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DIGEST OF PANEL PRESENTATION AND INFORMAL
DISCUSSION ON THE 1951 IMPAIRMENT
STUDY AT THE SPRING MEETINGS

Eastern Spring Meeting panel members:

LEIGH CRUESS, Chairman of Committee on Mortality under Ordinary
Insurances and Annuities
EDWARD A. LEW
WILLIAM J. NOVEMBER
EDWARD W. MARSHALL
DR. WILLIAM BOLT, Chief Medical Director, New York Life Insurance
Company

Western Spring Meeting panel members:

LEIGH CRUESS, Chairman of Committee on Mortality under Ordinary
Insurances and Annuities
EDWARD A. LEW
ALTON P. MORTON
JAMES T. PHILLIPS
DR. RICHARD C. MONTGOMERY, Medical Officer, Manufacturers Life
Insurance Company

MR. LEIGH CRUESS said that publication of the *1951 Impairment Study* is another important landmark in the work of the Committee on Mortality under Ordinary Insurances and Annuities. It is the latest in a series of studies covering mortality of impaired risks and there can be no question about the valuable contribution of these studies to the development and success of underwriting for both standard and substandard insurance.

It covers the experience under Ordinary insurance issued from 1935 to 1949 traced to the anniversaries in 1950. Standard and substandard policies were studied separately. World War II deaths were excluded but Korean War deaths were included. Twenty-seven companies representing 70% of the Ordinary insurance in force took part in the investigation. More than 725 thousand policies were involved. There were more than 18,000 terminations by death. The mortality on 132 impairments was studied.

He called attention to the growth of substandard insurance—\$1,900,000,000 issued in 1952 and slightly less than \$12,000,000,000 in force at end of 1952. Mr. Cruess feels that substandard insurance is one of the

most important developments of the last 25 years in the life insurance business. Approximately 10% of Ordinary issues today are on a substandard basis and the percentage of applicants now refused insurance is only 2% or 3% as compared with declination ratios of 10% or more 25 years ago.

From the standpoint of the insuring companies, the proper classification of substandard lives has enabled them to place on their books additional insurance on which considerable underwriting expense had already been incurred regardless of the final underwriting action, thus reducing the economic waste resulting from unwillingness to assume a risk. From the agent's viewpoint, substandard has expanded his market and increased his income, for he now can get policies issued on 98% of his applicants.

Important developments in substandard underwriting have come about because companies have been willing, at the outset, to rely upon the clinical judgment of medical directors, supplemented by whatever statistics were available. As time went on, through individual investigations and through joint company investigations under the direction of the actuaries with the assistance of the medical directors, underwriting became much more accurate and at present, in Mr. Cruess' opinion, substandard underwriting is almost as accurately done as is the underwriting of normal risks.

These studies, however, are not an answer for all substandard underwriting problems. In spite of the extent of this study there are many impairment groups in which the experience is so meager as to be almost meaningless. There will always be room for the clinician and for the underwriting judgment of medical directors trained in prognosis and for the actuaries in interpreting the results.

Mr. Cruess emphasized that during the period covered by the study (1935 to 1950) there were many advances in medical science, medical procedures and public health. Therefore, the over-all experience for this period may not always be a good measure of the most recent years and of the future. In the application of these results of the study a forward-looking attitude is advisable. As part of such a forward-looking attitude, there must be considered also what lessons should be drawn from the *1951 Impairment Study* for use in future investigations. In the *1951 Impairment Study* frequent reference was made to relevant medical and public health statistics where such information shed additional light on the experience among insured lives; perhaps there should also be an exploration to an even greater degree of the possibility of using such medical and public health statistics bearing on the mortality among persons with

physical impairments, when an insurance experience is not available or is particularly expensive to compile.

Mr. Cruess acknowledged the work done on the Committee on Mortality under Ordinary Insurances and Annuities by his predecessor as chairman, Mr. George V. Brady. When Mr. Brady relinquished this position in the fall of 1953 most of the planning, layout, and much of the work had been done. Mr. Cruess also referred particularly to the part that Mr. Lew as Secretary of the Committee played in all phases of this project.

MR. E. A. LEW stated that the primary value of the *1951 Impairment Study* lies in the wealth of new information it has made available on which to base ratings and extra premiums for a wide variety of medical impairments. Present ratings and extra premiums have in large part been based on earlier intercompany statistics, notably the *Medical Impairment Study 1929* and the two supplementary investigations *Impairment Study 1936* and *Impairment Study 1938*.

He stressed that in making comparisons between the findings of the *1951 Impairment Study* and those of previous studies it is particularly important to bear in mind that the mortality ratios in the current study were computed on a basic mortality table in which the death rates were markedly lower than those in earlier studies. The information and comments on pages 1-13 of the *1951 Impairment Study* should also be kept in view in interpreting the results. Mr. Lew further emphasized the need for bearing in mind that the risks included in the present study were selected more carefully and more accurately than in earlier studies. In part this is so because during the last fifteen or twenty years a number of more searching diagnostic procedures have come into use as underwriting aids. On the other hand, this study reflects only to a limited degree the effects on mortality of the use of antibiotics and of improved methods of medical and surgical treatment which grew out of World War II.

Mr. Lew made the following general comments on the findings:

Perhaps the most striking single feature of the findings of the *1951 Impairment Study* is that the mortality ratios in most impairment classifications are reasonably close to those in the *Medical Impairment Study 1929*, the *Impairment Study 1936*, and the *Impairment Study 1938*, indicating that the underwriting of medical impairments has on the whole been commendably accurate.

However, even where the mortality ratios in the *1951 Impairment Study* are reasonably close to those in earlier studies, it should be borne in mind that the general level of actual death rates has been markedly lower in the current study and that the incidence of excess mortality by age at issue and by duration has frequently been quite different.

In a relatively small number of impairment classifications higher mortality ratios were found in the *1951 Impairment Study* than in earlier studies. In some cases the less favorable experience in the current study can be attributed to unduly liberal interpretation of the results of previous investigations, or to overoptimistic evaluations of advances in clinical or surgical treatment.

A very important contribution of the *1951 Impairment Study* lies in the information developed for a number of impairments and conditions not previously studied in intercompany investigations. Among these are:

Chorea	Albumin with pyuria
Phlebitis	Hematuria
Varicose veins	Pyuria
Family history of cardiovascular-renal disease	Pregnancy
Insanity	Caesarean section
Psychoneurosis	Fibromas
Migraine	Family history of cancer
Vertigo	Arthritis
Cerebral concussion	Hypothyroidism
Albumin with hematuria	Osteomyelitis

It should further be noted that the *1951 Impairment Study* includes a number of combinations of two impairments treated as one: for instance, pulmonary tuberculosis with underweight, albumin with slight or moderate overweight, albumin with slight or moderate hypertension, albumin with casts, albumin with hematuria and albumin with pyuria. Special interest also attaches to several categories of family histories of certain diseases, such as cardiovascular-renal diseases, insanity, cancer, and diabetes.

