Incidence and Etiology

of

Pulmonary Phthisis and Allied Tubercular Diseases

in Scotland.

Graduation Thesis, 1885.

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The necessary limits of a Graduation Thesis forbid any ambitious purpose — even had I, as I have not, such a purpose in view — of offering here anything like a complete, or final statement of present evidence and knowledge regarding the Etiology of Pulmonary Phthisis and allied Tubercular Diseases. Nor, apart from the inadequacy

inadequacy of the particular occasion, does it seem to me that the time has yet arrived when such a complete statement can be put before the Profession and the public, with the hope of its affording ground for a final settlement of a long vexed question.

The over-sanguine anticipations which were indulged in at the first intimation of the discovery of the Tubercle-Bacillus have suffered not a little contraction in the face of after consideration and criticism. It is not too much to say that viewed from the ultimately all-important standpoint of Treatment, the results so far following upon the discovery have certainly been anything but encouraging, not to say satisfactory and real. It needs only be pointed out, in proof of the existence of competent opinion to this effect, that the veteran

veteran Jaccoud, at the recent Copenhagen meeting of the International Medical Congress, felt himself forced to declare — and that without raising much serious question — that this discovery had, so far at least, borne absolutely no fruit in the Therapeutics of the diseases of which the Bacillus was now declared to be the cause. The same eminent physician, in his recent work on The Treatment of Phthisis (*) most emphatically enforces this view, and records the failure, in his hands, of the plan of treatment which Professor Rokitansky, of Innspruck, based on the Bacillary causation of all Tuberculoses. It will, however, not probably add to Jaccoud's authority even with those least dominated by the Bacillus-Theory that all he has to say of it in such a work, over and above the record of the failure of special treatment just alluded

* Pulmonary Phthisis; Jaccoud. Edited by Montagu Lubbock, M.D.

alluded to, is that the treatment was "founded theoretically upon the supposed connection between bacteria and tubercle."

But, even as to the Etiology of Tubercular Diseases, the positive conclusions of Koch and his more unquestioning followers have not found universal acceptance. The advocates of what Germain See has christened "Bacillary Phthisis" have yet to reckon with equally eminent authorities, in whose view the Bacilli of Tubercle, as micro-organisms generally, are not the originators, primarily and simply, ~~but either~~ of specific contagion, but either its carriers only, or, if originators at all, then originators secondarily and as aiding or aggravating other and more primary factors in the Disease-results.

In the face of these yet opposing estimates of the value of present evidence as to the causal relations of the Bacillus-Tuberculosis — putting aside for the moment, as not essentially, questions of therapeutics and treatment and

and in the first instance at least having
right to prejudice or prejudge questions of Etiology—
it seems to me to be unwise,
not to say unscientific and unsafe, clinically
to enter upon the paths of partizan-
ships and special pleading as for the
one view or the other. It is
surely the more truly scientific and
philosophical present course, while frankly
and gratefully accepting the Bacillus-
Tuberculosis as another and exceedingly
important fact, and even factor in the
natural history of Tubercle, to
avoid as far as possible the
premature conversion of helpful hypothesis into cramping
dogma, and to try also, by the wise
adjustment of existing and accepted, and
the marshalling of new facts and
observations, to bridge over present gaps
in our knowledge and to reconcile
divergent views, so as finally to
arrive at the truth as to this
most important chapter of human
pathology.

In

In this attitude of mind, I first conceived, and have in the past two years carried out, the inquiry whose results I now respectfully submit to the judgment of the Medical Faculty of the University. It will be seen that I have chosen to approach the question of the Etiology of Tubercle by way of its Incidence in Scotland. It seemed to me at the outset, and that opinion has I think been confirmed by the result, that the Death-Registers of the country were capable of affording a large amount of valuable information to the careful and systematic inquirer. The manner, and to a large extent the matter, of the inquiry are, so far as I am aware, new in this country, though inquiries on the like lines are not unfamiliar elsewhere. It is well, however, that those interested in the knowledge and

