

**TRANSACTIONS OF SOCIETY OF ACTUARIES
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PRUDENTIAL 1946-1948 DISABILITY EXPERIENCE

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THE Prudential has recently investigated its experience under certain types of disability clauses during the calendar years 1946-1948. Since the Prudential has for many years automatically included some kind of disability benefit in most of its policies, there is a large experience available. Hence it is believed that the results of the investigation may be of interest to members of the Society. The investigation covers (1) the last type of disability income clause issued by the Prudential, (2) all premium waiver benefits automatically included in standard Ordinary policies since 1932, and (3) all waiver and instalment benefits automatically included in Intermediate (monthly premium) policies since 1932. Both rates of disability and claim termination rates were studied.

GENERAL

Table A describes the disability benefits involved. Coverage is to age 60 in every case. In order to get information on the effect of amount of policy on the disability experience, the Type II clauses were subdivided into three groups. The first group, Type IIa, consists of all Type II clauses in policy plans issued only for \$5000 or more (some of these policies may be reduced to \$2500 at the end of five years). Type IIc consists of all Type II clauses in policies on the monthly debit payment plan. Type IIb consists of all other Type II clauses. Table B shows the approximate average face amount of insurance per policy exposed and the average face amount of insurance per disability claim for each of the types studied. As might have been expected, the average amount per claim approved is greater in every case than the average amount per policy exposed, but the order of size of the averages is the same in the two columns. For purposes of reference in the tables, the Type I claims are described as "Income," the Type III claims as "Instalment," and the Type IIa, IIb, and IIc claims as "Waiver, Large," "Waiver, Medium," and "Waiver, Small," respectively.

Rates of disability and claim termination rates were studied by amount of insurance. The alternative of taking policies as the unit was precluded by the fact that the in-force tabulations do not show policies.

In both parts of the study the Type I claims were adjusted to a six

TABLE A
DESCRIPTION OF DISABILITY BENEFITS STUDIED

Type of Clause	Benefit	Waiting Period for Presumption of Disability	Years of Issue	Policies to Which Clause Is Applicable
I.....	Waiver of Premiums (retroactive to date of disablement). Disability Income of \$10 per thousand.	120 days	July 1, 1930 to early in 1932	Included in Ordinary policies on payment of an extra premium. This was the last Ordinary disability income clause issued by the Prudential.
II.....	Waiver of Premiums (retroactive to date of disablement).	6 months	1932 to present time	Automatically included in all Ordinary policies issued at standard rates.
III.....	Waiver of one year's premiums (retroactive to date of disablement) followed by payment of the face amount of insurance in quarterly instalments over a ten-year period. Interest on the instalment payment benefit varies from 3½% to 2%.	6 months	1932 to present time	Automatically included in all Intermediate (monthly premium) policies.

TABLE B
AVERAGE FACE AMOUNT OF INSURANCE

Type of Claim	Approximate Average Face Amount of Insurance per Policy Exposed	Average Face Amount of Insurance per Claim Approved (1946-1948)
I (Income).....	\$2,742	\$3,855
IIa (Waiver, Large).....	5,589	6,376
IIb (Waiver, Medium).....	1,434	2,069
IIc (Waiver, Small).....	1,066	1,099
III (Instalment).....	520	577

months basis, so that the results can be compared directly. In the study of rates of disability all Type I claims which terminated within two months of the date of disability were excluded. It is believed that this gives a good approximation to the claims which would actually have been approved on a six months basis. In the study of claim termination rates the probabilities of remaining alive and disabled were first calculated on the four months basis and then adjusted to a six months basis. All Type I figures given are on a six months basis unless the contrary is stated.

The standard for comparison of actual to expected has been taken as the Inter-Company Class (3) table with six months waiting period. Values of r_x on this basis have been generally available for some years, and several years ago the Prudential calculated commutation tables for disabled lives.

RATES OF DISABILITY

The disability claims considered were those with date of disability in 1946-1948, excluding disabilities occurring in the first five calendar years of the policy. An adjustment was made to provide for claims incurred prior to January 1, 1949, but not approved by March 31, 1949, when the basic data for the investigation were closed. The active life exposures were taken from the valuation in-force records. The June 30 in-force figures were used, so that, theoretically, a central rate of disability should be applied to the exposure. For practical reasons, the Class (3) r_x was used in calculating expected claims.

Some idea of the extent of the experience used in the study of rates of disability can be obtained from Table C, which shows the number of disability claims included in each type and age group. Since Type I clauses have not been issued since 1932, there is no experience for such clauses under age 30. The experience for the other types of clauses under age 20 was too small to be of interest.

Table D shows the ratio of actual to expected disability claims. For purposes of comparison, the Class (3) r_x at the central age of each age group is shown. As was to be expected, the Type I claims, which provide for disability income, show the highest ratios. The generally low level of the Type II ratios shows what can be obtained (in periods of high employment) when the waiver of premium benefit is automatically included in all standard policies. However, the Type II ratios should be interpreted in connection with the average amounts of policy shown in Table B in order to grasp their true significance. We have here three classes of business, all underwritten on the basis of the life insurance benefit alone, and all providing automatically for waiver of premium benefit, so that the effect of initial disability anti-selection on the part of the insured

might well be considered negligible. Yet there is a striking correlation between average amount of policy and rate of disability. Apparently, a disability experience, even on the same type of benefit, varies with the amount of policy involved.