So far as incidence of mortality by age at issue is concerned, the commonest pattern is that represented by a constant extra percentage; that is, substantially the same mortality ratios are found for each of the four broad age groups at issue: 15-29, 30-39, 40-49 and 50-64. (See Table 1 a). However, there are a sizable number of important exceptions, notably most organic heart murmurs, insanity, fractured skull, gastric and duodenal ulcers without operation, duodenal ulcers with operation, fistula, oöphorectomy and spinal curvature (see Table 2); despite the fact that mortality ratios in these classifications decrease with advancing age at issue, the pattern of the extra mortality cannot be represented by a constant number of deaths per thousand. There are only a few classifications where mortality is relatively low at the younger issue ages but high, or at least increasing, at the middle or older issue ages; e.g., irregular or

intermittent pulse, albuminuria, intermittent or constant trace, poliomyelitis with deformity, and pregnancy (see Table 1 *b*).

Concerning the incidence of mortality by duration, this *Study*, unlike the earlier one, shows the commonest patterns to be extra mortality approximately constant and extra mortality decreasing slightly with dura-

TABLE 1
INCIDENCE OF MORTALITY BY AGE AT ISSUE
a) Impairments Characterized by Mortality Ratios Approximately Constant by Age at Issue

AGES AT ISSUE	ACUTE ARTICULAR RHEUMATISM	RAPID PULSE	TUBERCULOSIS	NEPHRECTOMY, NOT KNOWN DUE TO TUBERCULOSIS OR TUMOR	PHLEBITIS
	One or More Attacks (Std. and Substd.) A40-A42	Found on Examination (Std. and Substd.) A45-A46	One Attack, All Weights (Substd.) C1-C9	History (Substd.) E87-E90	One Attack (Std.) A74
Mortality Ratios*					
15-29.....	135% (79)	140% (41)	150% (32)	125% (10)	70% (3)
30-39.....	130% (128)	145% (72)	150% (113)	135% (27)	140% (18)
40-49.....	95% (147)	135% (105)	165% (101)	115% (33)	150% (33)
50-64.....	125% (150)	130% (67)	130% (18)	120% (26)	130% (26)

b) Impairments Characterized by Low Mortality Ratios at the Younger Ages with Higher or Increasing Mortality Ratios at the Older Ages

AGES AT ISSUE	IRREGULAR OR INTERMITTENT PULSE	ALBUMINURIA, INTERMITTENT TRACE	ALBUMINURIA, CONSTANT TRACE	POLIOMYELITIS WITH DEFORMITY	PREGNANCY
	Found on Examination (Substd.) A47-A58	Found on Examination, All Weights (Std. and Substd.) E1-E3	Found on Examination, All Weights (Std. and Substd.) E10-E12	One Attack (Substd.) J14	Found on Examination (Std. and Substd.) F7-F9
Mortality Ratios*					
15-29.....	95% (10)	105% (32)	130% (40)	115% (17)	145% (23)
30-39.....	105% (22)	145% (30)	195% (48)	140% (20)	370% (14)
40-49.....	125% (59)	170% (82)	175% (74)	190% (16)	2100% (4)
50-64.....	125% (63)	135% (83)	150% (77)	255% (7)

* Number of deaths (policies) shown in parentheses. Ratios rounded to nearest 5%.

tion as a percentage of standard (see Table 3 *a* and 3 *b*). There are only a few impairments where it can be said with any degree of weight that the mortality is increasing with duration. Except in the case of these impairments (see Table 4 *b*) the mortality ratios for all durations combined can safely be taken at their full value; that is, they provide conservative

TABLE 2

INCIDENCE OF MORTALITY BY AGE AT ISSUE

Impairments Characterized by High Mortality Ratios at the Younger Ages, Decreasing with Advance in Age

AGES AT ISSUE	ORGANIC HEART MURMURS	INSANITY	FRACTURED SKULL WITH OR WITHOUT OPERATION	FISTULA WITH OPERATION	GASTRIC ULCERS WITHOUT OPERATION	DUODENAL ULCERS WITHOUT OPERATION	DUODENAL ULCERS WITH OPERATION	OÖPHORECTOMY	SPINAL CURVATURE
	Found on Examination (Substd.) A7, A8, A9, A13, A16, A17, A22, A25, A28, A34	One Attack, Over 5 Years (Substd.) B6	Once, within 10 Years (Std. and Substd.) B19-B26	Within 5 Years (Std.) D49-D50	One or More Attacks within 10 Years (Std. and Substd.) D1-D10	One or More Attacks within 10 Years (Std. and Substd.) D14-D23	One Attack within 10 Years (Std. and Substd.) D24-D26	Within 10 Years (Std. and Substd.) F5-F6	Found on Examination (Substd.) J13
(i) Mortality Ratios*									
15-29	320% (367)	525% (5)	200% (65)	170% (21)	205% (20)	135% (35)	465% (21)	105% (42)	295% (36)
30-39	260% (390)	290% (14)	140% (46)	150% (67)	130% (55)	120% (158)	195% (63)	90% (101)	250% (40)
40-49	210% (452)	130% (7)	100% (31)	85% (65)	120% (76)	110% (232)	180% (102)	45% (44)	220% (40)
50-64	175% (246)	55% (2)	105% (20)	75% (32)	75% (35)	85% (105)	165% (75)	55% (16)	90% (11)
(ii) Total Deaths per Thousand									
15-29	3.5	5.7	2.2	2.0	2.3	1.5	5.1	1.2	3.2
30-39	5.6	5.8	3.1	3.5	2.8	2.4	4.4	2.0	5.2
40-49	10.7	5.6	5.2	4.4	6.1	5.2	8.9	2.3	11.0
50-64	18.6	5.6	12.5	9.1	8.6	8.8	17.3	6.3	10.6
(iii) Excess Deaths per Thousand									
15-29	2.4	4.6	1.1	0.8	1.2	0.4	4.0	0.0	2.1
20-39	3.5	3.8	0.9	1.2	0.6	0.4	2.2	-0.2	3.1
40-49	5.6	1.3	0.1	-0.8	1.1	0.5	3.9	-2.8	6.0
50-64	7.9	-4.5	0.4	-2.7	-2.9	-1.6	6.6	-4.7	-1.1

* Number of deaths (policies) shown in parentheses. Ratios rounded to nearest 5%.

