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**DISCUSSION OF PRECEDING PAPER**

**ALLEN L. MAYERSON:**

My sociologist friends stress that there has been a tremendous change in marriage rates and in other aspects of family composition. I think many people would be much interested in a comparison of remarriage rates based on the very recent experience presented in the paper with the remarriage rates of, say, 10, 15, 20 years ago, to the extent that those are available. I hope that Mr. Niessen will be able, perhaps in his reply to the discussion, to give us some data on this subject or to indicate whether such data are available.

**E. E. CLARKE:**

Undoubtedly, widows' remarriage experience varies from group to group depending upon such conditions as the general financial circumstances of the widows in the group, the amount of income forfeited as a result of remarriage, and geographic location, including such circumstances as concentration or dispersion of the members of the group, location in predominantly urban or rural areas, and so on. Because of the relatively few published accounts of remarriage studies it has been difficult to find a table of remarriage rates appropriate for a particular group of widows. Mr. Niessen's study is a welcome step in helping to remedy this situation.

The work of the Department of Insurance includes the valuation of several pension plans for Canadian government employees. The principal plans are those for the public service, the armed forces and the Royal Canadian Mounted Police. Each of these plans provides for annuity benefits to widows of persons who die either while employed, having had a certain minimum number of years of service, or while on pension. Widows' benefits cease on remarriage.

The remarriage rates used in these valuations have been developed from studies of the experience of widows of members or former members of the armed forces to whom pensions have been awarded under the Pension Act of Canada or previous government administrative orders. The most recent study was made early in 1958, covering the experience of widows awarded pensions from the beginning of World War I to December 31, 1957. From that experience, observed over the period from January 1, 1940, to December 31, 1957, remarriage rates were developed

and are currently being used for the valuation of widows' benefits under the government plans. The number of widows observed during the 1940-57 period was 35,621 and the number of remarriages was 8,465. It is intended to present a summary of that study and the table of remarriage rates developed from it at a later meeting of this Society.

It is difficult to compare the 1940-57 Pension Act remarriage rates directly with the rates of Mr. Niessen's 1956 RRB Remarriage Table because of a different select period. In our studies, we found that selection from date of widowhood extended for a very long period. Accordingly, for ages at widowhood up to age 56, select rates were developed from the Pension Act experience for the first 14 years after widowhood.

For the first 2 years after widowhood, Mr. Niessen's rates are much higher than the rates developed from the Pension Act experience, but his rates drop much more sharply over the next few durations in order to merge with the ultimate rates.

Perhaps the most significant difference in the two sets of rates is in the incidence of the rates. Mr. Niessen's graduated rates reach a peak in the second year after widowhood, although the crude rates shown in the paper do not seem to provide absolute confirmation that this is really the case. This same pattern of peak rates in the second year after widowhood is found in the graduated rates of the American Remarriage Table published in Volume 19 of the *Proceedings* of the Casualty Actuarial Society. Again, however, the crude rates on which the American Remarriage Table was based do not seem to establish this incidence clearly since, for the younger ages at widowhood, the crude rates for both the second and fourth years after widowhood were higher than the rates for the third year after widowhood and, for a number of other ages, the crude rates had their peak in the third year after widowhood.

In the studies of remarriage experiences that we have made, we have found that for the younger ages at widowhood the crude rates almost invariably attain a peak in the third year after widowhood and remain high for the succeeding 2 or 3 years, and for the middle and older ages at widowhood the peak rates tend to be fairly level from the second to the fourth year after widowhood. There is a published precedent for this pattern, although it may appear to be too old to have significance at this time. In Volume 38 of the *Journal* of the Institute of Actuaries is published an account of an investigation into the Rates of Re-Marriage and Mortality amongst Widows in receipt of relief from the Patriotic (Russian War) Fund, 1854-1900. The tables of crude remarriage rates resulting from this study show peak rates in the third year after widowhood for almost all ages at widowhood. I think, also, that this feature is given some

support by the select Actual to Expected ratios shown in Mr. Myers' paper "Further Remarriage Experience," published in Volume 36 of the *Proceedings* of the Casualty Actuarial Society, where expected remarriages were determined on the basis of the American Remarriage Table.

