CORRESPONDENCE.

SUGGESTION AS TO STATISTICS OF INDIVIDUAL SICKNESS.

To the Editor of the Journal of the Institute of Actuaries.

SIR,—I venture to bring under your notice an idea with which I have been much impressed recently, and which, I would fain hope, may be the germ of important contributions to the theory of sickness insurance. The idea which has occurred to me, is that it might be advisable to compile statistics from the returns furnished by friendly societies, which would have the effect of showing the extent to which estimates of the probabilities of future sickness and mortality might be legitimately influenced by the past sickness experiences of the several individuals to which those estimates relate. In other words, statistics might be compiled which would show, for the individual

member, the influence of past sickness on the expectation of future
sickness and mortality. Compilers of sickness experience tables have
hitherto confined themselves, I believe, to an exposition of the average
amount of sickness experienced at each age of life, first, by members,
of either sex, *en masse ;* and secondly, by members following parti-
cular occupations or classes of occupation (*e.g.*, light labour with
exposure to weather, heavy labour with exposure to weather, &c.), or
residing in localities falling under such categories as "rural districts",
"town districts", "city districts". I am not aware of any attempt
to construct "select" or "analyzed" sickness tables showing the
influence upon the sickness at each age, of aught save sex, occupation,
and locality. Yet the investigations which have been made in regard
to the influence of selection upon mortality, resulting in the "select"
or "analyzed" mortality tables of Messrs. Sprague, King, and others,
—not to speak of the most conspicuous of all analyzed tables, the
$H^{M(5)}$,—would readily suggest the propriety of an investigation into
the influence of original medical selection and of subsequent discon-
tinuances, upon the sickness experience of friendly societies, resulting
in the compilation of "analyzed" sickness tables to exhibit the
connection between sickness and duration of membership. So far,
the analogy between life insurance offices and friendly societies would
appear to be perfect. But in the case of the friendly society a new
element, capable of numerical measurement, offers itself as a basis of
computation. *The friendly society has official cognizance of the
past sickness experience of its members.* In the case of each of its
insurers, it knows not only his age and the duration of his policy, but
also the amount, distribution in time, and qualitative nature of the
sickness experienced by him since he first became a "free member".
It has therefore data respecting the health of its members better
capable of numerical expression than those embodied in the proposal
papers of a life policyholder. These data are not, in the early stages
of membership, as valuable as those contained in the report of a
medical referee (indeed, their value *commences* by being *nil*, since at
first there is *no* past sickness experience to go upon) ; but their value
is constantly increasing, whereas the value of the medical report is
continually waning as the policy grows older ; and, above all, the data
possessed by the friendly society are partly * capable of definite
numerical measurement. I conceive, therefore, that it would be
possible to construct "analyzed" sickness and mortality tables of
great value, showing the sickness and mortality experienced at each
age by separate sets of members classified according to the character
of their previous sickness experience. Thus, one might make a
beginning by constructing two tables, showing the sickness (and
mortality) experienced at each age from 25 onwards, by those who
had suffered in passing from age 20 to 25—(1) less than half, and
(2) more than double, the expected sickness. Then one would have
two tables, showing the sickness (and mortality) experienced at each
age from 30 onwards, by those who had suffered (1) less than half,

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* The *amount* and the *distribution in time* of the member's past sickness is
capable of definite measurement, though of course the *qualitative nature* of his
sickness is not.

and (2) more than double, the expected sickness during the preceding decennium; and so on to the end of life.

It might seem as if the suggestions here ventured upon were over-refinements, possessing only a theoretical interest; but there are reasons which induce me to believe that the investigation I have sketched the outlines of, is at any rate of more pressing importance than that which would be the analogue, in the science of sickness assurance, of those researches on the influence of selection on mortality which have so deservedly assumed prominence in the more honoured science of life assurance. The smallness of the membership of the majority of friendly societies, renders it of vital importance, I think, at a valuation, to ascertain whether there is an undue proportion of members likely to experience an excessive sickness or to die early. *Roughly*, the past sickness is already taken into account by valuers in estimating the liabilities of a society; but such an investigation as I have suggested would enable us to replace the present crude process by one of a more scientific nature.

From a theoretical point of view, also, the subject appears to me of immense interest. When the statistical researches had been carried to a state of ideal perfection, the s_x (sickness experienced in passing from age x to age $x + 1$) and the p_x, q_x, of our calculations, would all have to be multiplied into a factor derived from the past sickness experience of the individual. Or, replacing the view of things which regards the changes in the elements of life contingency calculations as a series of annual jerks, by the more scientific view which regards those changes as constituting a continuous process, we may say that the "proportion of sick" and the "force of mortality" at any instant of age, as derived from tables based on experience *en masse*, must each be multiplied by a factor derived from the past sickness experience of the individual. The general mathematical form of each factor is, I think, rigorously determinable on *à priori* grounds. It must, I think, be an exponential function of the duration of the attack, and also some function of the time that has elapsed since the attack (the value of the function probably getting nearer to unity, *i.e.* becoming less operative in the calculation, as the attack recedes into the past). Where there has been more than one attack, the factor will be a product of several separate exponential expressions, one corresponding to each attack.

I have the honour to be, Sir,
Your most obedient servant,

FREDERICK W. FRANKLAND,
Govt. Actuary for Friendly Societies.

Wellington, New Zealand,
21 *August* 1880.