TABLE 3

INCIDENCE OF MORTALITY BY DURATION

a) Impairments Characterized by Extra Mortality Approximately Constant by Duration, as a Percentage of Standard

POLICY YEAR DURATIONS	ACUTE ARTICULAR RHEUMATISM	RAPID PULSE	TUBERCULOSIS	CHRONIC BRONCHITIS	ALBUMINURIA, CONSTANT TRACE	PHLEBITIS	INSANITY	PYURIA
	One or More Attacks (Std. and Substd.) A40-A42	Found on Examination (Std. and Substd.) A45-A46	One Attack, All Weights (Substd.) C1-C9	Found on Examination, or with History (Std. and Substd.) C10	Found on Examination, All Weights (Std. and Substd.) E10-E12	One Attack (Std.) A74	One Attack 5 or More Years Ago (Substd.) B6	Found on Examination (Std.) E79-E81
	Mortality Ratios*							
1-2.....	115% (65)	140% (52)	130% (40)	200% (34)	190% (45)	170% (13)	235% (7)	110% (61)
3-5.....	125% (128)	120% (74)	160% (78)	215% (64)	155% (63)	145% (21)	170% (8)	90% (99)
6-10.....	115% (195)	145% (106)	170% (105)	160% (69)	160% (91)	110% (26)	195% (10)	95% (166)
11-15.....	115% (116)	150% (53)	140% (41)	195% (39)	155% (40)	155% (20)	155% (3)	95% (89)

b) Impairments Characterized by Extra Mortality Decreasing Slowly with Duration, as a Percentage of Standard

POLICY YEAR DURATIONS	ORGANIC HEART MURMURS	IRREGULAR OR INTERMITTENT PULSE	FAMILY HISTORY OF CARDIOVASCULAR-RENAL DISEASE	NEURASTHENIA AND PSYCHONEUROSIS	ASTHMA	FRACTURED SKULL WITH OR WITHOUT OPERATION	GASTRIC ULCER WITH OPERATION	DUODENAL ULCER WITH OPERATION
	Found on Examination (Substd.) A7, A8, A9, A13, A16, A17, A22, A25, A28, A34	Found on Examination (Substd.) A47-A58	Two or More Cases in Family under 60 (Std. and Substd.) A76	One or More Attacks (Std. and Substd.) B7-B12	One Attack within 5 Years, or 2 or More Attacks within 10 Years (Substd.) C20-C35	Once, within 10 Years (Std. and Substd.) B19-B26	One Attack within 10 Years (Std. and Substd.) D11-D13	One Attack within 10 Years (Std. and Substd.) D24-D26
	Mortality Ratios*							
1-2.....	250% (255)	140% (28)	175% (125)	130% (107)	155% (46)	200% (35)	245% (34)	200% (45)
3-5.....	265% (467)	115% (42)	130% (180)	130% (196)	185% (83)	125% (37)	185% (48)	200% (81)
6-10.....	220% (517)	120% (58)	145% (308)	115% (255)	135% (60)	155% (68)	190% (68)	195% (102)
11-15.....	200% (216)	110% (26)	135% (143)	95% (117)	125% (20)	95% (22)	185% (30)	135% (33)

* Number of deaths (policies) shown in parentheses. Ratios rounded to nearest 5%.

TABLE 4

INCIDENCE OF MORTALITY BY DURATION

a) Impairments Characterized by Extra Mortality Decreasing Rapidly with Duration, as a Percentage of Standard

POLICY YEAR DURATIONS	GASTRIC ULCERS WITHOUT OPERATION	DUODENAL ULCERS WITHOUT OPERATION	INFECTED GALL BLADDER	GALL BLADDER REMOVAL	CARCINOMA OR SARCOMA WITH OPERATION	HYSTERECTOMY, NOT DUE TO FIBROMA OR MALIGNANT TUMOR
	One or More Attacks within 10 Years (Std. and Substd.) D1-D10	One or More Attacks within 10 Years (Std. and Substd.) D14-D23	One or More Attacks within 10 Years (Std. and Substd.) D34-D37	Within 10 Years (Std.) D42-D44	History (Std. and Substd.) G1-G6	Within 10 Years (Std.) F3-F4
(i) Mortality Ratios*						
1-2.....	165% (41)	125% (119)	190% (27)	135% (94)	} 220% (30)	80% (28)
3-5.....	105% (48)	105% (159)	90% (25)	110% (149)		75% (50)
6-10.....	110% (68)	105% (187)	140% (57)	100% (210)	} 95% (17)	55% (54)
11-15.....	95% (29)	85% (65)	110% (23)	80% (97)		55% (26)
(ii) Total Deaths per Thousand						
1-2.....	3.0	2.3	4.6	3.5	8.3	1.9
3-5.....	3.2	3.2	3.9	5.0		3.2
6-10.....	5.3	5.1	8.9	6.7	7.8	3.6
11-15.....	7.8	6.9	11.0	8.7		5.5
(iii) Excess Deaths per Thousand						
1-2.....	1.2	0.5	2.2	0.9	4.6	-0.5
3-5.....	0.2	0.2	-0.3	0.5		-1.0
6-10.....	0.5	0.3	2.6	0.0	-0.6	-2.9
11-15.....	-0.3	-1.0	0.9	-2.0		-4.9

* Number of deaths (policies) shown in parentheses. Ratios rounded to nearest 5%.

TABLE 4—Continued

INCIDENCE OF MORTALITY BY DURATION—Continued

b) Impairments Characterized by Extra Mortality Increasing Slowly with Duration, as a Percentage of Standard

POLICY YEAR DURATIONS	ALBUMINURIA, INTERMITTENT TRACE	GLYCOSURIA WITHOUT DETAILS	POLIOMYELITIS WITH DEFORMITY	TUBERCULOSIS	
	Found on Examination, All Weights (Std. and Substd.) E1-E3	Found on Examination (Std.) H17	One Attack (Substd.) J14	One Attack, within 3-5 Years, All Weights (Substd.) C1-C3	
	Mortality Ratios*				
1-2.....	140% (29)	70% (6)	160% (11)	160% (12)	
3-5.....	90% (36)	95% (16)	85% (10)	160% (17)	
6-10.....	165% (105)	110% (28)	140% (21)	210% (23)	
11-15.....	160% (57)	145% (18)	275% (18)	250% (11)	

measures of the experience over a longer period of years than that covered by the *Study*. Among the impairments showing mortality ratios decreasing slightly by duration are most organic heart murmurs, irregular or intermittent pulse, psychoneurosis, asthma, fractured skull and gastric and duodenal ulcers with operation; however, the mortality ratios for these impairments do not decrease rapidly enough with duration to make them suitable for temporary constant extra premiums (see Table 3 *b*). Impairments suitable for temporary extra premiums are gastric and duodenal ulcers without operation, infected gall bladder, history of cancer and of female operations (see Table 4 *a*).

Mr. Lew also commented as follows on specific impairments:

Heart Murmurs

The experience on persons with heart murmurs was quite sizable. It included primarily two broad categories: systolic murmurs over the apex and over the base of heart.

