

VITAL STATISTICS AND PUBLIC HEALTH WORK IN THE TROPICS INCLUDING SUPPLEMENT ON THE GENEALOGY OF VITAL STATISTICS

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FOREWORD

IT gives me pleasure to be invited to contribute a few prefatory words to the book of an old friend and colleague to whose vivid and inspiring teaching men in all parts of the colonial world owe gratitude. I hope and believe that many who have not had the advantage of Major Edge's personal teaching will have their courage strengthened by this book. I say courage, because that is the virtue a vital statistician working under a tropical sun chiefly needs. There are two obstacles in his path. The first is intellectual self-distrust, the second public indifference. Let us consider each.

I have been a student of statistical methods for more than forty years. At the beginning of the century, Karl Pearson's *Grammar of Science* (second edition) fired my enthusiasm for measuring living things, for vital statistics—using the word “vital” in a broad sense. Correlation, Regression, Standard Deviation, even now those words give me a thrill. I remember being spurred by the “Grammar” to consult, at a public library, its author's mathematical papers and the chill of discouragement pages of algebra engendered. Obstinacy, and some neglect of subjects it was my proper business to study as a medical student, enabled me to conquer most of the difficulties. Determinants have never come and eaten out of my hand, but I can look them in the face without blenching. The task confronting a youth, say a medical student, in 1943 who opens a treatise on statistical methods—to say nothing of a research paper—is much more formidable than it was in 1901. It would be very nearly true to say that a reader in 1901 with as much mathematical knowledge as the choice of mathematics in the modern Higher Schools Certificate implies, would have had no difficulty in *following* most mathematical-statistical books or papers. That is no longer true.

The reason is that the field of application of statistical methods has been enormously widened. A single illustration will suffice. Forty years ago, practical men were not much interested in small samples. Biometricians were hardly interested at all in them. One disdained samples of 100 or less; after all it was usually not

difficult to measure the heights and weights of samples of 500 or 1,000, if one needed an appraisement of the "population" of school children. But if measuring the height of a single child had taken a whole day, or if making such a measurement were associated with a risk, however slight, of injuring the child, then we *should* have been restricted to small samples. That is just what happens in the commercial application of statistics. A manufacturer of electric lamps wishes to be reasonably sure that only a small percentage of the articles he puts on sale shall be duds. He consults a statistician, and if the statistician tells him to burn out a sample of 500 or 1,000, he may say he cannot afford to do so. He most certainly would say that if his products were very costly weapons of modern warfare. Similarly, in biological trials neither time nor money (there are other reasons, but I will not complicate matters by detailing them) will permit spatial isolation of many clean experiments and controls. The statistician is forced to study the logical technique of small sampling. Not because he prefers small to large sampling, *not* because he imagines that any logical adroitness will make a small sample as informative as a large sample, if both are treated by equally efficient methods, but because small samples well treated will yield up far more and more exact information than small samples harshly treated. To discover the good treatment requires both natural aptitude *and* long mathematical training.

But this does not mean that, when large samples are available, and in the field of statistics with which Major Edge is concerned they usually are available, the older and simpler methods of numerical analysis have been superseded. They have not; such mistakes in arithmetical technique as were made by our fathers have been corrected, to use and understand the improved methods needs very little knowledge of algebra. In vital statistics it is not so much the smallness of the sample as its bias, its unrepresentative character, which is a danger. Here are indeed pitfalls. To avoid them needs common sense (a not *very* common quality) and experience of life. Major Edge shows the pitfalls. No man who wishes to blaze a vital statistical trail should be discouraged because he dislikes algebra. He will encounter intellectual difficulties but that will not be mathematical but psychological; to be overcome by a sympathetic study of human beings, knowledge of their history and customs, inexhaustible patience. The

advice given in *Acts* x, 15, should be taken to heart by a pioneer statistician.

