

MORTALITY OF RAILROAD ANNUITANTS, 1946-49

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THERE are reasons to believe that the mortality of railroad nondisability annuitants can be compared with the mortality of men who retired under group annuity contracts on or after the normal retirement date. The findings of the Committee on Group Mortality and Morbidity apparently produced no evidence of significant differences in matured lives mortality according to occupation. As of the present time, the experience of the Railroad Retirement Board on matured lives, as measured by the ratio of exposures, is more than three times as large as the comparable exposure of the intercompany study. It would thus appear that the admittedly specialized mortality experience of the Railroad Retirement Board might shed some additional light on recent mortality trends for retired workers.

SCOPE OF INVESTIGATION

This paper discusses the mortality of railroad annuitants between the 1946 and 1949 anniversaries. In a sense, the present study is a sequel to the one discussed in *TASA XLIX*, 296-302, which covered the period between the 1943 and 1946 anniversaries.

The total number of retirements during 1936-48 was 343,960 with a breakdown as follows:

- 230,830 retirements at ages 65 and over;
- 17,949 prenormal nondisability retirements at ages 60-64 with 30 years of service;
- 57,364 disability retirements prior to 1947; and
- 37,817 disability retirements during 1947-48 under the liberalized provisions of the 1946 amendments to the Railroad Retirement Act.¹

The total number of exposure years during the three benefit years 1946-49 was 649,127, out of which 479,763 were for nondisability annuitants (465,252 for normal retirements) and 169,364 for disability annuitants. The corresponding actual deaths numbered 45,935, out of whom 31,228 were age annuitants and 14,707 disability annuitants. By compari-

* The opinions expressed in this paper are those of the author and do not necessarily represent the official views of the Railroad Retirement Board.

¹ For an outline of the provisions of the Railroad Retirement Act, see "Actuarial Aspects of the Railroad Retirement System," by Joseph Musher, *TSA II*, 2-3.

son, the intercompany exposure on male normal retirements for the three calendar years 1947-49 was about 151,300 years, and the actual deaths numbered about 7,150.

CHARACTERISTICS OF THE EXPERIENCE

The railroad nondisability annuitants consist mostly of individuals who retired at ages 65 and over. The numbers of annual prenatal age retirements have been rather small in recent years due to the liberalization of

TABLE 1
MORTALITY OF RAILROAD NONDISABILITY ANNUITANTS BETWEEN 1946 AND
1949 ANNIVERSARIES, BY NUMBER OF LIVES
YEARS OF ACCRUAL 1936-48

ATTAINED AGE*	EXPOSED	ACTUAL DEATHS	RATIO OF ACTUAL TO EXPECTED DEATHS COMPUTED BY			
			1944 RRA†	1937 S.A.‡	1949 J-L§	1950 G.A.
60-64.....	14,511	312	87.9%	85.7%	107.6%	105.4%
65-69.....	167,729	7,321	105.5	124.2	151.3	141.2
70-74.....	161,417	9,857	105.6	121.6	139.8	132.5
75-79.....	102,041	9,128	107.5	125.4	133.8	134.8
80-84.....	29,391	3,680	107.9	126.3	124.5	134.4
85-89.....	4,115	773	115.4	132.1	118.7	139.5
90-94.....	516	140	115.7	135.9	112.0	142.9
95 and over.	43	17	121.4	141.7	106.2	141.7
All.....	479,763	31,228	106.4%	123.7%	137.3%	135.2%

* Age last birthday at the beginning of the exposure year.

† 1944 Railway Annuity Mortality Table with a 1-year rate-back (TSA II, 16).

‡ 1937 Standard Annuity without a rate-back in age.