and prevention in Scotland of one of the most formidable scourges of mankind, should be given as complete information as possible of, so to speak, its habitat and habits in their own country. To the acquisition of such information I hope I shall be found to have here provided an easy key. I have, as will be at once seen, not been content simply to re-arrange the materials which are open to anyone who may chose to examine the published reports of the Registrar-General, or even to edit such additional information as I might be able to extract from the courtesy of the Department or its heads. I have carefully examined and made excerpts from the individual registers of the results which I now submit to the Faculty in this new, and, I hope, more attractive and comprehensible shape. I am, therefore, personally responsible for the accuracy /

here and elsewhere

accuracy of these results, and for any conclusions to which these may seem to point — an accuracy which I have done my utmost to ensure, and conclusions which I have been careful not to push beyond sure limits. I feel I need offer no apology for the adoption of the graphic method for the demonstration of my results. For the adoption of this method serves the double purpose of presenting results in a shape more easily understood and appreciated, and of saving the necessity of much written description. By this means, the eye, both external and mental, will more readily grasp and weigh the conclusions to which I think the results of the inquiry point.

The Incidence of Tubercular Diseases is of course, for the purposes of this inquiry, of ~~chief~~ chiefly importance, and so far as it may tend to throw light on their Etiology.

Etiology. I shall, as I marshall the results of the inquiry, indicate what I conceive to be their value in this respect. It is far from my purpose to construct or to advocate special theories. I shall, for the most part, confine myself to the statement or demonstration of the facts I have been able to elicit in the course of the inquiry, and to the most direct and simple deductions from these facts.

The important and general, as it is a wide and far reaching, deduction I think it best to state at once. That is, that the idea which regards Tubercle in all its manifestations as the ultimate outcome — whatever may be the factors engaged in the process, or the phases and stages through which that process may meantime pass — of depraved Nutrition, will be found to receive marked support in the results

results here set forth. Conscious that partial and extreme views are most often the outcome of special studies, I was careful to avoid that danger by engaging in a pari passu study of the purely pathological and Bacillary sides of this question — a study which I was fortunate in being able to carry out under the direction, and with the assistance of Dr. G. Sims Woodhead, in the Special Class organised by Professor Greenfield in the past Winter Session. The work there done has no doubt modified not a little some of the conclusions which I might otherwise have been tempted to draw from the results of the other branch of my labours. But, essentially and in the main, my views as to the Nutritional basis of Tubercle has remained unaltered by pathological considerations. So markedly, indeed, is

is that view confirmed by some of the results of the Laboratory work that I have decided on widening the original scope of my Thesis so as to incorporate in it a few of the more typical specimens which seem to me to have peculiar value in this regard.

I am aware I am not speaking the language of some of the Schools when I say, that I am unable to lay aside a feeling that at this hour, when there is a disposition abroad to refer too much rather than too little to the action of micro-organisms, there is danger in too readily accepting dogmas as to the <u>absolute</u> action of specific ~~&~~ microbes. And in no field of Medicine that I am aware of could this danger well be greater, or fraught with more disastrous consequences in the way of prophylaxis and treatment, than in this with which I

I am here dealing. But, without going all the lengths which some would have us go in this matter of the causal relations of the Tubercle-Bacillus, it seems to me that clinical observation and experience of Treatment results, that such inquiries as has here been undertaken, and that the well-ascertained facts of the Pathology of Tubercle, dictate to us a safe middle course.

"Diathesis" is a dangerous term to pin one's pathological faith by, and that because so much and so little may be held to be meant by it. But, in a qualified sense of the term, I am inclined to believe that the Tubercle-Bacillus has not removed our grounds for holding by the existence of a Diathesis which is at the root of all Tubercle-manifestations. The statistical results which follow will be found to illustrate the working of ~~several~~ some among the

the many causes which induce Tubercle by perverting nutrition, choking the nutrition-channels of the body with the products of a perverted nutrition; and, chemically it may be and physiologically, altering the constitution of the cells of the whole organism. It may well be — the reason of the process may be, tho' I can't say that the actual evidence yet at our disposal is certainly in support of the idea — that the Tubercle-Bacillus plays an important part in this initial stage of Tubercle-generation. But what I believe to be quite in evidence is, that the Bacillus coming in contact with cells so debilitated finds a congenial soil, and, establishing himself there, not only lives, like a true parasite, at the expense of the host, but proceeds to produce, by some physico-chemical process yet to be discovered, an irritant poison. This poison, it is, which, in my view, causes that cell irritation /

irritation and proliferation, which precedes the advance of the Bacillus and prepares the way for the further ravages of the microbe.