The other obstacle is public indifference. It is true that if the word statistician crops up in general conversation now, it does not inevitably cause somebody to mention the positive, comparative and superlative degrees of lying; in spite of the provocation regularly given by the "experts" (anonymous) who broadcast statistics of war-time production and casualties. But it cannot be said that much prestige attaches to the title statistician, unless he is the head of a large official staff. A medical officer in the Colonial Service who is an amateur of vital statistics—which is what John Graunt, our first great vital statistician was—will not earn any respect on that account. He may even be pitied for not choosing a better hobby. But let him be of good courage. John Graunt comforted himself by the thought that "there is pleasure in doing something new, though never so little without pestering the world with voluminous transcriptions"; he had small honour in his day, and it is nearly two hundred years since his own countrymen reprinted his *Observations*. But Graunt was the teacher of those who taught the civilized world. It is not fanciful to say that John Graunt was the pioneer of the war against infant mortality, because he first *measured* the rate of mortality in childhood and contrasted the mortality of children in town and country. All men, statisticians or not, are impressed by a numerical measure of death. That an idea of his enabled business men to put life assurance on a sound basis is hardly worth mentioning in the same breath as that which proclaims a method of saving lives. But this minor discovery was utilized within a generation of Graunt's death; more than 150 years passed before we seriously used Graunt's methods of studying rates of mortality under different conditions, in town and country, at ages and by causes.

I am not so pessimistic as to think that the vital statistical pioneers of the tropical colonies will, like Graunt, be dead before their labours fructify. But they, like Graunt, will certainly find their highest reward in the pleasure of the work. It is a pleasure to discover something new. Major Edge tells them how to set about the undertaking. Fired by his enthusiasm their courage will not fail them.

I will add some words, addressed not to those who will labour

in the field but to those who sit at home and write letters to the papers or speak from platforms, whose letters and speeches abound in such phrases as our Imperial responsibilities, our genius for colonial administration, *etc.*, *etc.* Have they remembered that there are colonial territories administered by us for generations the vital book-keeping of which is far cruder than that of the home country three hundred years ago? Have they said a word to encourage or moved a finger to help those who tried to improve this state of things? Have they even heard of what a smaller nation has achieved? I read the colonial vital statistical publications of the Netherlands Government with admiration and also a sense of national humiliation.

MAJOR GREENWOOD.

LONDON, February 1944.

PREFACE

IT is generally agreed that the available vital statistics of the majority of tropical territories are incomplete and unreliable, and responsible authorities are continually pressing that steps be taken to improve existing systems of Public Health Book-keeping in order to ensure that the necessary facts are recorded under conditions which will make them territorially comprehensive, and at the same time guarantee their dependability.

In the opinion of the present writer, however, these urgently needed improvements will not necessarily follow from the slavish application of European procedures and practices to tropical areas where social organization and conditions of life are so vastly different, for it is believed that if success is to be achieved, the problems of vital statistical organization and administration must be approached from new angles. In the light of actual personal experience of conditions obtaining in several tropical countries, combined with the fact that for several years Annual Medical and Vital Statistical Reports relating to all British Colonial Possessions have been regularly examined and commented upon by the author, an attempt has been made to discuss some of the special difficulties encountered and how they might be overcome. It will be noted that the conventional features of the vital statistical handbooks have been omitted from the pages which follow so that space might be devoted to enlarge upon matters hitherto unheeded, but which appear to be of first-rate importance in connexion with Public Health activities among tropical peoples.

As the present contribution is primarily intended for the consideration of workers in tropical possessions of the British Empire, the Bibliography is mainly restricted to the mention of English books and papers, or to English translations of the works of foreign writers where they exist, and which are likely to be within reasonable reach of most people.

P. G. E.

LONDON, March 1944.

CONTENTS

	PAGE
FOREWORD	v
AUTHOR'S PREFACE	ix
CHAPTER I	I
Endeavours to explain the importance of public health book-keeping.	
CHAPTER II	8
Considers some of the difficulties ordinarily encountered by promoters of new enterprises in tropical territories.	
CHAPTER III	14
Discusses the primary requirement to be satisfied in the organization of a reliable system of human book-keeping.	
CHAPTER IV	21
Briefly considers how some of the inhabitants of tropical territories react towards attempts made for their enumeration, and discusses some of the beliefs and superstitions which may give rise to their fears.	
CHAPTER V	27
Continues the discussion of counting operations—briefly explains how the objects of a decennial census differ from those of a medical census—and proceeds to refer to some of the causes of inaccuracy in assembled data.	
CHAPTER VI	39
Deals with methods of estimating the size of a population when the census method is not used, and observes that though some of the earlier methods of estimation may appear crude and unorthodox, they were, nevertheless, of value.	
CHAPTER VII	47
Continues the discussion of population estimation with special reference to some unconventional practices which can, in certain circumstances, be used with advantage.	