TABLE C
NUMBER OF DISABILITY CLAIMS APPROVED (1946-1948)

AGES	NUMBER OF CLAIMS				
	Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instalment)
20-29.....	—	68	476	258	704
30-39.....	73	298	827	375	1,534
40-49.....	153	437	873	272	2,005
50-54.....	196	357	542	99	1,740
55-59.....	168	284	545	89	2,250
60.....	32	79	106	21	597

TABLE D
RATIO OF ACTUAL TO EXPECTED DISABILITY CLAIMS (1946-1948)
BY AMOUNT OF INSURANCE

EXPECTED CLAIMS BASED ON CLASS (3)—6 MONTHS WAITING PERIOD

AGES	1000 r_x AT CENTRAL AGE CLASS (3)— 6 MONTHS	ACTUAL CLAIMS PERCENT OF EXPECTED				
		Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instalment)
20-29.....	3.04	—	26%	14%	17%	15%
30-39.....	3.06	45%	29	19	21	20
40-49.....	4.11	51	38	29	29	28
50-54.....	6.21	93	60	50	33	38
55-59.....	8.75	108	62	51	39	41
60.....	10.95 (extrapolated)	135	97	55	57	51

The Type III claims, although they provide a higher benefit per thousand dollars of insurance than the Type IIc claims because of the instalment benefit, occur, nevertheless, at about the same rate. The small average size of the policy has apparently had its effect on this experience.

CLAIM TERMINATION RATES

Claim termination rates were calculated for each type and age group. The investigation covers the experience of the years 1946-1948, regardless

of when, or in what policy year, the date of disability occurred. The Type I experience at ages 20-29, the Type IIc experience at age 60, and all types of experience at ages under 20 were too small to be considered.

The Type III experience automatically ceases 10 years after the beginning of instalment payments. Hence, in order to provide a standard of comparison which could be used for the five different types of benefits, values of 10-year temporary disabled life annuities were calculated for each age group. Although the rates of termination were studied month by

TABLE E
NUMBER OF DISABILITY CLAIMS TERMINATED BY DEATH AND RECOVERY
DURING FIRST 10 YEARS OF DISABILITY
(1946-1948)

AGES AT DISABILITY	TYPE OF TERMINA- TION	NUMBER OF CLAIMS TERMINATED				
		Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instal- ment)
20-29	Death	—	10	69	45	120
	Recovery	—	117	407	230	512
30-39	Death	17	43	152	47	306
	Recovery	55	240	444	197	710
40-49	Death	48	109	186	67	657
	Recovery	112	235	374	123	642
50-54	Death	60	95	158	29	678
	Recovery	57	95	128	23	309
55-59	Death	65	95	201	30	907
	Recovery	29	58	96	10	329
60	Death	8	23	42	—	195
	Recovery	5	12	8	—	33

month for the first two years, the values given are for annuities payable yearly. All annuity values were calculated at $2\frac{3}{4}\%$ interest.

Table E shows the number of disability claims terminated by death and recovery during the first ten years of disability. This table should be used in evaluating the reliability of the figures given in Tables F, G, and H. Table F shows average annual rates of disability termination by death and recovery for durations 1, 2-5, and 6-10. Table G shows the ratio of temporary annuities on the crude experience basis to Class (3) temporary annuities for each type and age group. The crude experience annuities are based on the combined data for each age group; the Class (3) annuities are calculated at the central age of the age group. For ease of reference the Class (3) annuities are shown.

Although the experience covers a period of high employment, almost

TABLE F
 AVERAGE ANNUAL RATES OF DISABILITY TERMINATION
 BY DEATH AND RECOVERY (BY AMOUNT)
 1946-1948

TYPE OF DISABILITY	AGES AT DISABILITY	MODE OF TERMINATION	AVERAGE ANNUAL RATE OF TERMINATION			
			1st Year after Disability	2-5 Years after Disability	6-10 Years after Disability	
I (Income)	30-39	Death	.064	.048	.009	
		Recovery	.489	.133	.056	
	40-49	Death	.122	.035	.044	
		Recovery	.499	.178	.038	
	50-54	Death	.116	.101	.037	
		Recovery	.197	.053	.007	
	55-59	Death	.204	.082	.053	
		Recovery	.169	.034	.007	
	60	Death	.100	.008	.012	
		Recovery	.029	.054	.000	
IIa (Waiver, Large)	20-29	Death	.024	.021	.034	
		Recovery	.339	.249	.085	
	30-39	Death	.033	.036	.042	
		Recovery	.297	.182	.030	
	40-49	Death	.146	.075	.052	
		Recovery	.345	.145	.012	
	50-54	Death	.184	.097	.025	
		Recovery	.169	.089	.011	
	55-59	Death	.107	.087	.122	
		Recovery	.115	.050	.018	
	60	Death	.037	.151	.161	
		Recovery	.060	.053	.043	
	IIb (Waiver, Medium)	20-29	Death	.027	.023	.020
			Recovery	.215	.185	.062
30-39		Death	.049	.052	.031	
		Recovery	.366	.160	.037	
40-49		Death	.078	.051	.037	
		Recovery	.245	.171	.022	
50-54		Death	.177	.126	.145	
		Recovery	.133	.061	.014	
55-59		Death	.200	.092	.114	
		Recovery	.099	.080	.007	
60		Death	.047	.180	.066	
		Recovery	.068	.012	.006	
IIc (Waiver, Small)		20-29	Death	.043	.031	.056
			Recovery	.223	.210	.079
	30-39	Death	.036	.051	.030	
		Recovery	.243	.172	.045	
	40-49	Death	.127	.068	.104	
		Recovery	.255	.170	.031	
	50-54	Death	.195	.082	.064	
		Recovery	.131	.065	.126	
	55-59	Death	.265	.144	.000	
		Recovery	.094	.023	.051	