§ Jenkins and Low Annuity Table for 1949 without projection (TSA I, 387).

|| Prudential 1950 Group Annuity Valuation Table, by Henry E. Blagden (TSA II, 322).

the disability retirement provisions. The availability of disability annuities for qualified railroad employees makes the prenatal age retirements a select group with an amazingly low mortality at least in the first few durations. This is in direct contrast to the understandably heavier mortality of prenatal retirements under group annuity contracts which generally make no provision for retirement on account of disability. By the way of race and sex, railroad annuitants may be considered a reasonably homogeneous group consisting, for all practical purposes, of white males. Women constituted less than 2 percent of all annuitants considered in this study.

RESULTS AND CONCLUSIONS

The mortality of railroad nondisability annuitants remained at about the same level during each of the three benefit years 1946-47, 1947-48, and 1948-49. The A/E ratios by the 1944 Railway Annuitants Table (TSA II, 16) with a 1-year rate-back were 107.0, 105.9, and 106.5 percent, respectively. When we exclude accrual years 1936-37 which were atypical because of the doubt regarding the continued existence of the railroad re-

TABLE 2
CRUDE DEATH RATES FOR RAILROAD NONDISABILITY ANNUITANTS
BETWEEN 1946 AND 1949 ANNIVERSARIES
NUMBER OF LIVES

At-tained Age	Exposed	Actual Deaths	Crude Death Rate per Thousand	At-tained Age	Exposed	Actual Deaths	Crude Death Rate per Thousand
60....	1,229	16	13.02	80....	11,212	1,294	115.41
61....	2,002	49	24.48	81....	7,916	909	114.83
62....	2,879	52	18.06	82....	5,092	682	133.94
63....	3,697	75	20.29	83....	3,040	442	145.39
64....	4,704	120	25.51	84....	2,131	353	165.65
65....	27,464	980	35.68	85....	1,523	262	172.03
66....	33,697	1,363	40.45	86....	1,047	191	182.43
67....	35,539	1,543	43.42	87....	751	140	186.42
68....	36,109	1,728	47.86	88....	481	102	212.06
69....	34,920	1,707	48.88	89....	313	78	249.20
70....	35,706	1,918	53.72	90....	202	46	227.72
71....	33,579	1,865	55.54	91....	136	41	301.47
72....	32,162	1,933	60.10	92....	86	22	255.81
73....	30,518	2,019	66.16	93....	57	20	350.88
74....	29,452	2,122	72.05	94....	35	11	314.29
75....	26,998	2,071	76.71	95....	23	12	521.74
76....	24,087	2,033	84.40				
77....	20,115	1,884	93.66				
78....	16,957	1,700	100.25				
79....	13,884	1,440	103.72				

tirement system, the over-all mortality ratio for benefit years 1946-49 becomes 103.9 percent as compared with 107.3 percent for the preceding 3-year period 1943-46.² It would thus appear that there is no evidence of a significant improvement in mortality among railroad nondisability annuitants over the last six years. Certainly, the improvement has not been sufficient to indicate a definite trend and to warrant a revision in valuation standards.

² The mortality ratio of 99 percent appearing in Table 3 of this author's paper in TASA XLIX was computed without a rate-back in age.

A summary of the nondisability experience is presented in Table 1. It appears that of the three insurance tables Mr. Blagden's gives the most uniform mortality ratios. What is meant is that Mr. Blagden's table could be made to fit the railroad retirement experience by increasing all his mortality rates for ages 60 and over by a flat percentage. This may be a coinci-

TABLE 3
MORTALITY OF RAILROAD DISABILITY ANNUITANTS BETWEEN 1947 AND
1949 ANNIVERSARIES, BY NUMBER OF LIVES
YEARS OF ACCRUAL 1947-48