From beginning to end, however, the process is a nutritional one. Pathologically, I am able to submit some drawings which demonstrate without possibility of doubt that the Bacillus proceeds of choice by way of the lymph channels, the same channels by which clinical observation has long ago shown us that scrofulous and tubercular products chose to advance.

Another general deduction from this inquiry I would ask leave to state here, and that is that Tubercle is with us all days — not only from the earliest infancy to actually a ripe old age, but even shows its effects in utero. Whatever may ultimately come to be said as to the ~~absolute~~ actual Causative action

action of such influences as Climate, Locality, Occupation, Social surroundings &c in the production of Tubercle, the Registrar-Generals records are decisive as to their immense power in modifying its course, activity, and duration. The limits of this Thesis would be much exceeded by adducing the evidence I have been able to extract from these records on this branch of the inquiry. But I may be allowed to observe that it suggests the way to a profitable branch of observation.

I have, among other results, been struck, for instance, with the marked degree in which abortion, or rather, to speak more correctly, premature birth, occurs in females of what I may call the Tubercular class, if not with actual family history of Tubercle. By "Tubercular class" I mean females whose fathers or husbands or both, as well as themselves, come within the category of persons whose occupations are

those long recognised as most closely allied to Phthisis and Tuberculosis. The like observation applies, with even more force, to children under five years, whose deaths are put down to the credit of Atrophy, Infantile Debility, Malformation, and such like causes. Most of these cases, it would seem to me, should primarily be considered as deaths consequent on perverted, or defective nutrition, and a large proportion of them to that special form of Nutritional Diathesis, which, had life been somewhat more prolonged and vitality somewhat more tenacious, have come under designations more commonly recognised as Tubercular. Counting from this class of cases upwards, the Tubercle-Bacillus has done one of its most valuable services in demonstrating the unity of all Scrofulous and Tubercular manifestations. Could it not aid us in reclaiming a large proportion of these /

these cases of obscure and not well-recognised infantile disease and mortality?

One other observation I view as of considerable importance in this connection. It is, I think it will be admitted confirmatory of the view I am now advancing, that in some closely contiguous districts — such as the Canongate and St. Giles' districts of Edinburgh — not apparently differing markedly in hygienic conditions, a seemingly unaccountable difference in the Tubercular death-rate is nearly balanced by a corresponding difference in the Infantile Mortality from the causes just before mentioned. I can not think such a circumstance as this, more especially when, as I have found it to be, frequently repeated, to be without pathological significance. I am accustomed to explain this circumstance somewhat in the following way. Not only are individuals born with/

with a general predisposition to death by a particular disease or class of diseases, but special organes in the individual are so formed. It but follows in logical sequence, that there is a like particular as well as general, cellular liability to succumb to special, or, as they are hence termed, specific pathological agents and processes. Now, whether the individual will or will not fall a victim to his or her pathological predisposition, and, if so, at what period of life, has long been a matter of more or less nice and accurate clinical calculation; and the question of general and individual prognosis has been recognised to depend, other things in the way of occupation, habit and surroundings being equal, on the periods of greater or lesser vitality of the human organism. Not so careful and well-considered, up to the present time at least, has been our study /

study and recognition of the influence of the periods of physiological activity of the several organs — in other words, their inherent vitality and power of resistance to morbid action — on the period at which these organs are likely to get worsted in the inherited or acquired contest with disease and death. And yet this, I can not doubt, has much to do with the progressive gradual evolution of Tubercle as observed in its varied manifestations, now in this part and now in that, of the human organism! To the like consideration as affecting the life history of the cellular organism, notwithstanding the suggestive address of Sir James Paget at the latest Cambridge meeting of the British Medical Association, but little attention seems to have been paid. But such attention would probably, in the light of our present knowledge of Tubercle, be rewarded with a clearer insight than we now have into the causes at work in producing a large proportion of

as, for instance, the occurrence of scrofulous adenitis in tender, and of Pulmonary Phthisis in more advanced years.

