

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.

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".

As I understand Mr. Macaulay's letter, he did not dispute the "fact" that a maximum appeared in the percentages, but he showed (and to me the demonstration is sufficient) that this maximum percentage was probably "due to an entirely different cause" from that put forward in Dr. Sprague's "Maximum Mortality Theory".

The most important point in Dr. Sprague's letter relates to the question of a maximum in the mortality, which Mr. Macaulay is more capable of discussing than I am.

I am, Sir,

Yours faithfully,

HENRY MOIR.

NEW YORK, 30 October 1902.

MR. CHATHAM'S PAPER—"DISCOUNTED-BONUS" MORTALITY.

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

SIR,—I observe in the discussion which followed the reading of Mr. Chatham's paper¹ *On Premiums deduced from the New Mortality Experience*, that both Mr. Hewat and Mr. Chatham expressed the opinion that the mortality among policyholders assured under discounted-bonus schemes must be greater than the mortality under with-profit policies.

Some time ago the directors of the *Scottish Amicable Office* caused an investigation to be made into the mortality of their discounted-bonus class as compared with that under their ordinary with-profit class, in order to ascertain if the selection of those desiring a cheap premium scale had been detrimental to the Office. The following is a note of the result :—

Statement of Sums Assured which became claims during the years 1896 to 1900, both inclusive, under With-Profit Policies and under Discounted-Bonus Policies respectively, and of the corresponding claims expected by the H^M Table.

Ages.	With-Profit Policies.			Discounted-Bonus Policies.		
	Actual Claims.	Expected Claims.	Percentage of Actual to Expected.	Actual Claims.	Expected Claims.	Percentage of Actual to Expected.
Under 50	£30,800	£44,446	69·3	£37,450	£64,178	58·4
50 to 70	131,132	132,506	99·0	166,630	193,746	86·0
Over 70	151,768	163,894	92·6	146,780	128,863	113·9
Total,	£313,700	£340,846	92·0	£350,860	£386,887	90·7

The above figures show that not only has the aggregate mortality been less among assurances under the discounted-bonus scheme, but also that at

¹ See page 109.