For the most part the current study confirms the well-grounded facts developed in previous studies. Apex systolic murmurs which are inconstant and basic systolic murmurs in the pulmonic area show little adverse effect on longevity. The classification of apex systolic murmurs which are constant but not transmitted apparently comprised a mixture of functional and some organic murmurs, with mortality ratios approximating 120% on standard risks and 150% on substandard risks. The important classification of apex systolic murmurs which are constant and transmitted to the left (including those specified as mitral regurgitation) produced a mortality ratio of about 215% of standard. Basic systolic murmurs in the aortic area when constant and transmitted upward, which are presumed to be indicative of aortic obstruction, produced a mortality ratio close to 500% of standard.

The current study brings out much more clearly than previous studies the adverse effects of slight and moderate hypertrophy of the heart. It appears that more frequent reliance on heart charts and on X-ray or fluoroscopic examinations of the chest made it possible to determine the degree of hypertrophy very much more accurately than was practicable in the past. The mortality on cases with an apex systolic murmur constant transmitted to the left with slight hypertrophy was close to 300% of standard, while that with moderate hypertrophy was over 550% of standard.

Perhaps the most interesting difference between the current study and earlier studies relates to the findings on heart murmurs with histories of rheumatism, chorea, tonsillitis, or other streptococcic infections. The current study indicates that mortality on cases with heart murmurs is

increased from 50 to 100 percentage points by a history of any of these conditions. Previous studies indicated a similar finding for cases with histories of rheumatism or chorea, but only very small increases in mortality for cases with histories of tonsillitis or other streptococcic infections. In the *Medical Impairment Study 1929*, as well as in some other studies, histories of nonstreptococcic infections were probably included along with the histories of tonsillitis and streptococcic infections, and this may account for the lower mortality found in these earlier studies on heart murmurs with such histories.

The incidence of mortality by age at issue in the important classification of apex systolic murmur constant transmitted to the left is different from that found in earlier intercompany studies. In the present study, the mortality ratio among persons with this murmur is higher than before at issue ages under 30 but lower at ages 50 and over. The higher mortality ratio among younger persons with this murmur merely reflects the much greater improvement in the mortality of standard risks at the younger ages. The lower mortality ratio among older persons with this murmur may be attributed to the more careful selection of such risks at the older ages, due to the greater reliance on blood pressure readings, heart charts, X-rays of chest, and electrocardiograms.

In many of the heart murmur classifications, the mortality from cancer was significantly higher than average; the reason for this finding is obscure.

Rapid, Irregular, and Intermittent Pulse

The present study included a moderate volume of data on rapid, irregular, and intermittent pulse.

In the case of pulse rates from 90 to 100 per minute, the mortality ratio was about 120% for standard risks and about 150% for substandard risks. The higher mortality ratios on substandard risks may reflect the fact that in about two-thirds of the cases issued at substandard premium rates there were also present various minor impairments, such as slight overweight, slight hypertension, slight underweight, or abnormal urinary findings.

Because of the lack of uniformity in the reporting of irregular and intermittent pulse, these two categories were considered together. The rate of irregularity or intermittency of the pulse and the effect of exercise on the irregularity or intermittency appear to have little effect on the mortality experience.

Cases on which an electrocardiogram was obtained were classified separately from those underwritten without this test. The experience in these two classifications indicates the value of the electrocardiogram in screen-

ing out poor risks. More specifically, the mortality on cases with an irregular or intermittent pulse accepted at standard premium rates was only about 80% of standard where an electrocardiogram had been obtained, and about 90% of standard where there was no electrocardiogram. In the case of substandard risks, the mortality was 90% of standard where an electrocardiogram had been obtained and 120% where there was no electrocardiogram.

The cases of irregular or intermittent pulse were apparently rated substandard largely when there were associated minor impairments present or where the irregularity or intermittency of the pulse appeared to be relatively constant. Mortality as high as 150% of standard was found only on certain cases of irregular or intermittent pulse where no electrocardiogram had been obtained and substandard insurance had been issued.

Family History of Cardiovascular-Renal Disease

The findings on cases with a family history of cardiovascular-renal diseases, two or more cases (predominantly deaths) at ages under 60, represent perhaps the most startling result of the study. The experience on cases with this family history was based on over 18,000 policies and some 631 deaths. The overwhelming proportion of the exposure was on standard risks, the mortality ratio on which was 141%, based on 609 deaths. The much smaller substandard experience produced a mortality ratio of 185%, based on 22 deaths.

Because of the substantial size of the experience and because 10 out of the 14 companies contributing to the experience each had a mortality ratio in excess of 130%, it is possible to rule out the possibility that the mortality ratio of 141% for the combined experience was the result of chance fluctuations.

In judging the significance of this mortality ratio, it is necessary to keep in mind that at least 40% of the cases with this family history had associated minor impairments, such as slight overweight, slight elevation in blood pressure, etc. It is, therefore, possible that much of the excess mortality in this classification reflects the effect of the associated minor impairments rather than the effect of the family history of cardiovascular-renal disease. It is also possible that minor impairments, such as a slight degree of overweight or a slight elevation in blood pressure, have special significance in connection with a family history of cardiovascular-renal disease. The fact that the excess mortality among persons with a family history of cardiovascular-renal disease was largely accounted for by deaths from diseases of the heart and circulatory system and by deaths from vascular lesions of the central nervous system suggests the influence

of a hereditary factor in cardiovascular-renal disease. Several much smaller insurance studies, notably those made by Dublin and Marks and by Marshall, also indicated somewhat higher than average mortality among persons with a family history of cardiovascular-renal disease, but none of these studies produced as clear-cut a finding with regard to the excess mortality as was found in the current investigation.

Ulcers of Stomach and Duodenum

The experience on ulcers of the stomach and duodenum in the current study was quite large. In this experience (1) 96% of the exposure was on males, (2) the ratio of gastric to duodenal ulcers was about 1 to 3, or more nearly in accord with clinical experience than were the findings in earlier studies, and (3) about one-third of the gastric ulcer and about one-sixth of the duodenal ulcer cases had been surgically treated, which was a lower proportion of surgical cases than in earlier studies, and also more in conformity with clinical experience.

In the category of unoperated ulcers a differentiation was made between cases with and without a known history of hemorrhage. This was not done in previous studies. The small experience on cases of gastric and duodenal ulcers without operation but with a known history of hemorrhage suggests that such cases were apparently poorer than average risks. The experience on gastric and duodenal ulcers without operation and without a known history of hemorrhage was within 125% of standard where the last attack had been reported more than five years prior to application.

The sizable experience on gastric and duodenal ulcers with operation indicates that the mortality on such risks is in excess of 150% of standard even on cases where the operation was performed more than five years prior to application. The mortality on the carefully selected cases of gastric or duodenal ulcer with operation within two years of application was in excess of 200% of the expected. There was relatively little difference between the experience on gastric and duodenal ulcers.