of the infant mortality already referred to as being set down to such vague causes as Infantile Debility &c. For instance, to go no deeper than such immediate questions as the following — Is the real cause of death, in many of these cases, the almost immediate invasion of the cells of the organism generally, or in one or more of the vital parts, with the Tubercular microbe and virus? Or, in the case of Premature Births in the Tubercular class, or of mothers actually Tubercular, has there been Tubercular infection in Utero, as evidenced say by the presence of pathological tubercles and of the Tubercle-Bacilli? Answers to such questions as these, besides being valuable and interesting per se, would have double interest and value from the light they could not fail to reflect on the whole question of the Etiology of

of Tubercle

A last, and most important deduction from this inquiry into the Etiology of Pulmonary Phthisis, and its allies, which I shall venture to suggest here is, that we must rest our best and surest hopes of successfully combatting Tubercle rather in a general measures of prophylaxis than in treatment of individual cases. This, of course, is only repeating what has been declared by previous inquirers, and physicians are familiar with the immense benefits which have followed on improved ventilation in barracks and in mines, and on large measures of drainage suggested by Dr. Buchanan's memorable observations on the influence of a damp sub-soil in increasing consumption. The lesson however, is apt to be forgotten unless now and again the need for it is strongly reinforced, as it will be found to be in the figures here

given. The demonstration is, I think, here complete that many of the causes, at least aggravating and perpetuating, if not actually creating, the Tubercular Diseases are exceedingly general and wide-acting, and are such as can come within the corrective and preventive reach of the State alone. The individual can do little or nothing of himself to remove himself out of the reach of these causes, but the State can, and ought to be called upon to do much. In undertaking any such work, labours of the kind which I now submit for the approval of the University could not fail to be of service, indicating as this does the localities and the classes which these Diseases most affect.

Coming now to the actual results of the Statistical portion of my inquiry, I have grouped these, roughly, under the following heads.

I.

I. The comparative Incidence, over a series of years from 1855 to 1882 – both inclusive, and in the different months of 1882 – which is the year which I took up for detailed inquiry, of Tubercular Diseases with that of the general death-rate of the country and certain other principal classes of diseases.

II. The special Incidence of Phthisis and of ~~General~~ Tuberculoses generally, in the like periods.

III. The Geographical Incidence of Phthisis and of Tuberculoses generally, in 1882, both as regards the population and the general death-rate of Scotland.

IV. The Trade or Occupation Incidence of these Diseases, also in the year 1882, in Scotland.

V. The Incidence in point of age of these diseases in the same year, both from the point of view of Trade-Incidence, and of Geographical distribution.

I.

I.

The first diagram to which I would ask attention is one (I.), which shows a series of Mortality-Curves which constitute a convenient starting-point for the whole inquiry. The curves are partly derived from those given in Volume II of 'The Eighth Decennial Census of the Population of Scotland, 1871, with Report.' But they are somewhat altered to suit purposes of easier comparison, and have been carried forward from the year 1870 to the year 1882, so as to give a full period of twenty-eight years in all. The curves show the varying general mortality per each 100,000 of the population in the whole of Scotland and in each of the Groups of Districts into which the country is divided for Registration purposes.

A first fact of importance shown by

by these curves is the marked and steady fall in the death-rate of the country generally since the year 1875; and, except in the case of the Large-Towns Group, in each of the Groups of Districts. Very striking, indeed, is the manner in which, in 1874, the mortality-curves of the Large-Towns Group changed places with that of the Principal-Towns, and in which that change has, practically, been since maintained. Interesting questions thereby raised for solution are — Is the general fall in the death-rate due to improved public medicine and hygiene; is the special fall in the mortality-curve of the Principal-Towns Group the result of the carrying out of their immense Improvement Schemes; and has the Tubercular mortality-curve shown itself to be influenced by the causes acting on the general death-rate? This latter question, as specially /

specially concerning the present inquiry, finds a negative answer in diagram I.2., which shows, among others, the Tubercular mortality-curve for the same period of years — or at least up to 1880, the last of which the detailed Report of the Registrar-General has yet been issued.