To compare the financial effect of Mr. Niessen's rates (or probabilities) and ours, we calculated annuity values for quinquennial ages at widowhood based on the rates of mortality and the rate of interest used by Mr. Niessen in finding the annuity values set out in Table 4e and on the remarriage rates developed from the 1940-57 Pension Act experience. The annuity values so calculated, and a comparison with the corresponding values of Table 4e are shown in the accompanying table.

AGE AT WIDOWHOOD	ANNUITY VALUES		RATIO (1) + (2)  (3)
	1940-57 Pension Act (1)	1956 RRB (2)	
20.....	5.8767	6.4448	91.2%
25.....	9.3668	9.2183	101.6
30.....	13.5427	12.2763	110.3
35.....	16.6779	14.8629	112.2
40.....	18.1207	16.6050	109.1
45.....	18.2099	17.2409	105.6
50.....	17.3110	16.7062	103.6
55.....	15.8431	15.4130	102.8

ROBERT J. MYERS:

Mr. Niessen has again performed a valuable service for the Society of Actuaries and for other persons interested in actuarial and demographic matters by presenting further information on an actual remarriage experience for a relatively large group, namely widows receiving benefits under the Railroad Retirement Act.

Mr. Niessen's previous paper presented certain reasonable empirical modifications of the American Remarriage Table (1933), based on such limited experience as the Railroad Retirement Board had developed by the time his revised table was prepared (1949). Now, however, the Railroad Retirement system has developed such a significant body of data that a completely independent table is well justified. The American Remarriage Table was based on 37,040 life-years of exposure, while this table is based on 307,095 life-years (but 219,624 life-years are at ages 60 and beyond, where the probabilities of remarriage are low).

Mr. Niessen has performed excellent technical work in graduating the

data and constructing the remarriage table and commutation columns. Select remarriage probabilities were developed for a 5-year period and ultimate rates thereafter. The crude data clearly indicate the necessity for select rates and, in fact, suggest the possibility of using an even longer select period. There is a sharp break between the select rate for duration 4 and the next corresponding ultimate rate, at least for ages at widowhood under 35. Practical considerations, however, probably override any theoretical advantages of having a longer select period.

The remarriage probabilities are shown on a select basis only for age at widowhood up through 59, at which point the probabilities are about  $\frac{1}{2}\%$  and decreasing slowly. Ultimate rates are shown up through age 74 and at that point are about  $\frac{1}{8}\%$  and declining slowly. There is a fairly sudden

Age at Widowhood	SELECT PERIOD					ULTIMATE PERIOD	
	Ratio for Duration					Attained Age	Ratio
	0	1	2	3	4		
20.....	222%	163%	171%	143%	218%	25.....	222%
25.....	229	168	179	151	229	30.....	212
30.....	232	172	184	157	223	35.....	192
35.....	224	168	183	160	203	40.....	174
40.....	193	155	171	151	167	45.....	175
45.....	176	126	136	120	136	50.....	178
50.....	187	90	99	91	131	55.....	173
55.....	173	70	80	75	112	60.....	147
						65.....	104
						75.....	79

drop to zero at these terminal ages, suggesting that a few later remarriages are ignored. This type of "cut-off" has been the practical custom beginning with the American Remarriage Table. Smooth extensions would be possible, but of doubtful practical value.

Next, it may be of interest to examine how the new remarriage probabilities compare generally with those of the American Remarriage Table, so that users of the new table will have some idea as to the extent of the revision. The accompanying table gives the ratios of the new RRB table to the original one, for selected ages and durations.