TABLE F—Continued

TYPE OF DISABILITY	AGES AT DISABILITY	MODE OF TERMINATION	AVERAGE ANNUAL RATE OF TERMINATION		
			1st Year after Disability	2-5 Years after Disability	6-10 Years after Disability
III (Instalment)	20-29	Death	.042	.024	.028
		Recovery	.179	.155	.045
	30-39	Death	.053	.057	.034
		Recovery	.181	.125	.039
	40-49	Death	.105	.088	.044
		Recovery	.148	.083	.021
	50-54	Death	.124	.104	.080
		Recovery	.087	.043	.019
	55-59	Death	.136	.118	.098
		Recovery	.078	.042	.008
	60	Death	.080	.120	.076
		Recovery	.031	.014	.002

TABLE G

RATIO OF $\bar{a}_{(a):10}^i$ ON CRUDE EXPERIENCE BASIS (1946-1948) BY AMOUNT OF INSURANCE TO $\bar{a}_{(a):10}^i$ ON CLASS (3)—6 MONTHS BASIS
2½% INTEREST

AGES AT DISABILITY	$\bar{a}_{(a):10}^i$ AT CENTRAL AGE CLASS (3)—6 MONTHS	RATIO (PERCENT)				
		Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instalment)
20-29	2.782	—	129%	154%	142%	168%
30-39	3.236	112%	127	118	131	143
40-49	3.718	86	96	115	97	126
50-54	3.940	121	114	108	114	126
55-59	3.928	120	129	111	117	123
60	3.951	178	114	127	—	142

all of the temporary annuity ratios are greater than 100%. It seems probable that the ratios would be even higher in a period of less employment. It is interesting to note that the favorable experience on rates of disability (as compared to Class (3) rates) for the Type II and Type III benefits does not carry over to the disability annuities.

Moreover, the correlation between average amount of policy and rate of disability shown in Table D does not carry over to the temporary annuity values. In fact, the Type III claims have larger annuity values in general. This may partially be attributed to the fact that expensive pro-

cedures to discover unreported recoveries under this type of claim are difficult to justify, particularly after the claim has been in force for several years.

TABLE H
VALUES OF ${}_{10}p_{[x]}^d$

AGES AT DISABILITY	${}_{10}p_{[x]}^d$					
	Class (3)— 6 Months (at Central Age)	Crude Experience Basis (1946-1948) by Amount of Insurance				
		Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instal- ment)
20-29 .....	.080	—	.145	.225	.121	.267
30-39 .....	.149	.202	.218	.189	.227	.269
40-49 .....	.228	.151	.187	.237	.144	.290
50-54 .....	.236	.319	.321	.201	.116	.278
55-59 .....	.222	.308	.198	.212	.348	.250
60 .....	.212	.706	.120	.293	—	.347

TABLE I
APPROXIMATE* RATIO OF $r_{\infty} \ddot{a}_{[x]:10}^d$ ON CRUDE EXPERIENCE BASIS (1946-1948)
TO $r_{\infty} \ddot{a}_{[x]:10}^d$ ON CLASS (3)—6 MONTHS BASIS
2½% INTEREST

AGES AT DISABILITY	RATIO (PERCENT)				
	Type I (Income)	Type IIa (Waiver, Large)	Type IIb (Waiver, Medium)	Type IIc (Waiver, Small)	Type III (Instalment)
20-29	—	34%	22%	24%	25%
30-39	50%	37	22	28	29
40-49	44	36	33	28	35
50-54	113	68	54	38	48
55-59	130	80	57	46	50
60	240	111	70	—	72

* See text.

Values of the probability of remaining disabled for 10 years are shown in Table H. Like the annuity values, these values are based on the crude termination rates, combining the data for each age group. The corresponding Class (3) values at the central age of each age group are given for comparison.

A convenient yardstick for comparing the combined effect of rates of disability and claim termination rates is given by Table I, which shows

the product of the corresponding ratios of Tables D and G. The product closely approximates the ratio of $r_x \ddot{a}_{[x]:10}$ on the crude experience basis (combining the data of each age group) to $r_x \ddot{a}_{[x]:10}$ on the Class (3) basis (calculated at the central age of the age group). As in Table D, the Type I ratios are higher than the others, and the Type II ratios vary with average amount of policy. The variation of the values of $\ddot{a}_{[x]:10}$ on Type I and Type II claims is not sufficient to obscure the general trend of the rates of disability. However, the effect of the higher temporary annuities on Type III claims is to make the ratios higher than the Type IIc ratios.

AFTER-DEATH APPROVALS AND COMPROMISES

In the investigation of rates of disability and claim termination rates certain disability claims approved in connection with a death claim on the same life were excluded. The number of claims thus excluded was 9 for Type I, 50 for Type IIa, 82 for Type IIb, 23 for Type IIc, and 354 for Type III. Inclusion of these claims would have increased the rates of disability. Since, however, less than a year's disability payments are made on most of these claims, the 10-year temporary annuities would have been decreased. The net increase in the ratios of Table I would have been very small.

All cases which were subject to any sort of compromise were excluded from the experience. Only four such claims were thereby excluded from the investigation of rates of disability. The number of cases excluded from the investigation of claim termination rates was 15 for Type I, 15 for Type IIa, 13 for Type IIb, and 6 for Type III. It is believed that the net effect on the experience was small.

DEPENDENCE ON ECONOMIC CYCLE

It is well known that rates of disability are closely connected with the variations of the economic cycle. This can be illustrated by comparison of rates of disability in previous Prudential experiences with the present rates. Table J shows crude rates of disability on Type I claims for three different periods of experience. All of these rates are shown on the four months waiting period basis, and the Class (3)—four months rates are shown for comparison. The difference between the rates experienced in the late years of the depression (1935-1938) and those experienced in the war years (1942-1943) is striking. An interesting fact is the tendency of the rates for the postwar period (1946-1948) to be higher than those for the war years at the older ages, while they remain lower at the younger ages. This may be caused by a possible tendency for the postwar trend away from maximum employment to affect first those at the older ages.

