

## CORRESPONDENCE.

## MR. MOIR'S PAPER—MAXIMUM MORTALITY PERIODS.

*To the Editor of the Transactions of the Faculty of Actuaries.*

SIR,—I see that Mr. Moir in his paper on *First Year's Risk*, gives a table<sup>1</sup> entitled "Mortality amongst lives assured for different durations, as experienced while passing through different ages", and states that the method he has used "shows that there is no maximum mortality period between the 11th and 15th years, as was formerly contended by Dr. Sprague"; and I shall be glad if you will give me the opportunity of stating that, in my opinion, Mr. Moir's figures do not justify this conclusion. Before giving my reasons for this opinion, I have to remark, in the first place, that I object to Mr. Moir's statement, that I formerly "contended" that there was a maximum mortality period between the 11th and 15th years. This would appear to imply, that one of the objects I had in view in writing my paper of 1870, was to prove the existence of such a maximum mortality period; but I think that any person who reads that paper with an unbiassed mind, must admit that my object throughout was simply to ascertain what are the real facts. I have next to point out that, whereas my table, comparing the actual deaths at all ages with the computed, shows a maximum mortality at the years of insurance 11-15, the more extended tables, which give the figures for quinquennial groups of ages, show very different results. At ages attained 46-50, the maximum mortality occurs in the years 19-25; at ages 51-55 in the years 19-22; at ages 56-60 in the years 12-17; at ages 61-65 in the years 16-21; at ages 66-70 in the years 14-16; at ages 71-75 in the years 18-21; and at ages 76-80 in the years 27-36. It therefore gives an incorrect idea to say that I contended that there was a maximum mortality between the 11th and 15th years. For greater clearness it may be worth while to give the above figures in a tabular form; and, in order to give some idea of the weight to be attached to the figures, I give also the number of deaths in each group of ages.

Ages attained.	Years of Insurance.	Actual deaths.
46-50	19-25	231
51-55	19-22	354
56-60	12-17	565
61-65	16-21	463
66-70	14-16	213
71-75	18-21	229
76-80	27-36	268

Can it be possible that Mr. Moir read only the first half of my paper?

Mr. Moir refers to Mr. Macaulay's letter in the thirty-second volume of the *Journal of the Institute of Actuaries*; but he makes no reference to my letter in the same volume,<sup>2</sup> in which I prove, or at all events give reasons for believing, that Mr. Macaulay's explanation of the observed

<sup>1</sup> See page 28.

<sup>2</sup> *J. I. A.*, xxxii, 197.

maximum (which is not merely an "apparent maximum", as Mr. Moir calls it) is not satisfactory. I think that, as Mr. Moir dealt with this point at all, it is a pity that he did not continue his investigations further, for ages above 60; especially as, in my results, those higher ages exhibit the phenomenon of the maximum mortality more clearly than most of the ages given in his table. This is the weak point in his argument. Instead of dealing, as I did, with all ages attained in each year of insurance (grouped together for greater regularity in the results), he simply gives figures for individual ages attained, 40, 45, 50, 55, 60, and for a few periods of insurance—1st, 2nd, 5th, 10th, 15th, 20th, 26th, and 30th; and I submit that such fragmentary observations cannot safely be relied on, compared with the much more extensive ones I dealt with.

I am, Sir,

Your obedient servant,

T. B. SPRAGUE.

EDINBURGH, 25 June 1902.

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*To the Editor of the Transactions of the Faculty of Actuaries.*

SIR,—I thank you for your courtesy in sending me a proof of the letter from Dr. Sprague, and am gratified to find so eminent an authority giving my paper such careful consideration. As to my use of the word "contended", it is for others to judge. In his introductory remarks in 1870 Dr. Sprague said:—

"The effect of the withdrawals . . . is a question of fact. . . . I myself fully agree with those who attribute to these withdrawals a powerful influence in increasing the rate of mortality."—(*J.I.A.*, xv, 332.)

In the early part of his paper of 1870, Dr. Sprague carefully referred to the percentages and ratios of the Select figures to the  $H^M$ , but in the latter part and in his explanations of probable causes he assumed a maximum mortality and not merely a maximum ratio. For example:—

"But no such argument can apply to explain the phenomena shown above, viz.—first the increase of the mortality and then its subsequent diminution."—(*J.I.A.*, xv, 351.)

He also advanced reasons (*J.I.A.*, xv, 349-351) to show how the maximum in the mortality was caused by withdrawals, adding (page 351)—

"The foregoing observations not only demonstrate that the withdrawals produce a powerful effect in increasing the rate of mortality among the lives remaining under observation, but enable us to see clearly the way in which this effect is produced, and, to a certain extent, to measure its magnitude."

There is a great difference between a maximum mortality period, and a maximum ratio as between two tables, either or both of which may be distorted. Dr. Sprague certainly showed that a maximum ratio existed, but I do not think the method he adopted was capable of proving "a maximum mortality".