It is of some importance to note, also, how, in diagram I.1., the remarkably close manner in which the curve for the Small-Towns Group follows that of the mean curve for the whole country — the like fact being afterwards shown by Diagram I.3. to hold good as to the purely Tubercular Death-rate.

The diagrams marked from I.1. to I.6. (inclusive) seem to me to indicate a state of things strongly confirmative of the Nutritional Theory of Tubercle. From the Zymotic and the Respiratory Diseases' curves that of Tubercular Diseases differs, one may say, toto cælo. Its regularity is in

in marked contrast with the bizarre and febrile gyrations of the curve following the course of the Epidemic and Contagious diseases, on the one hand, and with the irregular, and steadily advancing, curve indicating the course of the diseases of the Respiratory Organs, on the other. Besides, a reference to diagrams I.2. and I.3. will, I think, satisfy one, that the causes at the root of the Tubercular mortality of the country have not, to any marked degree at any rate, shared in the very considerably lessened mortality of Scotland during the past few years. What decrease in the Tubercular mortality there has been, is seen to have taken place in the Principal and Large Towns, in many of which have occurred, coincidently, improvements in Sanitary and social conditions which must have beneficially affected the general nutrition of the dwellers in these populous centres. Plainly, on the face of these

these diagrams, the micro-organism of Tubercle does not work after the intermittent and over-mastering method familiar to us in his fellows of the Epidemic and Contagious diseases, nor does he seem largely dominated by the Seasonal causes admittedly commanding the incidence of the Respiratory diseases, whose course is even better marked in diagram I.4. than in that previously noticed.

The tentative conclusion from all this is not, as I think, ~~unwarrantable or~~ rash or unwarrantable, that the Bacillus-Tuberculosis is, in the production of Tubercle, not dominator but dominated. Year by year, with an almost monotonous sameness — varied only by a number of causes (afterwards to be considered, in part at least), the micro-organism finds an almost dead-level of soil unsuited for normal, or altered pathologically by abnormal, nutritional processes, but specially adapted for those perverted nutritional changes, which this microbe has a peculiar capacity

capacity to flourish upon and to aggravate and increase.

Diagrams I.5. and I.6. have been constructed to illustrate another noteworthy respect in which the incidence of Tubercular mortality differs from that from all causes, and, more particularly, from that from diseases of the Respiratory Organs pure and simple. As well in the Eight Principal Towns, as in the country generally, Tubercular mortality has its period of excess of the 'Mean' in the five months beginning with March and ending with July, and its maximum intensity in May. The mortality, on the other hand, from diseases of the Respiratory Organs agrees with the general mortality in having its maximum period of intensity in and about December, the other rises above the 'Mean' being in March and May, but not being by any means marked.

The same kind of thing is seen in the more detailed diagrams II.1. and II.2, constructed to show the monthly incidence of /

Tubercular mortality alone in Scotland, and in the Groups of Districts, and in the Divisions of Counties. Here the period of excess of the 'Mean' is seen to be practically unchanged, though the period of maximum intensity shifts about within the five months, in the several districts and divisions of the country.

This peculiar fact of the Spring prevalence of Phthisis, if not of Tubercular Diseases in general, has not been unnoticed before, but not, I think, so strongly enforced as I am inclined to enforce it here. As a result of that notice, several explanations, almost all of them resting entirely on atmospheric and temperature changes, have been offered to account for a monthly incidence of mortality peculiar, as far as I can discover, to Tubercular diseases. With the view of testing some of these explanations, I have constructed diagrams II.2. (Mean Temperature Curves), II.3., and II.4.