AGE AT ACCRUAL*	TOTAL AND PERMANENT DISABILITY			OCCUPATIONAL DISABILITY		
	Exposed	Actual Deaths	Ratio A/E †	Exposed	Actual Deaths	Ratio A/E †
First Year Experience, Duration 0						
Under 45	891	78	88.3%	615	46	148.9%
45-49	1,157	86	67.8	2,361	185	133.4
50-54	1,943	175	79.0	5,599	460	111.5
55-59	2,567	228	79.4	9,473	776	104.1
60-64	750	90	115.2	12,251	966	97.7
All	7,308	657	81.9%	30,299	2,433	105.1%
Second Year Experience, Duration 1						
Under 45	606	51	118.1%	410	24	131.1%
45-49	844	49	64.8	1,505	80	104.6
50-54	1,382	102	76.7	3,456	202	95.9
55-59	1,804	134	78.8	5,802	373	91.8
60-64	456	39	93.5	6,648	401	78.2
All	5,092	375	80.9%	17,821	1,080	88.2%

* Age last birthday.

† Expected deaths computed according to the 1944 Disabled Railway Employees Select Mortality Table (TSA II, 18) with the following modifications:

- (i) For total and permanent disability, $[x - 1] + 1$ was substituted for $[x]$.
- (ii) For occupational disability, $[x - 3] + 3$ was substituted for $[x]$.

dence, but it may also indicate an intrinsic property of that particular table. It is also interesting to note that railroad nondisability annuitants experienced a heavier mortality than shown in the intercompany study. Measured by the 1937 Standard Annuity Table, the over-all mortality ratio for railroad annuitants was 124 percent for benefit years 1946-49 as

compared with 111 percent for calendar years 1947-49 for normal retirements in the intercompany study.

Table 2 is presented as a supplement to Table 1. The main purpose of the additional table is to give fairly reliable crude death rates for a number of advanced ages. It would appear that up to and including age 95 both the exposures and the actual deaths are sufficiently large to produce meaningful death rates. The age interval in this table is from $x + \frac{1}{2}$ to $x + 1\frac{1}{2}$, as is the case in the other two tables included in this paper.

As far as disability annuitants are concerned, the amendments of 1946 introduced a new class of occupational disabilities. Theoretically, individuals classified as disabled for work in their regular occupation should, in most cases, be better lives than individuals classified as totally and permanently disabled for work in any regular employment. However, for reasons of administrative convenience, an individual is often classified as an occupational disability even though he actually is totally and permanently disabled for all kinds of work. This practice makes it almost impossible to draw a clear distinction between true occupational disabilities on one hand and total disabilities on the other. With these qualifications in mind, we present in Table 3 the mortality experience of railroad disability annuitants who retired in calendar years 1947-48. Terminations on account of recovery from disability (aside from medical recovery, there is a provision of presumptive recovery if the annuitant earns \$75 or more in each of six consecutive months) have not been considered in this study. As can be seen from the mortality ratios of Table 3, the 1944 disability mortality table does not fit the experience too well. Perhaps, when more experience on disability retirements under the 1946 amendments becomes available, a new table will be constructed.

In conclusion, it might be mentioned that because of the 1946 amendments it was not possible to study the experience by amounts without going through the considerable work of adjusting the annuity amounts for deaths occurring during the first half of the benefit year 1946-47. A mortality study by amounts will be possible in the course of the next valuation which will, among other things, concern itself with the mortality experience between the anniversaries in 1947 and 1950. Judging from earlier studies, there should be little difference between the mortality ratios by number of lives and by amounts.

DISCUSSION OF PRECEDING PAPER

CHARLES A. SIEGFRIED:

Mr. Niessen's paper is an interesting and valuable addition to the relatively small amount of data available on the subject of mortality of annuitants covered under retirement plans.

The author refers to the studies of the Society's Committee dealing with group annuity mortality and states that the findings "apparently produced no evidence of significant differences in matured lives mortality according to occupation." It seems desirable to keep in mind the conclusion of the Committee as expressed more precisely in *TASA XLIX*, 212, which was that "There . . . appeared to be hardly any difference in the mortality experienced [on matured lives] between groups with predominantly clerical lives and all others." Thus far the Committee has not had adequate data to make a study of matured life mortality based on occupational classifications, although it seems reasonable to believe that variation by occupation prior to retirement exists.

