course, the much higher rental cost of such a computer might offset the savings resulting from his shorter program. In view of the constant set-up time, I would prefer to use the 1620 for the policy plans of a single company.