Table K shows crude rates of disability on Type III claims for four different periods of experience. For the first three periods of experience the claims studied are those occurring after the second calendar year of the policy rather than after the fifth, as in the current study, but this

TABLE J
CRUDE RATES OF DISABILITY ON TYPE I (INCOME) CLAIMS (FOUR MONTHS WAITING PERIOD) FOR VARIOUS YEARS OF EXPERIENCE BY AMOUNT OF INSURANCE

AGES	1000×RATE OF DISABILITY			
	Class (3)— 4 Months (at Central Age)	Type I Experi- ence of 1935-1938	Type I Experi- ence of 1942-1943	Type I Experi- ence of 1946-1948
30-39.....	3.83	3.16	1.86	1.56
40-49.....	5.17	6.00	3.51	2.50
50-54.....	7.89	10.37	4.92	6.27
55-59.....	11.15	12.59	8.52	9.59

TABLE K
CRUDE RATES OF DISABILITY ON TYPE III (INSTALMENT) CLAIMS FOR VARIOUS YEARS OF EXPERIENCE BY AMOUNT OF INSURANCE

AGES	1000×RATE OF DISABILITY			
	Experience of 1932-1935	Experience of 1936-1940	Experience of 1941-1945	Experience of 1946-1948
20-29.....	.91	.73	.34	.46
30-39.....	1.34	1.09	.54	.62
40-49.....	2.17	1.85	.97	1.14
50-54.....	3.12	3.10	1.65	2.34
55-59.....	5.44	5.33	3.25	3.61

should not affect the validity of the comparison. The low rates of disability during the war years are noteworthy. Even during the postwar period of high employment, the disability rates on this type of claim were higher than during the war period.

CONCLUSION

The 1946-1948 disability experience covered in this paper can be summarized in the following statements:

(1) Rates of disability experienced under a nonautomatic disability income clause have been much higher than those experienced under an automatic waiver of premium clause.

(2) Compared to the corresponding Class (3) rates, rates of disability experienced under an automatic waiver of premium clause have been very favorable during a period of high employment.

(3) Even under the automatic waiver of premium clause, the rates of disability have been higher for the larger policies.

(4) Disability annuities under the automatic waiver of premium clause have been greater in general than the Class (3) annuities, even during a period of high employment.

Previous experience indicates that rates of disability cannot be expected to remain at their present low levels if the current trend toward unemployment continues. It would be interesting and valuable to know the experience of other companies on these and other comparable aspects of disability insurance.

DISCUSSION OF PRECEDING PAPER

WALTER KLEM:

The Equitable Life Assurance Society recently investigated its experience between the policy anniversaries of 1938 and 1947 with the waiver of premium benefit included in Ordinary insurance policies issued at standard premium rates in the years 1935 to 1945. The waiver provision appears to be similar to that of the Prudential (six months waiting period—benefit retroactive to date of commencement of total disability). Unlike the Prudential's clause, which was automatically included in all policies, ours was written only if applied for and approved for issue in accordance with selection standards. A small proportion of our waiver of premium issues was on the lives of women and on other risks for which an extra rating was applied to the premium for the benefit.

For whatever value a comparison may have in throwing light on the question of relative experience with the same clause when automatically included in all policies and when selectively issued, it would have been better had our study involved the same calendar years of exposure. However, to the extent that general levels of employment describe the economic climate, the Equitable's experience covers a period probably not very different on the average from the favorable postwar period covered by the Prudential. The 1938–1947 period covered in our study includes the still more favorable war years, and some prewar years of fairly high general unemployment. While the weight of the exposure to disability from issues of the years 1935 to 1945 is naturally heaviest at the end of the period of observation, the fact that we excluded only the first policy year of experience gives more weight to the earlier part of our period of observation than if we had excluded the first 4–5 policy years as was done in the Prudential's investigation.

Most of the policies under observation in our study contained a provision to the general effect that disability resulting from military or naval service in time of war was a risk not assumed. It is not believed that our results have been greatly affected by this provision. Whatever reduction in claim rate has resulted is largely confined to the younger attained ages and has been minimized by a fairly liberal administration of service-connected claims.

Another consideration in making any comparison lies in the difference

in the results to be anticipated depending upon the size of the benefit under consideration. The results of Mr. Mosesson's investigations on this point are most interesting. From the table given below it will be seen that, roughly speaking, the general level of the Equitable's issues falls about midway between the Prudential's "Waiver, Large" and "Waiver, Medium." A break-down of our figures by age groups shows, incidentally, that for all ages combined the excess of the average face amount of approved claims over the average face amount exposed to risk may be substantially greater than the excess at any single age, and that there is no meaningful relationship between the over-all averages.

AVERAGE FACE AMOUNT PER POLICY

Attained Ages	Exposed to Risk	Approved Claims	Excess of Claims over Exposed
20-29.....	\$1,876	\$2,195	\$319
30-39.....	2,981	3,588	607
40-49.....	4,095	4,701	606
50-54.....	4,281	4,288	7
55-59.....	3,966	4,434	468
20-59.....	\$2,956	\$3,816	\$860

The expected disability claims according to the Class (3) (6 months) Table were computed by number of policies and by face amounts of insurance for each attained age, and were combined in age groups for comparison with the actual claims. The results follow.