Or

On the exhibition of the 'Mean Temperature Curves' as explaining anything in connection with Tubercle, or its death-rate, I am not inclined to place over much reliance. It is here introduced, however, to show that it has not been over-looked, nor the relative view that the Spring mortality of the Tubercular patient is in almost direct proportion to the severity of the preceding Winter. Succeeding Registrars-General have lent the weight of their observation, and consequent authority, to the belief that a severe winter — at least where the temperature readings show a mean fall of about 5° below that of the same season in the previous year, has a serious effect upon mortality from all chest diseases, including in them Consumption. But this explanation, it will be seen, does not explain why the Bronchitic subject, for instance, should be killed off at once in December or January, leaving this feebler Phthisical brother

to follow him, after the lapse of several months, in May, or even in July it may be — to take the full benefit of the period of excess over the 'Mean' death-rate from Tubercular causes.

More reliance, even from the preceding point of view, is to be placed on the "Curve (Diagram II. 4.) of Daily Range of Temperature," as indicating a possible, if not probable, source of fatal danger to the phthisical patient. With the exception that the ascent above the 'Mean' does not commence till a month later and continues for two months beyond the fall of the Tubercle-curve, we have here a typical Tubercular course; and my own observation (which, however, has not extended over such a period as to entitle any conclusions derived therefrom to any great weight) inclines me to the opinion that these present temperature changes have some considerable influence on the fatality of the /

the Tubercular and Phthisical process at this particular period. And not without its share of influence, to my mind, is another fact illustrated by the "Sunshine Curve." (diagram II.3.), which is also typically 'tubercular', if I may use the term adjectively in this special sense, in its course. What influence the greater prevalence of hours of bright sunlight at this ~~time~~ season may have on the Tubercular process is not, of course, direct but only indirect — the inviting sunshine being a veritable ignis fatuus, luring the phthisical subject to brave the temperature dangers he would otherwise carefully avoid.

Among causes which have been spoken of, but the connection of which with the maximum period of Tubercular mortality is far from clear, are those of the Rainfall and Humidity of the air (diagrams II.3.), and of the respective prevalence of Easterly and Westerly winds, (diagram II.4). That which has been most

1. varying and aggravating its course,

most insisted upon is the prevalence of Easterly winds in March, April, and May. Now, in the particular year under consideration specially here, the Easterly winds had their maximum intensity in April, with minor, but still marked, periods in May, October, and December. The April maximum scarcely accounts for the high Tubercular mortality of March, April, May, and June, on the one hand; and the succeeding periods of Easterly winds were not followed by any renewed access of Tubercular mortality, but the reverse. Again, in the home of Easterly winds — namely, here in Edinburgh, not only is the truly indigenous Tubercular mortality considerably below the 'Mean' of the Principal-Towns Group, but it actually takes the course of proving the rule of general monthly incidence by being an exception thereto (Diagram II 5.), and having its period of maximum Tubercular mortality in August.

August. I am not sure that I can defend this particular use of the case of Edinburgh as in every respect sound and legitimate. Because the influx of extern cases for advice at the Royal Infirmary — and that just in the months when travelling can best be borne by the patient — no doubt somewhat vitiates Edinburgh vital statistics in this as in other instances. But, yet, sufficient, I think, remains to give important aid in removing the Easterly winds theory from its often over-stretched relations to the production of the maximum period of Tubercular mortality.

Underlying all other general, and it may be local, reasons or causes at the root of this matter is a much deeper and far more important one, which gives these other causes their special effect. All vital processes are tidal in their operation, and have their respective periods of ebb and flow as certainly, and frequently enough as clearly marked, as f

as the waters of the earth have theirs. The poets have long recognised this truth from their point of view of men and life, and "the spring-tide of the passions" is but one, though a typical one out of many phrases descriptive of a great vital truth. In his realm, in turn, the physician is perfectly familiar with the same great law, which is specially, perhaps, to be recognised in its manifestations in the domain of Gynæcology. But what is true of the total human organism and of its several component organs, is not the less true of their cellular 'intra-structure', if I may coin the phrase to meet my needs. For the cellular organisms, too, there is a spring-tide, at which a special call is made on their physiological vitality, which, if from any cause the organism is unable to meet it, is necessarily followed by a corresponding physiological 'wearedness' and