The author seems to minimize the significance of the lower rates of mortality observed during the 1946-49 period as compared with those indicated by the earlier study. The annual rates of improvement in mortality which were proposed by Jenkins and Lew are only about 1% when averaged over all ages of a matured life experience. These rates are so small that when observed mortality ratios decrease from 107.3% to 103.9% in three years, as was the case in the two successive railroad experiences, one is inclined to explain the difference as due to statistical fluctuation. Yet the fact remains that actual mortality improvements of the magnitude suggested by Jenkins and Lew could have produced the observed differences. Assuming that mortality improvement is being experienced to such a degree, and will in the future so continue, then the author's conclusion that a revision in valuation standards is not warranted might not be conservative from a purely actuarial standpoint (if the present valuation margin, if any, is to be preserved). Thus in the case of the Alberta retirement annuities, where the annuity rates for purchases to be made so far ahead as the year 2000 and later are guaranteed to those as young as age 3 today, it is interesting to note from Mr. Coward's paper, submitted at this meeting, that the annuity rates and valuation take into account future improvement in mortality based on the Jenkins-Lew improvement factors, the annuities increasing by nearly $2\frac{1}{2}\%$ for each 10-year advance in the birth date.

A comparison of the railroad retirement experience with the intercompany Group Annuity experience reveals some interesting relationships as indicated by Table 1, for which I am indebted to Mr. F. W. Elley and Mr. E. W. Emery. First a graduation of the intercompany experience for the years 1946-49 was prepared. Column (2) of the table shows the ratio of the actual intercompany experience to the expected according to this graduation of the experience. Column (3) shows the ratio of the actual railroad experience to the expected according to the graduated intercompany experience. This comparison shows rather strikingly that while rail-

TABLE 1

AGE GROUP (1)	MORTALITY RATIOS ON GROUP ANNUITY TABLE	
	Intercompany Group Annuity Experience 1946-49 (4 Calendar Years) Male Lives Retiring on or after Normal Retirement Age (2)	Railroad Nondisability Annuity 1946-49 (3 Policy Years) (3)
65-69.....	100.5%	121.5%
70-74.....	99.3	109.1
75-79.....	100.0	105.8
80-84.....	113.4	103.0
85-89.....	103.9	106.3
70-89.....	101.7	106.7

road mortality experience was somewhat less than 7% higher than the intercompany experience for ages 70 to 89, it was over 21% higher for ages 65 to 69. These figures suggest that perhaps, in addition to some basic differences in the mortality of the lives included in the respective studies, there may be some significant differences in the mortality rates because of differences in the basis of administration of the plans.

For example, the railroad experience does not include lives retired on disability annuities, and the intercompany experience does not include lives retired prior to normal retirement for any reason. The exclusion of impaired lives would affect the mortality rates and this effect would be most pronounced in the early years after retirement. It does not seem possible to draw any definite conclusions from these figures other than to

suggest that differences in administrative practice in effecting retirements may have an important effect on mortality rates, and this possibility should be recognized in making comparisons of different studies.

RAY M. PETERSON:

I was particularly pleased to see Mr. Niessen's paper appear, as I am now engaged in a study of group annuity mortality experience with the purpose of preparing a group annuity mortality table paralleling the Jenkins-Lew Annuity Table for 1949 in character but representative of group annuity experience. This table, in conjunction with appropriate projection for mortality improvement, will be used in our company to study the adequacy of group annuity rates and reserves.