WAIVER OF PREMIUM

Issues of 1935 to 1945—Exposed 1938 to 1947 Anniversaries

(Policy Year 1 Excluded)

Expected Claims by Class (3) (6 months) Table

ATTAINED AGES	ACTUAL CLAIMS		EXPECTED CLAIMS		RATIO OF ACTUAL TO EXPECTED	
	Pols.	Amounts	Pols.	Amounts	Pols.	Amounts
20-29.....	372	\$ 816,388	1,716	\$3,210,508	22%	25%
30-39.....	625	2,242,741	2,320	6,952,568	27	32
40-49.....	621	2,919,132	1,665	6,853,857	37	43
50-54.....	242	1,037,606	455	1,948,346	53	53
55-59.....	132	585,322	191	752,158	69	78

The same face amounts of claims which entered into the investigation of the rates of disability were studied for their rate of termination, except that the 1947 claims were omitted. Observations were closed on the 1947 anniversary of the dates of disability. Claims were observed in five year groupings of ages at disability. Deaths and recoveries were recorded by months during the first year of claim to obtain an average annual rate of termination. Thereafter terminations were taken by whole years. The results for the first year of claim are as follows:

FIRST YEAR DISABILITY TERMINATIONS BY FACE AMOUNT OF INSURANCE
Expected Terminations by Class (3) (6 months) Table

Attained Ages at Disability	Actual Terminations	Expected Terminations	Ratio of Actual to Expected Terminations
20-29.....	\$ 364,893	\$ 379,476	96%
30-39.....	1,058,798	992,058	107
40-49.....	1,379,281	1,192,760	116
50 and over....	598,308	611,639	98
All Ages....	\$3,401,280	\$3,175,933	107%

For all ages combined, the terminations in the second claim year were 150% of those by the Class (3) (6 months) Table, and for claim years 3 to 9 combined the terminations were 121% of the expected. For the second and subsequent claim years, the ratios by age fluctuated much more than shown above for the first claim year. The absence of any sizable exposure at the longer claim durations precluded the calculation of 10 year temporary disabled life annuity values, but, with the great weight to be attached to the experience of the first year, our figures indicate the likelihood that such values would be generally lower than those based on the Class (3) (6 months) Table. However, the weight of the exposures of the disabled lives must be very nearly in the best period of high employment, and probably helps to account for the difference between our results and those given by Mr. Mosesson for the Prudential.

JOSEPH A. CHRISTMAN:

This paper is of considerable practical value for the information it gives on the experience under a waiver of premium clause automatically included in all policies. It would be of great interest if we could measure the

difference in claim rate between an automatic waiver benefit and a corresponding non-automatic benefit. The difficulty in making such a comparison is that there are nearly always other factors involved, particularly when the comparison is between the experience of two different companies whose life insurance underwriting and disability claim practices may differ. Metropolitan issued a waiver of premium benefit with a 6-month presumptive period from 1932-41. This benefit was issued only when applied for and required an extra premium. As our experience includes the large, medium and small classes without distinction, it was necessary to weight together the experience of the subtypes a, b and c of type II shown in Table D. Such composite type II experience compares with Metropolitan's experience as follows; for ages below 50 it appears to be the same, while for ages in the 50's Metropolitan's admission rates were approximately 1.50 per thousand higher.

We took occasion also to compare our admission experience under the 1930 income benefit with that shown in Table J. We find our claim rates to have been materially higher in each of the periods shown. For instance, in 1946-48 the two compare as follows, per thousand:

	Table J	Metropolitan
30-39.....	1.56	2.00
40-49.....	2.50	4.57
50-54.....	6.27	7.12
55-59.....	9.59	14.30

THOMAS E. GILL:

We have investigated the disability experience of our Ordinary insurance on the six months clause for the period 1944-48. The experience is divided into two classes;

1. Clauses providing waiver and monthly income of \$5.00 per \$1,000 or \$10.00 per \$1,000
2. Waiver benefit only.

We commenced issuing the six months clause in 1932. Coverage ceases at age 55.

The expected claims were based on Class (3) adjusted to the six-months clause. The experience by amount of insurance is as follows:

	Age Groups	Expected	Actual	Ratio of Actual to Expected
Income Clauses...	18-19	\$ 10,269		
	20-24	82,258	\$ 22,685	28%
	25-29	185,949	35,050	19
	30-34	309,820	105,822	34
	35-39	338,017	73,587	22
	40-44	280,312	76,557	27
	45-49	162,082	54,210	33
	50+	74,986	42,322	56
		\$1,443,693	\$410,233	28%
Waiver Only.....	18-19	\$ 28,488		
	20-24	265,725	\$ 18,526	7%
	25-29	543,339	98,949	18
	30-34	659,890	76,806	12
	35-39	599,317	132,718	22
	40-44	441,246	116,933	27
	45-49	296,599	131,213	44
	50+	161,904	92,192	57
		\$2,996,508	\$667,337	22%

The experience takes substandard business into account with the proper allowance being made in the exposure.

The experience is on an aggregate basis and as there was a big increase in issue in the later years of experience this would account to some extent for the low ratio of actual to expected.

MURIEL M. MUDIE:

The Confederation Life makes an investigation each year of the experience under the disability clauses with the Waiver of Premium and Monthly Income Benefits:

- a) Three months clause issued prior to 1932
- b) Six months clause issued 1932 and later.

These are described in *RAIA XXXV*, 156, and *XXXVI*, 340, where it is also pointed out that for the years 1942 to 1946 the figures used for "Expected Claims" are approximate only.

The unit is number of policies, while that of the Prudential was amounts of insurance.

All disability claims of the types mentioned above are included, while the Prudential excluded those occurring in the first five calendar years of the policy.

The Class (3) r_x is used for calculating Expected Claims, the ratio of Actual to Expected Claims being on an aggregate basis.