The mortality ratios on surgically treated gastric and duodenal ulcers found in the present study were appreciably higher than those in the *Impairment Study 1936*, and also higher than in most of the corresponding classifications in the *Medical Impairment Study 1929*. The relatively favorable experience found in the *Impairment Study 1936* and unduly overoptimistic evaluations of recent advances in the surgical treatment of ulcers may have led to some unduly liberal underwriting of this impairment in recent years, which has apparently been reflected in the higher mortality ratios found in the present study.

Gall Bladder Disorders

The volume of data on gall bladder disorders was also fairly sizable. Paralleling the trend in clinical practice, it was concentrated to a much greater degree than in previous studies in the classifications with the gall bladder removed. Reflecting the sex ratio typical of gall bladder disorders, there was a high proportion of female lives, ranging from about 25% among medically treated cases to about 50% in the surgically treated cases.

The experience on medically treated cases with one attack within two years of application produced a mortality ratio of about 125% in the aggregate. The cases with an attack three or more years prior to application showed mortality of about 100%. The carefully selected surgically treated cases to whom standard insurance was issued experienced mortality within 125% of standard, while those with gall bladder removed to whom substandard insurance was issued showed mortality ratios in the range from 125% to 150%.

Mortality from diseases of the digestive system, and more especially of the liver and biliary tract, was significantly above normal in most classifications. Taking into consideration the high proportion of females in these classifications, there was also some suggestion of slightly higher than average mortality from heart disease, which is in line with the observations made in clinical studies as to the association between gall bladder disorders and coronary artery disease.

Albuminuria and Abnormalities of Urinary Sediment

It is important that the discussion on pages 151-153 of the *Study* be read carefully before trying to interpret these results.

Albuminuria (without casts, red cells, or white cells) was studied in classifications by build and blood pressure. Intermittent or constant trace of albumin with average weight produced mortality of about 135% on standard risks and 160% on substandard risks. Where the weight was 10% to 20% above average, the mortality was 30 percentage points higher than in cases with average weight. In the substandard classifications with constant albumin, there was a marked increase in mortality with increased systolic pressure. The findings for combinations of albumin with slight or moderate overweight and with slight or moderate hypertension, while covering only limited ranges of build and blood pressure, shed some new light on the pattern of mortality for combinations of related impairments.

In the substandard classifications of constant albumin, mortality increased progressively with the amount of albumin.

The experience on intermittent or constant albumin with casts was significantly higher than the corresponding experience without casts. The experience on intermittent or constant albumin with pyuria was appreciably but not significantly higher than the corresponding experience without pyuria. The experience on intermittent or constant trace of albumin with hematuria was quite small.

The cases with casts, hematuria, or pyuria without albuminuria accepted at standard rates produced a mortality ratio within 125% of standard. Those accepted at substandard rates produced somewhat higher mortality.

Genito-Urinary Stone or Colic

The experience on this impairment was generally somewhat less favorable than in the *Medical Impairment Study 1929* or the *Impairment Study 1938*. Nevertheless, unoperated cases with a history of one attack within five years of application produced mortality within 125% of standard; on unoperated cases with a history of one attack more than five years prior to application, the mortality ratio was somewhat lower.

The experience on surgically treated cases produced a mortality ratio of about 150% where the operation had been performed within five years of application; on cases with surgery more than five years prior to application, the mortality ratio was close to 100%.

Tumors

The *1951 Impairment Study* included an experience on about 1,000 policies with a definite history of cancer who had been issued insurance, usually after five or more years had elapsed since operation. A very small experience on cases accepted at standard rates produced a mortality ratio of about 100%. An experience on cases accepted at substandard rates produced a mortality ratio of about 200%, based on 32 deaths. It is also of interest that on cases accepted ten or more years after operation the mortality was within 125% of standard.

An attempt was made to analyze the experience on cancer by site but the data for individual sites were very small. In so far as these data go, they showed a mortality ratio of 172% for cancer of the breast, based on eight deaths; an even smaller experience on genito-urinary cancers suggests that the mortality on such cases was relatively favorable.

All of the excess mortality on histories of cancer was due to recurrence of cancer. On the other hand, in the small experience on histories of epithelioma, which produced a mortality ratio of about 100%, the number of deaths from cancer was just about that expected.

The study also included a sizable volume of data on family histories of cancer, two or more cases under age 60. The mortality ratio in this classification was 106% based on 81 deaths. Deaths from cancer were twice the expected.

MR. W. J. NOVEMBER commented briefly on diseases of the brain and nervous system. He said three impairments under this heading were covered for the first time in an insurance mortality investigation: history of insanity, migraine and cerebral concussion. Although the volume of data was not large for either history of insanity or migraine, the results indicated substandard mortality should be expected with the former, but that apparently the latter does not substantially shorten life. The somewhat more voluminous data on cerebral concussion seems to indicate that persons who have had a concussion but show no residual impairment are not subject to any appreciable extra mortality. In connection with the fractured skull category, he called attention to the fact that the mortality level on substandard was about the same as in the *M.I.S.*, while the standard policies did not fare as well. An attempt to differentiate between "with operation" and "without operation" classifications was inconclusive because of lack of information in so many cases, but it did appear that the "with operation" cases produced higher mortality. The neurasthenia and psychoneurosis categories, rather difficult groups to classify from the point of view of accuracy and homogeneity, had a rather sizable volume of data. While there were some groups which showed extra mortality, it appeared that a great majority of persons with a neurotic condition managed to attain a fairly normal span of life.

Referring to diseases of the respiratory system, Mr. November commented on the large volume of data on personal history of pulmonary tuberculosis. He felt this was probably due to more frequent discovery of cases and more liberal acceptance of persons with such a history. Although there has been a sharp drop in death rates from tuberculosis, this study shows substantial excess mortality in the substandard categories among persons with a history of pulmonary tuberculosis. Supplementary information from a number of companies indicated that a current X-ray had been obtained in about 18% of the cases which resulted in better selection and further revealed that the proportion of cases diagnosed as moderately advanced or far advanced was small in most classifications. He called attention to evidence in this study that the old underwriting guides of build and time since recovery may not be as effective in the selection of risks as an assessment of the present status of the disease (as revealed by a current X-ray and physical examination) and the determination of the degree of involvement at the height of the disease (as revealed by the medical history and X-rays taken while the disease was active). Another

condition in the respiratory group referred to by Mr. November was chronic bronchitis. With a fairly substantial volume of data, this impairment presented high mortality for both standard and substandard policies. The mortality level for the standard policies, particularly, was in excess of that which had been found in the *M.I.S.*

On the matter of family history of cardiovascular-renal disease, Mr. November said that he does not minimize the importance of what may appear to be minor impairments. However, he felt that heredity was responsible to a considerable extent. Certainly the combination resulted in substantial extra mortality.

Mr. November pointed out that the area of the investigation dealing with female diseases and conditions was characterized by low mortality ratios, primarily due to the fact that the mortality among women is on the whole so much lower than that among men. Even after adjustment had been made for this, however, it was found that fairly good mortality was achieved in the various female disease categories that were studied.