As a part of this study, the intercompany group annuity mortality experience for the calendars 1946-49, as compiled by the Joint Committee on Group Mortality and Morbidity, was used as a starting point. The experience with respect to lives retired on or after normal retirement date was used with an adjustment for the experience after normal retirement date with respect to lives retired prior to normal retirement date. This adjustment consisted of including in the deaths and exposures the experience for attained ages 70 and over from the early retirements and also modifying the crude death rates from 65 to 69 inclusive, in the same proportion, in effect, as the crude death rates were changed after 70, in the aggregate, by the inclusion of the early retirements experience. This latter adjustment resulted in increasing the crude death rates from 65 to 69 1.68% for males and 2.30% for females. The crude rates were then graduated by the Whittaker-Henderson Formula B. Mr. Niessen's presentation of actual deaths and exposures, age by age, gave us the opportunity to graduate his experience by the same graduation formula.

I show in Table 1 a comparison of the railroad retirement mortality experience, both ungraduated and graduated adjusted to integral ages, with the graduated 1946-49 group annuity mortality experience for male lives.

I don't suppose that Mr. Niessen meant in the opening sentence of his paper that his railroad retirement experience is comparable in all respects with the intercompany group annuity experience. In the latter experience, the lives come under observation at normal retirement date whether they retire or not. Under the railroad retirement plan there is a range of optional retirement ages and in Mr. Niessen's experience the lives come under observation only as they actually retire. The higher mortality rates in his experience shown in this Table 1 at ages 65 to 70 can be accounted for, in substantial part at least, by this basic difference in the

data. In the words of Mr. Niessen from his paper "Recent Mortality of Railroad Annuitants" in *TASA XLIX*, "It is reasonable to assume that railroad employees in a very good state of health would try to remain on their jobs as long as possible. It should be remembered in this connection that a railroad annuitant is not permitted to draw an annuity while he is working for a carrier or for his last employer even if that employer is not a carrier." This difference in the character of the basic data usually exists in all cases where the retired life mortality experience of self-insured plans is compared with that of group annuity contracts. It is a source of much con-

TABLE 1

ATTAINED AGE	RATIO OF 1946-49 R. R. MORTALITY EXPERIENCE TO 1946-49 GROUP ANNUITY MORTALITY EXPERIENCE		ATTAINED AGE	RATIO OF 1946-49 R. R. MORTALITY EXPERIENCE TO 1946-49 GROUP ANNUITY MORTALITY EXPERIENCE	
	Ungraduated	Graduated		Ungraduated	Graduated
65.....	109.4%	124.9%	81.....	93.2%	95.7%
66.....	121.9	122.8	82.....	93.2	95.6
67.....	120.8	120.3	83.....	97.2	96.2
68.....	120.5	119.1	84.....	101.0	97.2
69.....	117.9	117.5	85.....	102.7	98.7
70.....	114.6	114.7	86.....	101.3	100.5
71.....	110.9	111.1	87.....	99.3	102.5
72.....	106.3	107.8	88.....	101.1	104.7
73.....	105.2	105.6	89.....	110.5	107.0
74.....	104.9	104.3	90.....	107.9	109.5
75.....	103.0	103.3	91.....	113.2	112.1
76.....	101.8	102.4	92.....	112.7	114.8
77.....	102.5	101.1	93.....	116.0	117.5
78.....	101.7	99.6	94.....	120.1	120.2
79.....	97.7	97.9	95.....	142.6	122.8
80.....	96.3	96.5			

fusion as to real mortality levels and any actuary in the pension field quoting comparative figures to employers bears a professional responsibility to bring out this fundamental difference.

Another possible reason for the difference in mortality rates in the early years of retirement is the persisting effect of occupational influences.

The lighter mortality rates of the railroad experience in the 80's suggests that the group annuity experience at these ages may have been affected by sparsity of data or spurious influence. Certainly Mr. Niessen's data will be of value in establishing satisfactory mortality rates at these ages for group annuity purposes.

I think this report of railroad retirement experience gives some support to the idea that as you follow experience into the late 70's, 80's and beyond, there will be smaller and smaller differences in the inherent level of mortality for different categories of experience.