and failure of strength. My observation of advanced phthisical subjects has convinced me that, with the advent of nature's new year and at the time when she is putting forth evidences on all sides of her perennial youth and generative vigour, such subjects show a renewed Expectancy of life and strength and are, as it were, in a physiological, tidal sympathy with their surroundings. This call for a greater physiological activity of its parts, the debilitated system is unable to answer; and at no part of the year, to my mind, is the physiological failure so marked as at the period we are now considering. This tidal aspect of disease and death is nowhere so ~~marked~~ observable as in the Tubercular process, just because, in my view, it is essentially a Nutritional one; and the onset of the physiological tide calling for a more active and healthy nutritional process, the call is not ~~made~~ answered, and, not being answered, ends in a still more pronounced degree of physciological

— the most essentially Nutritional one with which physicians have to deal;

physiological failure. If this be anything more than a fanciful view, which I think it is, of what occurs at this time in the Cellular economy, then the period for the most pronounced Bacillary activity is more easily explained than on any other hypothesis known to me. The cells which were already weakened, are yet more depressed in their vital powers, and the Bacilli are able the more quickly and surely to complete their work of local destruction and spread.

This said, all the other special causes which go to reduce nutrition, or to start other processes of disease, find place in working out the fatal result.

The third series of diagrams here given have for their object the demonstration of the local incidence, or, in other words, the Locality of Phthisis and the allied Tubercular Diseases in Scotland. Here I may explain what, perhaps, I should have done earlier, that

Also, it should be explained that, in all but the diagrams up to I-4., dealing with the incidence over a lengthened series of years, I have constructed my diagrams on the Registrar-General's latest arrangement of the Groups of Districts, still further modified by me to suit the special purposes of this inquiry. Thus, the Principal-Towns Group, besides including Kilmarnock, contains (as being practically part of Glasgow) Cathcart, Eastwood, Maryhill, Shettleston, Plantation, Govan, Partick, and Rutherglen, with the Landward portions of the several districts of Glasgow as usually dealt with in the Registrar-General's returns up to this time. This, of course, has correspondingly affected the Large-Towns and Small-Towns Groups.

that my classification of Tubercular Diseases is that of the Registrar-General. Thus, there are the four classes — Scrofula, Tabes Mesenterica, Phthisis, and Hydrocephalus; and, of the first three, Scrofula is sub-divided into Scrofula, Adenitis, Psoas Abscess, and White Swelling; Tabes Mesenterica into that disease and Tubercular Peritonitis; and Phthisis into phthisis proper, Hæmoptysis, Pneumothorax, and 'Phthisis and Child.' [So made up, then, I have in this series of Diagrams demonstrated the Locality of deaths from Phthisis and of Tuberculosis generally — (1) in proportion to every 100,000 of the population; and (2) in proportion to every 100 deaths from all causes in the same localities. In all cases, I have given the general death-rates in the like proportions, and indicated by abscissa lines the "means" of the several death-rates. From this method of dealing with the statistics of this part of my inquiry, I have proposed to myself to earn the

following results. First, to enable the inquirer to set his finger at once and easily on the localities where an undue (meaning thereby a mortality above the 'mean') proportion of tubercular mortality to the population exists. Second, to enable one to see with the like ease those localities in which, even while the proportion to the population may not be undue and the tubercular condition may be satisfactory from that point of view, yet the tubercular mortality in proportion to the general death-rate may be beyond the normal. In either case, the advantage of such charts of reference, from the point of view of prophylaxis, would be considerable.

A glance at diagrams III.1., and III.7., will at once show that the two sets of curves — those, namely, showing the proportions of Tubercular and Phthisical mortality to the

the population and to the general mortality, by no means coincide. Thus, while the proportion to the population fairly follows the operation of Dr. Farr's law of density, the proportion to the total death-rate certainly does not, and ~~that~~ the otherwise healthy record of the Small-Towns districts is marred by the heavy percentage which Tubercle exacts. The curves for the County-Divisions (excluding the specially manufacturing Counties of Renfrew, Ayr, and Lanark — South-Western Division) show a gradual increase in the Tubercular mortality per 100,000 of the population as one comes from the north to the south; while, in proportion to the general death-rate, — if we except the South-Eastern group (which is low) and the Northern (which is high) — the rise is marked from north to South, the extreme Southern Counties being here in advance even of those of the South-Western Division.