In referring to the glycosuria category, Mr. November stated that the general level of mortality ratios of the current investigation was somewhat higher than found in the *M.I.S.*, with deaths from diabetes being significantly high. Cases where a blood sugar test had been made were distinguished from those without a test, and it was found that the former group showed somewhat lower mortality ratios. It was thought from this that the blood sugar test had been effective in screening out cases with high blood sugar.

Concerning family history of diabetes, Mr. November called attention to the large volume of data and the favorable mortality ratios. In spite of this, the deaths from diabetes were high, as were deaths from nephritis and from diseases of the heart and circulatory system for issue ages under 40. He also pointed out that comparison with prior investigations was not easy because the policies studied in the past were generally those with two or more cases of diabetes in the family history.

MR. A. P. MORTON reviewed the *1951 Impairment Study* to show in what areas selection procedures had been successful in distinguishing between standard and substandard classes, in what areas they had failed to make a good distinction, and what areas caused special underwriting difficulties. He pointed out that standards of selection had changed from year to year during the period studied, and that different companies use different methods in underwriting an impairment. He emphasized that the practical application of the results of this Study requires a very careful appraisal of the standards of selection used to produce the past results, and an equally careful estimate for the future for a given impairment.

As examples of distinguishing successfully between standard and substandard, Mr. Morton referred to:

- (1) Class A1, apex murmur, systolic, constant, not transmitted—124% for standard, 146% for substandard;
- (2) Class A34, heart murmur without details—82% for standard, 209% for substandard;
- (3) Class A45, rapid pulse (90-100 per minute)—118% for standard, 148% for substandard;
- (4) Class A47, intermittent or irregular pulse, under 5 per minute—101% for standard, 152% for substandard;
- (5) Class B7, neurasthenia or nervous prostration, one attack, within 2 years of application—109% for standard, 176% for substandard;
- (6) Class C37, coresidence with tuberculosis—101% for standard, 168% for substandard;
- (7) Class J13, spinal curvature—112% for standard, 216% for substandard;
- (8) Class J14, poliomyelitis, with marked deformity, one attack—101% for standard, 149% for substandard.

As examples of areas where selection standards failed in some degree to distinguish between standard and substandard classes, Mr. Morton mentioned:

- (1) Class D13, gastric ulcer, with operation, one attack within 6-10 years of application—231% for standard, 147% for substandard;
- (2) Classes D24-D26, duodenal ulcer, with operation—164% for standard, 209% for substandard;
- (3) Class A40, acute articular rheumatism, one attack within 5 years of application—129% for standard, 121% for substandard;
- (4) Class E85, genito-urinary stone or colic, with operation, once, within 5 years of application—157% for standard, 168% for substandard.

Among the classes reflecting special underwriting difficulties, Mr. Morton discussed urinary impairments and family history.

Regarding urinary impairments he commented that companies had been only partly successful in distinguishing between standard and substandard. High mortality is shown in the standard group for a trace of albumin, either intermittent or constant. The results for a combination of albumin and blood pressure seem to indicate that elevated blood pressure is the more significant impairment of the two when they are found together. He pointed out that albuminuria is a symptom and not a disease. There seems to be no suggestion in the results of any conclusive way to determine when the symptom is unimportant or can safely be ignored. A further complicating factor is the variety of laboratory standards which entered into the classification of risks.

With respect to family history, Mr. Morton commented on Class A76,

family history of cardiovascular-renal disease, two or more cases in family under age 60, which showed 141% (based on 609 deaths) for the standard group. He analyzed the Prudential's data which showed an over-all ratio of 132% based on 258 deaths. A subgroup consisting of the cases involving borderline blood pressure or weight had 40% of the deaths and gave a ratio of 169%. The rest of the cases showed a 112% ratio. In both these groups the higher ratios were at the younger ages. The analysis by causes of death showed that a heavy preponderance of the excess deaths in the borderline group were due to cardiovascular-renal disease. No cause of death was especially outstanding in the other group. Mr. Morton said his tentative conclusion was that more careful underwriting is needed especially in those cases where other borderline factors are present.

Mr. Morton said the results for family history of cancer (G17) and diabetes (H41) were puzzling since the mortality ratio indicated satisfactory results but the causes of death analysis showed a preponderance of deaths from cancer and diabetes respectively. In his opinion this showing indicates the need for a continuation of careful underwriting in these areas.

MR. E. W. MARSHALL spoke of the limitations of the *1951 Impairment Study*. It must be frankly recognized that few ready-made answers are given. As in the case of the previous impairment studies, its results will require actuarial and medical interpretation and application in light of up-to-date clinical evidence and each company's own underwriting standards. He pointed out that this is not easy, and urged that before anyone looks at the results he should carefully read and reread pages 6, 12, and 13 of the *Study* which concern comparisons with previous studies and interpretation of findings. He also referred to limitation resulting from the small number of deaths in many of the groups. Fairly small groups can be given more credence if the results are supported by similar results in several other analogous groups or by strong clinical evidence. Helpful statistical criteria are given to test for fluctuations, but for very small groups even these are very uncertain reeds to lean upon.

Mr. Marshall pointed out that the cardiovascular-renal group remains pretty much as unfavorable as ever. In this connection he said it should be remembered that the *1951 Impairment Study* does not cover the depression period of the early 1930's with its increased mortality rates, particularly on policies for large amounts. He raised the questions: Would this cardiovascular-renal group—already so important—respond unfavorably to the financial strain of a substantial depression if it should occur, and should a special margin of safety against it be included in arriving at rating classifications for this group? In general, as the *Study* is

based on policies rather than amounts, should these ratings for all impairments which are associated with higher than average amounts of insurance per life be given an added margin of safety to allow for this fact?

Mr. Marshall said he agreed with those who felt that owing to continued advances in medical science, etc., the current rate of extra mortality in many impairments is likely to be well under the average shown in the Study; also that some allowance should be made for future medical progress. However, he urged that the published statistics not be scrapped too readily. The restraining influence of past statistical experience is needed so that optimistic enthusiasm regarding clinical possibilities will not cause underestimation of future mortality. He mentioned, as a possibility only, the reversal that might take place if some important germs such as in tuberculosis or staphylococcus infections should develop a large scale resistance to previously effective drugs such as penicillin or streptomycin. This is already happening to some extent and, while he expressed full confidence that the problem would be overcome in one way or another, he cited it as a reminder that what counts in the life insurance business is the test of time.

Mr. Marshall referred to another problem which he felt was important, *i.e.*, whether a new approach to impairment studies is needed. He mentioned the long time lag in any large study, and the almost insuperable problems of getting the work done. He asked the questions: Should there be a revolving process of studying each year a few impairments on a shorter range basis? Or should there be periodic quick samples of large important ones? Or are there other new approaches? He felt there is an obvious need to reconsider the problem of intercompany impairment mortality studies.