Although Mr. Niessen found no conclusive evidence of mortality improvement over the last six years, in his over-all ratios of 107.3% and 103.9% (and certainly no conclusions should be drawn from such aggregates), it is unfortunate that he did not present his data in such a way that an examination by age groups and duration of retirement could be made. It would be of great interest if he could present, in reply to the discussion of his paper, a table corresponding to his Table 3 in *TASA XLIX*, 301, where the experience is presented by quinquennial age groups and according to first, second and later years of retirement. The higher mortality rates shown in that table for the early retirement years give support to the thought that the better lives continue working.

Even though during a short period of observation there may have been no significant evidence of mortality improvement, I am rather puzzled that Mr. Niessen felt it unnecessary to provide for such improvement in his valuation. There is so much evidence of mortality improvement now at the older ages, and there are such prospects of continued and greater improvement, that it seems little short of folly to adopt a valuation theory that only when there is evidence of actual improvement will one adjust the reserve factors for benefits falling due many years in the future. Why shouldn't the same considerations apply here as Mr. R. J. Myers followed in his Social Security cost projections of making specific and substantial provision for mortality improvement? Can a valuation be considered adequate when it is assumed that future mortality rates at the older ages will remain unchanged? Many employers with self-insured plans today have been receiving and paying for cost estimates which do not, in my opinion, represent a reasonably prudent appraisal of the future.

In conclusion, I want to express my appreciation of Mr. Niessen's published experience. It is a source of great satisfaction to an actuary to have such a large volume of homogeneous data. The experience presented in Mr. Niessen's paper will be quite valuable in properly assessing the the value of retirement benefits in this country.

W. RULON WILLIAMSON:

Mr. Niessen adds another timely contribution to those dealing with advanced age mortality, recently and currently presented to this Society. As an exponent of adequate diagnosis, with limitations understood, but

with simple prescriptions written out, I want to make a few observations on mortality, selection and the passing of time, deduced from this paper.

1. There is a wide frequency distribution among the lives at each age, ranging from 0 to 1 as the probability of death.
2. The business of life insurance has been to select from this wide range, with a skewness over toward 0 rather than 1.
3. It is the business of the welfare state to deal with those nearer the 1 than the 0.
4. If the prognosis of either is right at the time, those whose prognosis was "bad," but who do not die early, will seem to improve (against the standard of measurement applied to all alike) over time, while those who, in George Malcolm-Smith's phrase, are "slightly perfect," will find the flaws in the perfection increasing, and will tend to "grow worse."

The Railroad Retirement system has at least four strands in the annuity rope:

1. The pensioners of the carriers before Government take-over
2. Age pensioners, beginning with the third railroad retirement act
3. "Permanent Total Disability" Annuitants
4. "Occupational Disability" Annuitants

Taking a common mortality measuring-rod—say population tables—the disability categories are tinged with more threat of early death, the "age," where the disabled have just been removed, less threat, and the first strand, tossed out many years ago, still less. Mr. Niessen here does not adduce the evidence to back up that superiority now of the oldest pensioners of a previous day. I hope he will. Time, the healer, will show a bettering of the worse classes, but a worsening of the better. If the Social Security Administration is right that most of its retirements are for disability, though labeled "age," that experience too should improve over time, when the victims of the temporary prognosis shall have recovered from the shock of being tossed out and have again found the normal life.

(AUTHOR'S REVIEW OF DISCUSSION)

ABRAHAM M. NIESSEN:

When I mentioned in my paper certain results of intercompany group annuity studies comparing them with railroad retirement experience, I was not unaware of the fact that the two experiences had basic differences that make them not strictly comparable. What puzzled me was that for the period 1941-45 the two experiences showed almost identical mortality ratios, whereas in more recent years they began to drift apart. I hoped that the discussion would shed some light on this matter. It was indeed gratifying to me to see the discussions by Messrs. R. M. Peterson, C. A.

Siegfried, and W. R. Williamson, who raised important questions, warned against unwarranted conclusions, and injected some life into an otherwise dull and morbid topic.