As a broad generalization, the new probabilities are from 50% to 125% higher at the younger ages, but beyond age 35 at widowhood they begin to merge with the original ones and approximately do so by age 50 at widowhood for the select period and at attained age 65 in the ultimate period. In comparison, Mr. Niessen's earlier revision of the American Remarriage

Table had remarriage probabilities that were closer to those of the American Remarriage Table, the differential being 50% up to age 55 and then decreasing smoothly until merging at age 59.

It may also be of interest to compare the remarriage probabilities Mr. Niessen has developed with remarriage experience during 1956 under the mother's benefit provisions of the OASDI system. We are currently preparing combined mortality and remarriage tables, with commutation columns at  $2\frac{1}{2}\%$  and  $3\%$ , for the available 402,947 life-years of such exposure combined with U.S. White Females, 1949-51, mortality. A 5-year select period will be used. Our remarriage probabilities will be roughly 120% of the 1956 RRB experience for the younger ages, grading to 150% at the later ages.

We are also preparing remarriage tables based on the experience of widow beneficiaries under the U.S. Employees Compensation system (workmen's compensation for Federal Government employees), covering the period 1916-55. Again, a 5-year select period will be used, with U.S. White Females, 1949-51, mortality and commutation columns at  $2\frac{1}{2}\%$  and  $3\%$ . This experience, in contrast to that for OASDI mother's benefits shows rates of remarriage considerably lower than those in Mr. Niessen's table, the differences being especially pronounced at the higher ages. Also, in this table there will be comparatively much less difference between the select and ultimate rates (although quite enough to justify the use of a select period). Even though this experience shows pronounced trends in remarriage rates during the 40-year period, it was decided to use all available experience, thus producing a table representing long-term average remarriage rates.

These two tables and Mr. Niessen's table show widely varying remarriage experience. Although the groups involved, the benefit amounts, and the conditions for payment are quite different, I cannot explain the reasons for the varying patterns.

Mr. Niessen's work has also added to the body of data indicating excess mortality for widows, especially at the younger ages. For our 1956 OASDI mother's benefit experience, no study of mortality by age was attempted since for convenience all types of nonremarriage terminations were combined in tabulating the data. For the U.S. Employees Compensation experience, our study did indicate some excess mortality for widows at the younger ages. In my opinion, the principal reason for this apparent trend is not the actual experience of higher mortality rates for women who are widowed, but rather that healthy widows are more likely to remarry and thus drop out of the experience.

Over-all trends in present values of widow's benefits are illustrated by

Table 1, which shows annuity values based on various remarriage and mortality bases. The trend through the years toward generally higher remarriage rates and lower mortality rates produces interesting variations in the annuity values, which move toward higher values at the older ages and lower values at the earlier ages. There are only slight changes in the middle ages, around 45 or 50, where the effects of varying mortality and remarriage rates approximately balance.

TABLE 1  
ANNUITY VALUES ( $\ddot{a}_{[a]}^m$ ) BASED ON VARIOUS REMARRIAGE  
AND MORTALITY RATES 3% INTEREST

REARRIAGE BASIS	MORTALITY BASIS	AGE AT WIDWOOHD					
		20	30	40	50	60	70
100% American..	USWF 1939-41	12.11	16.51	17.90	16.20	12.76	8.93
150% American*	USWF 1939-41	8.56	13.85	16.63	15.72	12.55	8.85
1956 RRB.....	RRB 1950†	6.99	12.82	17.15	17.25	14.27	10.40
1956 OASDI.....	USWF 1949-51	5.35	10.44	15.36	16.47	13.60	9.76
1916-55 USEC...	USWF 1949-51	9.48	16.06	18.48	17.38	13.99	9.90

\* The OASDI experience during 1942-45 roughly indicated rates of the order of 150% of the American Remarriage Table.

† With 1-year rate back in age.

(AUTHOR'S REVIEW OF DISCUSSION)

A. M. NIESSEN:

Mr. Mayerson asked for a comparison between current and past remarriage rates. Our data go no further back than 1947, since that was the first year when survivor benefits became payable under the Railroad Retirement Act. We have studied the experience in two sections, *i.e.*, for policy years 1947-51 and 1951-56, respectively. A comparison of the crude rates (probabilities) for these two periods is given in the table on page 20.

