ORIGINAL PAPERS.

THE PRACTICAL APPLICATION OF WILTON'S
MORTALITY CURVE FOR PHTHISIS.

By W. RAMSAY SMITH,

D.SC., M.B., C.M., F.R.S.E.,

Permanent Head of the Department of Public Health of South Australia.

SOME years ago my attention was drawn to the subject of estimating the number of consumptives alive in this State.¹ I may here give a brief résumé of the history which ended in the establishing of what I have termed Wilton's Mortality Curve for Phthisis. An estimate was required some years ago for the purpose of giving an idea of the provision that would be necessary for consumptives, presuming that the Government should see fit to undertake the care and treatment of patients. From the very imperfect data at my disposal, I estimated that the number of consumptives in the State was probably not more than 500. This gave rise to some expressions of dissent.

The collection of facts regarding the duration of phthisis is, no doubt, the work of the physician; but the interpretation of them had better be entrusted to the actuary or the mathematician. Recognizing this, I proceeded to deal with the matter in as scientific a manner as I possibly could.

Dr. James Clark² had combined Bayle's 200 cases and Louis's first series of consumptives, and had made a table showing—(a) How many of an original hundred persons would die by the end of the third month, sixth month, etc.; (b) the number living; and (c) how many die in the various periods of the disease. I wished to know whether it was possible, from these data, to obtain a co-efficient of the death-rate that would give the number alive at any given time; and the table was given to Mr. J. R. Wilton, then of the Adelaide University, now of Cambridge. From the data supplied he constructed a curve, which, he said, might be interpreted thus: "At any time the number of those who will die in the next month is one-twelfth of the original hundred who are yet alive."

¹ The story of my inquiries is related in *The Scottish Medical and Surgical Journal* for October, 1902.

² "Cyclopædia of Practical Medicine," vol. iv., p. 276.

As applied to any actual case, this means one-twelfth part of every original hundred alive at the beginning of any month will die by the end of that month; therefore, in a community where consumption is neither increasing nor diminishing, twelve times the monthly death-rate will equal the number of consumptives alive at any given time; in other words, and speaking roughly, the annual total of deaths is the number alive.

After this I combined Louis's two series, making a total of 307 cases, and gave Mr. Wilton the duration of the disease in every instance. From these data he constructed another curve, on which he remarked: "This curve may be taken to indicate that the deaths in any month between the third and fifteenth number about one-tenth of those alive at the beginning of the month." As he showed, the calculated figures corresponded in a very remarkable manner with the actual numbers given in the tables; the theoretical very closely agreed with the practical.

Speaking on the subject of the number of consumptives alive, I said with reference to Wilton's Curve: "This means that, in South Australia, we may with fair certainty estimate the number at about 300 persons. This is the first piece of solid groundwork on which State or philanthropic action has to be based. To my mind, all the statistics of the British Congress, and they are not many, are of minor importance to us, or to others, compared to Mr. Wilton's Mortality Curve and its interpretation."

At that time I accepted Mr. Wilton's Curve and its interpretation as being a very accurate means of estimating from the death-rate the number of consumptives alive at any time in an average community. But the subject gave rise to a good deal of discussion. Some people, not mathematicians, condemned the conclusions as palpably wrong, seeing that they were so inconsistent with what one had been accustomed to believe, and so much at variance with first thoughts begotten by the interpretation.

Since compulsory notification of pulmonary tuberculosis has been in force in this State for the past eight years, we have a means of testing this matter. Of course allowances have to be made for cases of sufferers who consult no medical practitioner, for a certain percentage of possibly unnotified cases of persons who do, for consumptives who may die from other causes, for some who leave the State, and for some who recover. All these influences tend to modify the results in one direction or the other.

From week to week and from month to month the notifications and the death returns have been before me, and I have been struck with the general agreement of the two numbers. Desiring, however, to test the matter more thoroughly than by these totals, or by the results

WILTON'S MORTALITY CURVE FOR PHTHISIS 49

shown by the "Central Register of Consumptives" kept in my office, I called for a nominal return from the local boards of health of all consumptives reported to them at any time, and known to be alive on December 31, 1906. I also received returns from hospitals, consumptive homes, and sanatoria. In this way it has been possible to correct double notifications and other disturbing elements, and so to make a comparison between the number reported during the year, the number of deaths during the year, and the number known to be alive on the last day of the year. The following table gives the statistics of the two first :

Year.	Cases Reported.					Deaths.
1899	...	...	220	...	...	318
1900	...	...	310	...	...	301
1901	...	...	352	...	...	306
1902	...	...	323	...	...	299
1903	...	...	346	...	...	305
1904	...	...	333	...	...	298
1905	...	...	352	...	...	290
1906	..	...	341	...	...	307
			2,357			2,106
Average for seven years			336.7			300.8

In calculating the totals and averages, I have excluded the year 1899, since the requirements of the Act were not fully, nor even fairly fully, carried out. A little judicious pressure on negligent medical practitioners appears to have brought the notifications in the following years up to something near the correct figures.