The tables presented by Mr. Peterson and Mr. Siegfried are extremely interesting. Mr. Peterson's ratios of railroad retirement to group annuity mortality experience assume the shape of an upward bent parabola with the low point around age 82. I wish I knew the reason for this particular flow of the ratios. Be it as it may, the railroad retirement experience during the policy years 1946-49 was quite different from the intercompany group annuity as is so strikingly brought out by these two tables.

I was particularly pleased to note that Mr. Peterson is engaged in a broad study of group annuity mortality. I hope that the railroad retirement studies will prove of some value in his work. I am supplementing my paper with a table (Table A) showing the mortality of railroad non-disability annuitants with a select period of two years. This is the table which Mr. Peterson said he would like to have.

At this point, I would like to clarify one of the statements which I made in my paper. In the section headed "Results and Conclusions" I stated that when accrual years 1936-37 are excluded, the mortality ratio for benefit years 1946-49 becomes 103.9 percent as compared with 107.3 percent for the preceding 3-year period 1943-46. This 103.9 figure refers to accrual years 1938-45, which cover the same generation of annuitants that was considered in my earlier paper in *TASA XLIV*, 296-302. When we consider also accruals after 1945, the over-all mortality ratios for policy years 1946-49 becomes 104.5 percent, which is even closer to the 107.3 than the 103.9 figure. The most striking feature of the additional table which I am presenting here is the relatively low mortality ratios for the second year after retirement. Here again, I can offer no plausible explanation except to point out that the people who retired during the war and immediately thereafter had certain peculiar characteristics. Furthermore, the amendments of 1946 might have injected some more confusion into the mortality picture.

I fully realize that there exist certain basic differences between railroad retirement and group annuity coverages and that these differences became more pronounced in very recent years. It is difficult, however, to assert that the blame lies with the occupational classifications. The opening paragraph of my paper stating that railroad retirement nondisability mortality experience may be comparable to the intercompany group annuity is based on the conclusions of the Committee as quoted by Mr. Siegfried. I reasoned, perhaps not correctly, that if no differences of consequence showed up between clerical lives and other groups, no sub-

TABLE A

MORTALITY OF RAILROAD NONDISABILITY ANNUITANTS BETWEEN
1946 AND 1949 ANNIVERSARIES, BY NUMBER OF LIVES
YEARS OF ACCRUAL 1936-48

ATTAINED AGES*	EXPOSED TO RISK	ACTUAL DEATHS	RATIO OF ACTUAL TO EXPECTED DEATHS COMPUTED BY	
			1944 RRA†	1937 Standard Annuity Table‡
First Year after Retirement				
60-64	4,627	77	71%	69%
65-69	43,629	1,980	123	139
70-74	10,594	600	102	119
75-79	1,597	129	100	116
80 and over	260	28	88	104
Total	60,707	2,814	114%	129%
Second Year after Retirement				
60-64	4,039	96	99%	96%
65-69	40,292	1,737	108	127
70-74	13,261	673	91	105
75-79	2,015	157	97	113
80 and over	329	27	68	79
Total	59,936	2,690	102%	118%
Ultimate Experience, 3d to 13th Years				
60-64	5,845	139	93%	91%
65-69	83,808	3,604	97	116
70-74	137,562	8,584	107	123
75-79	98,429	8,842	108	126
80 and over	33,476	4,555	110	128
Total	359,120	25,724	106%	124%
1st to 13th Years after Retirement				
60-64	14,511	312	88%	86%
65-69	167,729	7,321	105	124
70-74	161,417	9,857	106	122
75-79	102,041	9,128	107	125
80 and over	34,065	4,610	109	128
Total	479,763	31,228	106%	124%

* Age last birthday at the beginning of the exposure year.

† 1944 Railway Annuity Mortality Table with a 1-year rate-back.