Mr. Marshall directed attention to the low rate of mortality at the younger ages. He agreed with Mr. Lew who has advanced the idea elsewhere that stating extra mortality in terms of a percentage may not be the best method of expressing impairment mortality. He expressed the hope that someone would explore this matter and some of the other problems mentioned.

With reference to the family history of cardiovascular-renal disease findings previously discussed by Messrs. Lew, November, and Morton, Mr. Marshall said it was his belief that the extra mortality is almost entirely due to the hereditary influence, but that the associated "minor" impairments of slight overweight or slightly elevated blood pressure become of *major* importance in these groups as a symptom that the hereditary forces are likely to be at work.

MR. J. T. PHILLIPS referred to the extent of the study and its cost

to the companies—well over \$500,000. He said this raises the question (already mentioned by Mr. Marshall) as to whether the results can be supplemented and kept up-to-date by using statistics from other sources, such as disability claim statistics or perhaps even Veterans Administration statistics.

Mr. Phillips said that a cautious approach was indicated in setting ratings at a lower level than the mortality experience because of medical developments. In this connection he referred to Mr. Marshall's remarks about the need for the restraining influence of past statistical experience. He also called attention to the fact that the Study did not cover any depression years.

In interpreting the results of the Study, account must be taken of the distribution of the data between standard and substandard policies and the distribution by duration. Mr. Phillips suggested using the "model office" approach, weighting individual age-duration subgroups by volume of exposures representing an assumed in-force distribution for the impairment.

Mr. Phillips said there has been a trend toward use of multiple tables and broader mortality groupings in classifying substandard risks. The use of broad classes makes it somewhat easier to express the intercompany experience in terms of mortality ratings, at least for those impairments where the mortality level appears to fall well within the limits of a particular class.

DR. WILLIAM BOLT said that in connection with impairment studies it is necessary to distinguish between those impairments which are specific conditions or diseases and those representing symptoms or findings. The first group includes cancer and other tumors, syphilis, pulmonary tuberculosis, gall bladder disease, etc. In these, the results of the Study are definite and can usually be applied directly to future underwriting, subject to certain restrictions. In the second group are conditions such as irregular and intermittent pulse, rapid pulse, vertigo or syncope, glycosuria and albuminuria. In dealing with these the underwriter must exercise his knowledge and ingenuity to detect the cause, or rate to cover all possibilities. A rapid pulse, for instance, can be due to something other than heart disease—possibly some infection, such as tuberculosis. Vertigo may mean ear disease or a brain tumor. Glycosuria may mean diabetes. Albuminuria may be caused by kidney disease.

Dr. Bolt said he stressed the underwriting factors in these impairments because some of them show up favorably in the Study, yet if any company adopts underwriting standards based on a literal application of these results the experience may be bad in the future. As an example, he cited chronic bronchitis where the current experience is not as favorable

as it was in the *M.I.S.* He felt that most underwriters glossed over this condition because it did not appear to be too important. As a result, deaths from tuberculosis and tumors were unduly high.

Dr. Bolt commented on the important medical factors in the interpretation of the following impairments:

- (1) *Heart Murmurs*—Experience varies with accuracy of classification which depends on quality and thoroughness of examination, whether or not heart studies are obtained, and the alertness of the underwriter.
- (2) *Brain and Nervous Disease*—Main difficulty is getting accurate history of emotional upsets and illnesses.
- (3) *Pulmonary Tuberculosis*—Build may not be so significant, overweights have probably been treated too liberally in past. This condition is no longer mainly a disease of younger ages. Future evaluation should be based more on degree of lung involvement as shown by X-rays. Studies by year of issue groups might be valuable since many new treatments are being used.
- (4) *Ulcer*—Results seem to confirm feeling of many that underwriting of this condition has slipped gradually into overliberal treatment. Hemorrhage and operation are unfavorable factors. Surgery alone may never be 100% effective in these ulcer cases because the individual's personality or "psyche" remains unchanged. Study shows that deaths from coronary artery disease and cerebral hemorrhage were above normal where there was an ulcer history.
- (5) *Tumors*—Results suggest a future study by site, including organs affected. In papillomata and fibromata the deaths from malignancy were high. Knowledge as to the site would be helpful, particularly in the case of papillomata.
- (6) *Glycosuria*—Higher than expected deaths from diabetes suggests some underwriters accepted these cases too freely without screening them by blood sugar tolerance tests. The experience with glycosuria should not be used without recognition of the fact that the use of these tests has served to eliminate many diabetics or potential diabetics.
- (7) *Spinal Curvature*—The high mortality in the substandard group probably means these cases were classified substandard because the underwriters suspected some disease, such as tuberculosis, as the causative factor and rated accordingly. The results are so similar to those of tuberculosis of the spine that it seems clear the suspicion or hunch of the underwriters was correct.
- (8) *Poliomyelitis*—The higher than expected deaths from cardiovascular disease may well indicate that handicapped people develop heart disease because of the efforts they have to make to rehabilitate themselves and to try to carry on as normal individuals.
- (9) *Blindness*—The experience is favorable but it must be remembered that cases of blindness due to serious disease had been eliminated by the under-

writers. Earlier studies of individuals who became blind after issue show a less favorable mortality picture.

DR. R. C. MONTGOMERY expressed the opinion that the *1951 Impairment Study* would prove valuable to the clinician as well as to insurance underwriters. Of course, it is necessary to give the clinician some assistance in interpreting the results. At the May meeting of the Executive Council of the Life Insurance Medical Directors the job of dissemination of these findings to the profession was given to Dr. Ralph Simonds, Chairman of the Committee on Professional and Public Relations, and Dr. William Bolt, Chairman of the Mortality Committee.

Dr. Montgomery said that, in general, the *Study* provides corroborating evidence of good judgment in classifying the risks since there are few surprises. He felt that present underwriting should reflect this past experience, combined with judgment of present and anticipated improvements in the particular categories.

Dr. Montgomery commented as follows on some of the impairments:

- (1) *Pulmonary Tuberculosis*—The incidence of tuberculosis is declining but there are still many tuberculosis deaths. For example, in 1952 there were more tuberculosis deaths in Ontario than from all the other infectious diseases combined. Greater use of X-ray is indicated.
- (2) *Chronic Bronchitis*—Results indicate bronchitis is more important than realized.
- (3) *Hematuria and Pyuria*—Difference in laboratory techniques is a problem here. It seems there are not too many hazards in underwriting these cases if those showing constant findings are carefully investigated.
- (4) *Epilepsy*—Results suggest these risks can be underwritten on a definitely substandard basis. It is difficult to get true histories.
- (5) *Rapid Pulse*—Dr. Montgomery said that in younger people this may indicate only nervousness but he feels that at age 18 a pulse of 100 is not normal. The causes of death seem to indicate that there is an undiagnosed disease, such as tuberculosis, new growth, or hyperthyroidism. A consistently rapid pulse is surely substandard.
- (6) *Pregnancy and Caesarean Section*—Study suggests normal expectancy. Maternal mortality showed a definite drop following the advent of sulpham in 1937. Similarly, Caesarean section has undoubtedly been improved by the same drug and later antibiotics and by improved surgical technique.