The total number of persons reported at any time during the past eight years, and known to be alive on December 31 last, is 308. This result is very remarkable when compared with the 307 deaths reported during the year, and with the annual average of 300 deaths. There were, however, 36 persons in consumptive homes or sanatoria on that date who had not been reported to any local board as suffering from pulmonary tuberculosis. They may or may not have been suffering from this disease ; but if we include them all, the total would be 344. Further, I may mention that, in their endeavours to be exact and to be helpful, the local boards sent lists of persons, numbering in all 50, who had been reported within the past eight years, but whom they could not trace. These the officers of the Central Board have also failed to trace ; so it is probable that very few of these are at present alive in the State.

Allowing for all these disturbing influences, it will be granted, I believe, by statisticians that, when tested by Wilton's Curve, these

results agree closely enough to inspire one with confidence that, given the annual death-rate, the number alive at any given time may be estimated with sufficient exactness for any practical purpose, especially for estimating the amount of accommodation or provision necessary to be made in any community.

In estimating the value of these statistics, one cannot ignore the fact that the numbers dealt with are not large. At the same time, there are some circumstances that add to their trustworthiness. If there were only one year's figures of deaths, then the possible variation, according to Poisson's rule, would be very considerable, and not much stress could be laid upon the results. When, however, a record of seven or eight successive years shows such slight variation or fluctuation as is graphically shown in the table, one is justified in inferring that the

TABLE INDICATING PROPORTION BETWEEN NOTIFICATIONS AND DEATHS OF CONSUMPTIVES IN SOUTH AUSTRALIA.

death-rate from year to year is a fairly constant quantity. The numbers of notifications vary a good deal more than the numbers of deaths; but these notifications may be subject to a greater number and variety of disturbing conditions.

Since the practice of notification of pulmonary tuberculosis may be said to be still on its trial, some remarks on one or two phases of it may not be out of place.

Under our Act, "Every medical practitioner attending on or consulted by any person suffering from pulmonary tuberculosis shall, as soon as the fact becomes known to him, report the same to the local board of the district in which the person resides: Provided such notification shall not be necessary if the case has been previously reported to the same local board."

Pulmonary tuberculosis is not classed as an infectious disease, and is, therefore, not notifiable by anyone except the medical practitioner. Further, since it is not an "infectious disease," no fee is legally payable

for notification. Some local boards of health, however, recognize that what is worth having is worth paying for, and they pay the notification fee. This, if not an inducement to notify, removes at any rate any objection or excuse that practitioners may have for becoming careless in performing their legal duties.

In some places an objection is made to notification on the ground that it is followed up by visits of inspectors or nurses, and annoyance to the patient or his friends, or even by actual harm, inasmuch as the patient becomes cognizant of the nature of his disease, greatly, it may be, to his detriment. The Central Board of Health has stated, in answer to questions by local boards, that, if a medical practitioner, in reporting a case, has said that visitation by the officers of the local board is not necessary, the local board may assume that such a practitioner will have himself seen that all necessary instructions have been given and precautions taken.

One thing more: Notification is made the basis of treatment in sanatoria assisted by the State, public philanthropists, local authorities, or private individuals; and much is thereby done for the treatment and cure of the afflicted and the affected. No one would say a word against doing all that is necessary in this way, nor would anyone desire to restrain sympathy or practical philanthropy towards consumptives and their needs. It is a question, however, whether we are not in danger of directing our attention too exclusively to the treatment and the cure, and of neglecting what is equally important, if not even more necessary, viz., stopping the supply of consumptives. It may be that, with means at our disposal to alleviate, we ignore too much the conditions that originate and breed tuberculous disease in the population—filth, overcrowding, bad food, bad drink, and such-like. Social science and sanitation will not advance much if owners of insanitary property and careless landlords are allowed to draw profits from breeding-grounds of disease. There would be less necessity for donations to charitable and other institutions if such individuals were compelled to do their legal duties. Slum-owners salving their own consciences and stopping public criticism by contributing to sanatoria should form a fit subject for "Cynicus." And the prime duty of local authorities is not to provide or maintain places for consumptives, but to use every legal effort to abolish the conditions that make consumption possible.