The results for the last three years are as follows:

CLAIMS OF YEAR	THREE MONTHS CLAUSE				SIX MONTHS CLAUSE			
	Nonmedical		Medical		Nonmedical		Medical	
	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected
1946.....	32	69.6%	17	94.6%	3	31.6%	4	44.2%
1947.....	34	78.3	10	59.2	3	23.6	4	37.4
1948.....	32	78.0	9	57.5	9	59.2	8	64.2

The results by attained age at disability for all years covered by the investigations are as follows:

AGES	THREE MONTHS CLAUSE (1922-1948)				SIX MONTHS CLAUSE (1932-1948)			
	Nonmedical		Medical		Nonmedical		Medical	
	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected	Actual Claims	Ratio to Expected
15-24.....	216	119.8%	24	83.2%	4	43.6%	5	63.4%
25-34.....	411	115.0	108	116.9	9	28.0	18	57.0
35-44.....	408	102.5	185	109.7	12	39.0	22	62.9
45 and over.....	403	95.0	341	98.6	5	39.6	13	56.4
Total.....	1,438	105.7%	658	103.5%	30	35.4%	58	59.5%

Expected terminations are based on the Class (3) Experience on a select basis. All terminations are taken into account, while the Prudential excluded terminations within two months of date of disability as an approximation to a six months basis.

Termination rates are not calculated separately for death and recovery. The results for all years covered by the investigations are as follows:

POLICY YEAR AFTER DISABLEMENT	THREE MONTHS CLAUSE (1922-1948)				SIX MONTHS CLAUSE (1932-1948)			
	Nonmedical		Medical		Nonmedical		Medical	
	Actual Terms.	Ratio to Expected	Actual Terms.	Ratio to Expected	Actual Terms.	Ratio to Expected	Actual Terms.	Ratio to Expected
1st Yr.	908	109.74%	394	107.44%	15	96.90%	24	74.51%
2d Yr.	180	137.66	93	151.37	1	54.95	8	120.12
3d Yr.	72	110.19	25	87.97	1	90.09	4	111.73
4th Yr.	55	140.74	30	179.96	0	0	3	155.44
5th and sub- sequent	135	173.75	62	153.39	1	196.08	5	171.82
	1,350	118.39%	604	117.59%	18	92.93%	44	93.04%
ATTAINED AGE AT DISABILITY								
15-24.	210	104.49%	24	103.99%	2	78.74%	4	136.52%
25-34.	404	123.34	105	115.42	8	118.87	16	99.07
35-44.	387	120.76	177	131.46	7	95.76	16	88.79
45 and over.	349	119.80	298	112.47	1	35.84	8	78.51
	1,350	118.39%	604	117.59%	18	92.93%	44	93.04%

Our experience gives rather a different result from that of the Prudential, in that it shows no tendency for the ratio of actual to expected claims to rise at the higher ages.

The ratio of actual to expected was not calculated separately for attained age at disability 60. By general reasoning we would expect a much higher claim rate at that age, as is borne out by the experience of the Prudential. What little experience we have at age 60 does not show this tendency, and there seems to be a tendency to very short disability at age 60, the few claims which we have being mostly caused by cancer or some form of heart disease.

WILLIAM H. KELTON:

Mr. Mosesson's paper is a valuable addition to our meager information on disability experience. Two very interesting points are the gradation in premium waiver experience by size of policy and the analysis of termination rates between death and recovery. The latter appears to be essential to thorough understanding of disability experience, but I do not recall having seen such an analysis in a previous insurance company experience.

Our various disability experiences have not been prepared along the same lines as those presented by Mr. Mosesson. In submitting the following data of The Travelers I must emphasize that they have been taken from previous experiences prepared at different times and with different purposes in view. There has not been sufficient time available to synchronize the data in any way or to make it parallel more closely the experi-

ence of the Prudential. In particular, much of our current experience on income claims is for all clauses combined and these include (1) a permanent total clause, to which a "dispute settler" three months clause was later added, (2) two three-months clauses and (3) a four-months clause.

INCOME DISABILITY TERMINATION EXPERIENCE

From Disability Anniversaries in 1946 to
Anniversaries in 1948

Ratios to Class (3) Tabular

DURATION IN YEARS	ATTAINED AGE AT DISABILITY		
	30-39	40-49	50-59
Permanent Total Clause			
1.....		35%	40%
2.....		116	69
Waiting Period Clauses			
1.....	97%	111%	83%
2.....	76	130	89
All Clauses Combined			
3.....	56%	79%	95%
4-5.....	112	80	160
6-10.....	75	168	177
11.....	161	108	104

Our current exposure under these three types is divided approximately 34%, 55% and 11% respectively. All these clauses except the four-months clause involve disabilities to both age 60 and age 65.

Our experience on all these income disability clauses combined for the calendar years 1947 and 1948, paralleling as closely as I am able the age distribution in Mr. Mosesson's Table D, was as follows:

Ages	Income Disability Claims Calendar Years 1947 and 1948 Ratios to Class (3) Tabular
35-49.....	89%
50-54.....	109
55-59.....	119

Our termination experience under income disability claims is available from the disability anniversaries in 1946 to the anniversaries in 1948. This has been divided between our permanent total clause and waiting period clauses for the first two durations. There does not appear to be much variation in termination rates between the two types of clauses after the second year.