Taking

Taking, next, the individual Counties, we are able to analyse their respective Tubercular and Phthisical death-rates, with some peculiar results. Of the Counties that rise above the 'mean' in proportion alike to population and to total deaths, Bute is perhaps most marked. Not a little of this unenviable position is due to the high rate of Tubercular mortality, which will be afterwards seen to obtain at Rothesay (diagram III. 5.), and is to be explained away, no doubt, by the fact that Rothesay is an old-time popular Consumptive resort. But I have elsewhere eliminated "externs" as far as possible from the register, with the result of still leaving a largely undue proportion of Tubercular mortality for this and neighbouring places. Indeed, few results of this inquiry into the Locality of Tubercle in Scotland are more pronounced than the fatal injury which it has done to the reputation of ~ (diagrams III 2. & III 8.) to some extent

most of these Consumptive-resorts. And if, as I imagine it is, the principle be sound which would pronounce against the sending of Consumptive subjects to places having a high indigenous Tubercular mortality, these places will in the future have to be specially avoided.

Another noteworthy result is to show the fallacy of an announcement published not long ago of the immunity from Phthisis of the Western islands. Of all the Counties, Nairn and Kincardine stand best on both diagrams a position which is well maintained by their Small Towns. (Diagrams III. 4. and III. 10.)

The other diagrams of the series suggest material for only too much speculation as to etiology. But, as with my present knowledge it must be largely speculation and nothing more solid, I prefer to leave the diagrams as affording basis for further inquiry and work.

The series,/

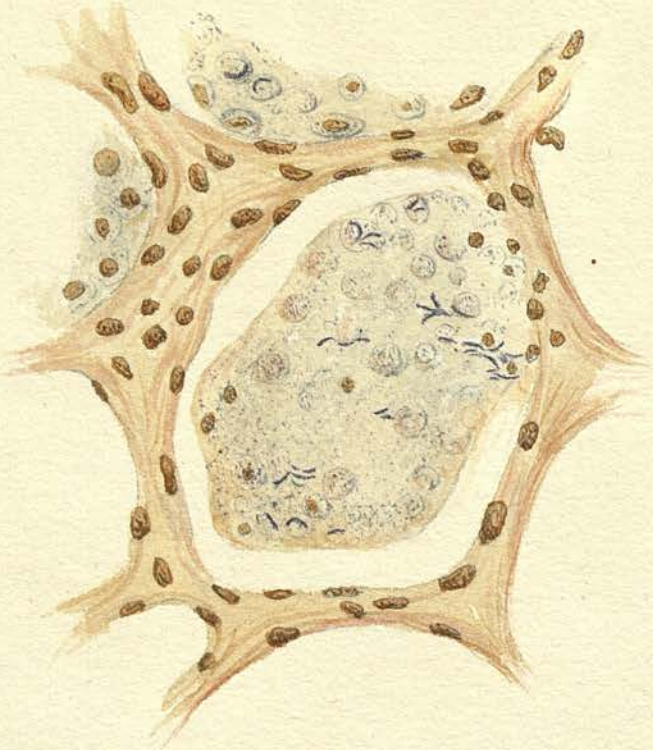
The series is, however, completed by two diagrams (III. 13. & III. 14.), which show the incidence of Tubercular and Phthisical mortality in the Counties and their Divisions, after the Principal-Towns, Large-Towns, and Small-Towns, and the special influences and causes there at work in producing or aggravating Tubercular Diseases, have been eliminated. These diagrams afford material evidence on which to judge of the relatively unaided influence of country locality in favouring the development and maintenance of Tubercular Diseases. The completeness of the demonstration is, however, marred somewhat by my having to follow the Registrar-General in ~~Excluding~~ including in the Country some places which should more properly, as far as I can judge, be still dealt with as Small Towns. For general purposes of comparison, the diagrams are yet pretty reliable, and may, I think, be found of considerable value.

Thus,

Plate I.

+50

Plate 2.



+1500

Plate 3.

+50

Plate. 4.

× 50