‡ 1937 Standard Annuity Table without a rate-back in age.

stantial differences can be expected by occupational classification in general. I was also guided by the close agreement in the over-all mortality ratios observed for the period 1941-45. I am referring to Mr. Musher's discussion of my previous paper in *TASA XLIV*, 607, which shows percentages of 124.6 and 125.0 for intercompany group annuity and railroad retirement, respectively. I was aware of the fact that this agreement might be more apparent than real because of the differences in the relative age distributions, but I still felt that the two experiences are not so far apart as to make comparisons utterly meaningless.

The most important known difference between the two experiences seems to be due to the fact that in group annuity the lives "come under observation at normal retirement date whether they retire or not," whereas under the railroad retirement plan only lives actually retired are considered. This difference alone, regardless of any other consideration, would make it impossible to base premiums and reserves for group annuity on tables derived from other types of experience. However, self-insured plans, whether government or private, need to concern themselves only with postretirement mortality and for that reason they may find the large experience of the Railroad Retirement Board suitable as a reference base. Of course, postretirement mortality is only one part of the picture, the other being the active mortality before and after retirement age but before actual retirement. However, when we come to the very old ages, say 75 and older, the problem of active lives becomes rather unimportant, so that here valid comparisons can be made also with group annuity experience.

There certainly are differences in the administrative practices of the Railroad Retirement Board as compared with insurance companies. It seems to me, though, that when we consider retirements on or after the normal retirement date neither the Railroad Retirement Board nor the insurance company can influence the composition and characteristics of the retiring groups. There is, of course, the possibility that the employer practices are different in the railroad industry as compared with other industries that are chiefly represented in the group annuity coverage.

Both Mr. Peterson and Mr. Siegfried take me to task for not recommending more conservative valuation standards for nondisability annuitants. It is my belief that the actuarial standards for a governmentally administered plan like railroad retirement need not be as strict as those applicable to insurance and retirement plans with contractual premiums and contractual benefits. Theoretically, plans like railroad retirement can change premiums and benefits whenever necessary.

Another consideration applicable to self-insured plans, but not to group annuity, is that improvements in mortality are likely to result in a postponement of retirement. Even a slight reduction in retirement rates would offset a considerable decrease in mortality rates for those who retired. It is therefore not clear that we should assume lower mortality just on the chance that such an improvement will actually take place without assuming at the same time somewhat lower retirement rates. Of course, we shall continue to study the mortality of our annuitants, particularly of those retired under the amendments of 1946. Decisions regarding mortality standards to be used in the forthcoming valuation will be based on all material available. All I was saying was that the study described in my paper does not in itself indicate a need for a more conservative mortality standard.

I am in no position to know to what extent Mr. Myers's intermediate cost figures for the 1950 Social Security Act allow for improving mortality. It should be remembered that mortality is only one of many factors, as is the case, incidentally, in railroad retirement valuations, and that Mr. Myers's low cost estimate assumes mortality at the 1939-41 levels without improvement. The analogy between railroad retirement and annuities purchasable under the government of Alberta plan appears to be no more proper than between railroad retirement and group annuities. Railroad retirement has a different method of financing and a high degree of flexibility accorded by the absence of contractual premiums and benefits.

Mr. Williamson makes some very interesting observations on advanced age mortality. We have a group of former railroad pensioners who are still classified as either age or disability. These individuals have been on the railroad retirement rolls since 1937 and so can be considered past any reasonable select period. We made no recent mortality study of these pensioners since too few of them are left to be important from a financial point of view, but I suspect along with Mr. Williamson that the disabled pensioners may now have a better mortality than the group of non-disabled. Another point which I would like to make is that the crude death rates shown in my Table 2 are undoubtedly more reliable than corresponding census data but still far from perfect. The Railroad Retirement Board requires proof of age for nondisability retirement but, of necessity, proofs other than original birth certificates are accepted. I understand that our death rates for the old ages are in fairly close agreement with general population data.

Let me again thank Messrs. Peterson, Siegfried and Williamson for their helpful and interesting discussion.