Our termination rates during the above two years of exposure were unusually low for the first three durations and for durations eleven and over, as will appear from the following comparison for the two exposure periods 1939-1946 and 1946-1948:

RATIOS ACTUAL TO CLASS (3) TABULAR TERMINATIONS
Income Disability Claims—All Ages Combined

DURATION	EXPOSURE 1939-1946		EXPOSURE 1946-1948	
	Permanent Total Clause	Waiting Period Clauses	Permanent Total Clause	Waiting Period Clauses
1.....	50%	92%	39%	91%
2-3.....	92	120	76	100
4-5.....	129	133	164	123
6-10.....	169	150	159	157
11 and over.....	126	145	104	121

The data which we have available on our current premium waiver clause, issued since January 1, 1932, is summarized as follows:

PREMIUM WAIVER DISABILITY RATIOS TO CLASS (3) TABULAR

AGE GROUP	RATE OF DISABILITY 1932-1945	TERMINATIONS BY AGE GROUP ALL DURATIONS COMBINED EXCLUDING DURATION 1 1941-1945	TERMINATIONS BY DURATION ALL AGES COMBINED 1941-1945	
			Duration	Ratio
Under 29.....	29%	171%	1	58%
30-39.....	26	181	2	158
40-49.....	40	161	3	121
50-59.....	46	98	4-5	123
.....			6-10	184

The following data are somewhat along the lines of Mr. Mosesson's Tables I and J, except that we do not have the data broken down to age groups:

RATIOS TO CLASS (3) TABULAR
Rates of Disability and Annuity Values Combined

POLICY YEARS OF EXPOSURE	INCOME CLAUSES		CURRENT PREMIUM WAIVER CLAUSE
	Permanent Total	3 Months	
1932-1935.....	166%	189%	33%
1935-1941.....	123	139	40
1941-1945.....	87	102	34

The above experiences have not been taken out since 1945, but we know in general that the income disability ratios have increased during the last two or three years.

NEIL W. MACINTYRE:

In view of the decision to postpone the Inter-Company Disability investigation, this paper of Mr. Mosesson's is particularly timely. This Prudential experience substantiates the well known facts that the rate of disability and value of the annuities at disability depend, *inter alia*, on the benefits paid at and during disablement and the economic conditions. One particular feature is the persistency of anti-selection, even under the automatic waiver of premium clause, as evidenced by the higher rates of disability for the larger policies.

Recent studies by the Mutual Life of their disability experience may be of some interest. I am presenting this experience in two parts, the first being the disability income benefit and the second, the waiver of premium benefit.

Disability Income

We have recently completed a rather extensive investigation of our disability income policies. These results were combined with those of a prior investigation. The study covered the experience of 1940-47 for all premium paying policies on standard male lives containing disability in-

come benefits. The investigation covered the following classifications of disability income benefits.

Clause	Issued in Year	Income per \$1,000 Face Amount	Waiting Period	Dating Back	Amount Exposed (In Millions)
Level Income	1917-20	\$100 per annum	T & P	No	\$ 198
Level Income	1920-22	\$10 monthly	T & P	No	280
Level & Incr. Inc.	1922-25	\$10, 15, 20 monthly*	90 Day	No	994
Level & Incr. Inc.	1926-30	\$10, 15, 20 monthly*	90 Day	Yes	2,210
Level Income	1930-31	\$10 monthly	4 Months	No	450

* For increasing benefits the amount of income increases to \$15 after 5 years of total and permanent disability and \$20 after 10 years of total and permanent disability.

a) RATE OF DISABILITY

The ratios of actual to expected rates of disability per \$1,000 face amount under the several different clauses are shown below. For the T & P clause the expected are based on Hunter's table and for the 90 day and 4 months clause, Class (3).

	T & P Annual 1917-20	T & P Monthly 1920-22	90 Day 1922-25	90 Day 1926-30	4 Months 1930-31
1930-40	340%	433%	161%	190%	124%
1940-47	190	261	114	132	88
1930-47	313	392	147	170	110

Except for the 4 months clause in the period 1940-47 the rate of disability everywhere exceeds the expected rate. The rates were at their highest in 1930-33, decreased during the late thirties and early forties to a minimum in 1942-43, and have increased since then.

b) RATE OF TERMINATION OF DISABILITY

Ratios of actual to expected rates of termination per \$100 of annual benefit (income and waiver) under the several different clauses were calculated. For the T & P clauses the expected rates are based on Hunter's termination rates, and for the 90 day and 4 months clauses, on Class (3) termination rates. The termination rates, except for the annual T & P

clause, were higher in all instances in the 1940-47 period than in the 1930-40 period.

Period of Investigation	T & P Annual 1917-20	T & P Monthly 1920-22	90 Day 1922-25	90 Day 1926-30	4 Months 1930-31
1930-40.....	116%	129%	88%	91%	84%
1940-47.....	101	132	115	115	113
1930-47.....	132	131	93	101	96

Our more favorable termination rates in the forties are due in part to (a) economic conditions during the war, (b) much stricter claim administration beginning in the latter part of 1938 and (c) a large increase in compromise settlement cases beginning in 1939. For these policies the duration of the disability claim was determined by dividing the amount of the compromise settlement by the sum of the annual premiums waived and the annual income.

Waiver of Premium Benefits

This study covers the issues of 1932 to 1936 exposed from 1940 to 1945 anniversaries for all policies issued with waiver of premium benefits on standard lives. Our disability clause is the usual 6 months clause with retroactive benefits. We were satisfied that our experience in the select years was favorable but were particularly interested in the disability rate at later durations. The investigation is by amounts of insurance.