While he realized that the present *Study* cost considerable money and a great deal of hard work, Dr. Montgomery hoped that these studies would be kept up. Probably twenty years is too long to wait and it might be possible for some of the companies to carry on a continual study on certain fixed subjects. Recalling that the old team of Rogers and Hunter added a lot to our present knowledge, he did not doubt that we have some young men who will be willing and anxious to follow in their footsteps.

MR. A. C. WEBSTER said he would like to point out that this *Study* furnishes a lot of material on impairments which have not been studied before, and there is need for caution in interpreting the results. This is particularly true of the groups for which the number of deaths was less than 35.

In connection with Mr. Morton's analysis of the difference between standard and substandard, Mr. Webster called attention to the fact that the results are by lives and policies and that there is no information as to results by amounts. He suggested it is quite possible that a favorable standard result and an unfavorable substandard result could be affected by amounts of insurance involved.

Mr. Webster compared the experience on the two family history groups, cardiovascular-renal diseases and diabetes, and said that he found it difficult to understand why the diabetes group should give a standard result and the CVR group a substandard result, although we probably had to accept the results of the CVR group as authentic because of the tests made. He suggested that perhaps family history was not the important factor, but rather multiple minor impairments which may have been ignored in underwriting.

MR. LEW answered Mr. Webster's question as to what the mortality by amounts might be by referring to some tests made by the Central Bureau. These tests indicated that the mortality by amounts followed very closely the pattern of relationship between policies and lives. One way of crudely estimating what the mortality by amounts would have been is to look at the ratio of policies to lives. Concerning interpretation of the results in cases of family history of cardiovascular-renal disease, Mr. Lew referred to Mr. Morton's analysis of the Prudential's experience as a major contribution and also suggested that a family history of cardiovascular-renal disease could be regarded as an approximate index of overall family longevity. He felt that the important point in interpreting the results in family history of diabetes was the fact that this study included histories of one or more cases whereas previous studies covered histories of two or more cases. He said an analysis of the Metropolitan's contribution to the Study confirmed this view.

DR. C. D. GOSSAGE said he wanted to emphasize, as others had done, that the results of the *1951 Impairment Study* are not as significant as they might have been if our fact finding and recording methods were standardized. He referred specifically to the findings of albumin where the technical methods used seemed to be satisfactory but the method of recording was not. With respect to examination of urinary sediments, the differences in technical methods were more serious, from the point of view of interpretation, than those of recording.

Dr. Gossage hoped that these difficulties could be resolved and sug-

gested that more realistic techniques be recommended. In the past those recommended have not been universally accepted because they were difficult and time consuming. It must be remembered that the purpose is to obtain aids to diagnosis and prognosis and not the conduct of scientific research. He urged the recommendation of simple inexpensive procedures which would give the essential facts for a standard method of recording acceptable for statistical analysis, which the majority of companies will support.

MR. N. F. BUCK referred to the suggestion made by others that the Society make smaller and more frequent studies, and said the Lincoln National had already reached that conclusion as a result of a similar study of all their impairments which took three years to complete.

Mr. Buck reported on an analysis made of the Lincoln National's contribution to the Study on albuminuria without pyuria, casts or hematuria. This contribution was about one-fifth of the total measured by number of deaths. In the form in which the experience was submitted for the Study the mortality ratios showed no trend by issue age, but increased sharply with increases in systolic blood pressure. Surprisingly they decreased with increases in weight. In the only subdivision with enough data for reliable comparison, the trace group, the cases with intermittent findings produced a somewhat higher ratio than those with constant findings. For the re-examination this material was divided into twelve groups, two by amount of albumin, three by build, and two by systolic blood pressure. Mr. Buck said this analysis seems to show that in underwriting albuminuria, age and intermittency or constancy of findings are less important than has been thought. Mortality increases substantially with increasing amounts of albumin, and even mild hypertension is very unfavorable.

MR. ARTHUR PEDOE said he thought a study of this kind is well worth doing once every twenty years. He felt that it takes about ten years before the results are translated into underwriting practice so that the length of time needed to make the studies was not a good reason to discontinue them. He suggested that during the intervals between inter-company studies of the entire impairment field individual companies could profitably investigate certain impairments in which they are interested or in which they think there has been a definite trend one way or the other. He also expressed the feeling that the influence of social trends on mortality has not received the attention it deserves.

MR. P. K. FRAZER reported the results of a study made by the Northwestern Mutual to determine whether glucose tolerance tests are worth while on applicants who have a diabetic family history. He said his company routinely requests such a test where there are two diabetics in the family or one diabetic and the weight is borderline. During a period

of approximately three years ending in 1952, the findings were unacceptable in 28% of the cases. There was very little difference between the two categories. This suggests that the acceptance of diabetic family history cases may have been responsible for the excessive deaths from diabetes. The Northwestern's contribution to the Study involved 342 deaths for a mortality ratio of 96%. No analysis by causes of death was made. He thought an analysis of the underlying data might be helpful, and agreed that the inclusion of the cases involving only one diabetic may be responsible for much of the difference between this and other studies.

MR. W. M. BELL said he wanted to emphasize the fact that selection rules and procedures apparently have an important effect on the results in some impairments. Strict underwriting produces standard mortality, but careless or lenient underwriting results in substandard mortality. In this connection he urged caution in modification of underwriting rules for varicose veins, neurasthenia and nervous prostration, and hysterectomy. He remarked that the results in chronic bronchitis and ulcer with operation are probably the result of underwriting on too lenient a basis because of favorable results in earlier studies.

DR. FRANCIS A. L. MATHEWSON said he believed it is important to know the specific cause of death in those impairments which show excess deaths from cardiovascular disease, and hoped that the scope of the present or future mortality investigations might be expanded to include such studies. He suggested that further investigation along these lines might make important contributions to medical knowledge which would be directly beneficial to the life insurance industry. Dr. Mathewson said he was impressed by the fact that in the section on heart murmurs increased mortality seemed to be directly related to heart size.

MR. E. A. GROSSMAN referred to another method of using confidence limits. The table produced by this method would show, for example, in a given impairment which had 10 actual deaths, that a premium based on 17 deaths would merit 95% confidence. A description of the method referred to appears in a paper presented to the Casualty Actuarial Society in 1947 by Mr. Grossman and Professor Bernard Friedman of New York University (*PCAS* 34, 95-101).

DR. MONTGOMERY said, in response to a question by Mr. B. F. Blair as to whether there are any categories of ulcers with operation which can be selected so as to produce standard mortality, that he thought these things have to be handled on an individual basis and the better cases after five years are pretty close to standard. He stated that the type of operation is undoubtedly important.