While the rates for the latter period are in many instances higher than for the former, it would be rather difficult to use our data as proof that remarriage rates have been on the increase. Perhaps the data underlying the remarriage tables for the U.S. Employees Compensation system mentioned in Mr. Myers' discussion can provide an answer to Mr. Mayerson's question.

Mr. Clarke made a number of very interesting observations on the differences between remarriage rates for particular groups of widows. I was glad to learn that the remarriage experience under the Canadian

## A NEW REMARRIAGE TABLE

Pension Act will be published in the *Transactions* in the near future. Of course, his period of observation is different from mine and perhaps there are other important differences which make the two experiences not strictly comparable. As for the length of the select period, our data also indicated the existence of a rather long select period but we decided to use only five years in order not to make the table too cumbersome. It was simply a case of sacrificing theoretical refinements for the sake of practical

CRUDE REMARRIAGE PROBABILITIES OF WIDOWED MOTHERS RECEIVING  
BENEFITS UNDER THE RAILROAD RETIREMENT ACT—  
1947-51 AND 1951-56  
(Remarriages per 1,000)

DURATION OF WIDOWHOOD	PERIOD	AGE OF WIDOW†						
		20-24	25-29	30-34	35-39	40-44	45-49	50-59
0 . . . . .	1947-51	83.6	81.3	50.1	35.5	16.2	9.2	3.4
	1951-56	93.8	79.6	58.4	39.2	16.1	8.8	2.5*
1 . . . . .	1947-51	224.7	147.1	92.2	52.9	39.8	15.8	7.4
	1951-56	215.0	150.4	118.5	60.3	36.3	20.1	9.2
2 . . . . .	1947-51	158.5	155.5	70.7	50.6	28.5	18.1	12.8
	1951-56	195.4	133.1	84.7	58.9	35.6	13.9	7.5
3 . . . . .	1947-51	136.5	121.9	76.9	36.1	23.7	19.3	13.5
	1951-56	131.0	118.4	61.2	54.2	27.6	17.8	3.4*
4 . . . . .	1947-51	155.5	89.9	64.6	34.2	17.5	7.4	8.3*
	1951-56	127.5	100.3	61.4	33.4	19.8	10.2	4.5*
5 and over.	1947-51	230.8*	125.7	78.2	35.2	23.1	13.2	4.4
	1951-56	285.7	87.9	62.1	40.3	23.1	14.5	6.3

\* Less than 10 actual remarriages.

† Age last birthday on date of husband's death for durations 0 to 4 and age last birthday at the beginning of the policy year of exposure for durations 5 and over.

considerations. Perhaps I shall be in a position to say something more on the subject when I have the opportunity to study Mr. Clarke's paper.

Mr. Myers enhanced the value of my paper by adding two tables of comparisons between our new remarriage data and those obtained from other experiences. I was particularly interested in the pronounced differences between our 1951-56 remarriage rates and those obtained from the 1956 OASI experience for widowed mothers. The eligibility provisions and the benefit amounts have been essentially the same for the two groups, so that one would expect very similar incidences of remarriage. The table based on the experience of the U.S. Employees Compensation

system should also be very interesting because it is based on a rather long period and relates to a benefit program in many respects different from either railroad retirement or OASI. This experience might also give an indication of the existence of a secular trend in the incidence of remarriage among American widows.

Mr. Myers also made a number of important technical comments for which I am very grateful. I might add one more such comment, namely, that the annuity values for ages 75 and over should have been exactly the same in Tables 2 and 4e of the paper. The practically negligible differences are due to somewhat different rounding procedures. While the effect of technical refinements on annuity values is practically nil, they have a definite place in the construction of tables. The actuary should strive to strike a happy medium between considerations of practical value and of technical elegance.

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