AGE AT ISSUE	EXPOSURE (IN MILLIONS OF DOLLARS)		RATIO OF ACTUAL TO EXPECTED; EXPECTED BASED ON CLASS (3)— 150% MODIFICATION		
	Male	Female	Male	Female	Combined
15-24.....	\$177	\$34	19%	16%	18%
25-34.....	347	29	37	20	34
35-44.....	310	17	43	28	42
45-55.....	88	3	47	38	47
Total.....	\$922	\$83	39%	23%	38%

Comparison of Mutual Life and Prudential Experience

a) WAIVER OF PREMIUM BENEFIT

A comparison of the Mutual Life rate of disability under the Waiver of Premium Benefit with the Prudential's can only be made roughly, since Mr. Mosesson presents his analysis by attained age and does not give the over-all result. At the present time, we are not able to make this break-down by attained age for our rate of disability. However, very roughly, our experience is similar to Type IIa (Waiver, large) in Table D.

b) INCOME BENEFIT

I have had made a calculation of the Mutual Life attained age rate of disability for the 4 months clause between 1940-47. The results are as follows:

Attained Age	1000 r_x
30-39.....	2.58
40-49.....	4.69
50-54.....	7.43
55-59.....	15.41

Comparing these figures with Table J it is seen that the Mutual rate of disability during 1940-47 falls between the Prudential 1935-38 and 1942-43 experience except at the oldest ages. Here our rate is higher but the exposure is somewhat scanty.

Mr. Mosesson's paper will be of considerable value to anyone interested in a recent disability experience.

(AUTHOR'S REVIEW OF DISCUSSION)

ZEHMAN I. MOSESSON:

The discussion of the paper has been most gratifying to me and adds greatly to our knowledge of current disability experience. I am grateful to all those who contributed to the discussion.

Mr. Klem is quite correct when he points out that there is no meaningful quantitative relationship between the over-all averages given in the two columns of Table B. I am unable to produce figures corresponding to the age break-down in his table. However, I believe the figures in Table B show that we were able to establish a satisfactory subdivision of our Type II disability clauses by amount.

Mr. Christman, in his discussion as originally submitted, pointed out an inconsistency in the figures in the last column of Table J. I have had the figures recalculated, and the correct figures appear in the published paper. I am very grateful to Mr. Christman for setting me on the track of this error.

Mr. Christman and Mr. Klem have both mentioned the desirability of comparing an automatic with a non-automatic benefit and the difficulties of doing so. Since we are not likely ever to see any one company issuing both an automatic and an identical optional benefit on two similar blocks of business, an exact comparison can probably never be made. It is interesting, however, to note that Mr. Klem's figures for ratios of actual to expected disability claims follow the same general pattern as the figures in Table D for Type IIa.

Mr. Gill, Miss Mudie, and Mr. Macintyre have given ratios of actual to expected disability claims for all ages combined. I am adding here the corresponding ratios for the Prudential experience. These figures properly belong with Table D.

RATIOS OF ACTUAL TO EXPECTED DISABILITY
CLAIMS (1946-1948) BY AMOUNT OF INSUR-
ANCE, EXPECTED CLAIMS BASED ON CLASS
(3)—SIX MONTHS WAITING PERIOD

Type I (Income).....	77%
Type IIa (Waiver, Large).....	43
Type IIb (Waiver, Medium).....	29
Type IIc (Waiver, Small).....	23
Type III (Instalment).....	28

Mr. Klem, Miss Mudie, Mr. Kelton, and Mr. Macintyre have given ratios of actual to expected terminations. I have calculated the Prudential figures for the Type II (Premium Waiver) experience (Types IIa, IIb, and IIc combined) for comparison.

TYPE II (PREMIUM WAIVER) DISABILITY TERMINATIONS 1946-1948
BY FACE AMOUNT OF INSURANCE
EXPECTED TERMINATIONS BY CLASS (3)—SIX MONTHS TABLE

ATTAINED AGES AT DISABILITY	DISABILITY TERMINATIONS FIRST YEAR		DISABILITY TERMINATIONS SECOND YEAR		DISABILITY TERMINATIONS 3D TO 10TH YEARS		DISABILITY TERMINATIONS 1ST TO 10TH YEARS	
	Actual Termina- tions	Ratio of Actual to Ex- pected Termina- tions	Actual Termina- tions	Ratio of Actual to Ex- pected Termina- tions	Actual Termina- tions	Ratio of Actual to Ex- pected Termina- tions	Actual Termina- tions	Ratio of Actual to Ex- pected Termina- tions
20-29	\$ 610,197	49.9%	\$ 448,743	98.3%	\$ 528,281	80.4%	\$1,587,221	67.9%
30-39	1,398,248	60.2	693,920	103.8	863,591	93.7	2,955,759	75.6
40-49	2,062,788	75.3	873,947	112.9	966,124	124.2	3,902,859	90.9
50-54	1,105,846	64.3	610,895	121.2	426,528	95.3	2,143,269	80.2
55-59	732,594	50.6	351,334	97.0	590,161	125.4	1,674,089	73.4
60	65,104	23.1	64,286	74.5	269,690	201.2	399,080	79.5
20-60	\$5,974,777	61.4%	\$3,043,125	106.7%	\$3,644,375	106.9%	\$12,662,277	79.2%

The most striking feature of these figures is the low ratio of actual to expected in the first year of disability. The Equitable experience given by Mr. Klem does not show this characteristic, but it appears in Mr. Kelton's premium waiver termination rates for 1941-45. It should be pointed out again that the Prudential experience excludes all after-death approvals, as described in the paper.

I should like to point out that Mr. Macintyre's ratios in his Paragraph 2 are based on the 150% modification of Class (3) rates and hence cannot be compared directly with the Prudential ratios, which are based on 100% Class (3).

The discussion of the paper points up not only the many differences in types of disability clauses issued, of which all actuaries are aware, but also the difficulties in comparing one company's experience with another's. In spite of these difficulties the experience described in the discussion will well repay study by those who are concerned with disability benefits of any type. The discussion has been a most valuable addition to the paper.