	PAGE
CHAPTER VIII	58
Brings to the notice of the reader a necessary and supplementary system of recording vital facts, in order that human book-keeping services shall be completely equipped to meet the needs of public health administrations.	
CHAPTER IX	65
Introduces the subject of birth registration and seeks to indicate how local beliefs and superstitions associated with conception, pregnancy, and childbirth can adversely influence the progress of the work if their significance is misunderstood.	
CHAPTER X	75
Proceeds to the discussion of specific items of information required for the registration of births and their relative importance from the public health point of view, and calls attention to the effects some local customs and beliefs may have in affecting the accuracy of the recorded facts.	
CHAPTER XI	98
Suggests that attempts should be made to obtain more complete and reliable records of sickness than are at present available.	
CHAPTER XII	113
Provides a brief commentary on some aboriginal beliefs and customs associated with the origins of sickness and death in various parts of the tropical world.	
CHAPTER XIII	130
Represents an attempt to explain the purposes of death registration, and the reasons underlying the demands for specific items of information to be recorded.	
CHAPTER XIV	147
Discusses the importance of disease nomenclature in connexion with Annual Medical Reports.	
CHAPTER XV	165
Briefly suggests that population studies based upon carefully assembled facts are a pre-requisite to the solution of the many difficult problems involved in post-war reconstruction in all parts of the tropical world.	
APPENDIX	173
Bibliography.	
SUBJECT INDEX	185

CHAPTER I

Endeavours to explain the importance of public health book-keeping

M. DIAFOIRUS, a physician, when pressing the claims of his son (also a physician) for the hand of the daughter of Argan (*Le Malade Imaginaire*), quotes in his son's favour: "I am glad to see him follow my example in that he is blindly attached to the opinions of the ancients, and would never understand nor listen to the reasons and experiences of pretended discoveries of our century, etc."¹ It is submitted there are still unprogressive members of the medical profession true to the Diafoirus type, who adopt attitudes of indifference or open hostility towards the adoption of new ideas or technical processes which, though they are of proved value, are for some obscure reason regarded with disfavour. Thus the obstructive attitude of some members of the profession towards medico-statistical work, which a century ago inspired the retort, "Il est les médecins de bonne foi qui n'aiment pas la statistique." . . . "Ils préfèrent les mots, les phrases, les subtilités aussi vides, etc.,"² continues by many public health officers in various parts of the world even at the present day.

Why is this important branch of work unpopular? Perhaps professional statisticians are partly responsible. During the past forty years or so the statistical vocabulary has seen the introduction of many strange words and terms, while during the same period there has developed a somewhat alarming multiplication of mysterious looking mathematical symbols and liberal use of the Greek alphabet, together with a tendency on the part of some

¹ "Ce que me plaît en lui, et en quoi il suit mon exemple, c'est qu'il s'attache aveuglément aux opinions de nos anciens, et qui jamais il n'a voulu comprendre ni écouter les raisons et les expériences des prétendues découvertes de notre siècle," *Le Malade Imaginaire*, Molière, Act 2, Sc. v.

² Cf. *Des Maladies Mentales*, E. Esquirol, Paris, 1838, pp. 665 *et seq.* See also p. 15, *infra*, and "The Contents of Colonial Medical Reports," P. Granville Edge, *Trop. Dis. Bull. Supp.*, 1936, p. 5.

workers when publishing the results of their labours to preface such results by a presentation of difficult-looking algebraic formulæ. This was inevitable; the technical demands made on statisticians increase daily, but do not tend to popularize the study and practice of medico-statistical work by field workers.

This line of development must not be allowed to proceed at the expense of that branch of the work concerned with the *collection, classification, and tabulation* of data—activities which provide the foundations of sound medico-statistical practice.¹ One would be as usefully engaged in endeavouring to extract sunbeams out of cucumbers as employed in mathematical acrobatics with data which are basically unreliable; no statistician can ever raise dependable conclusions from the muddy depths of inaccurate data, however great his technical skill.

The absence of carefully compiled records of disease permitting detailed analyses and specific epidemiological studies has often delayed the advancement of medical knowledge and led to the persistent acceptance of mistaken notions regarding the cause of this or that disease. All the great contributors to medical knowledge, by the exercise of common-sense methods of collection, classification, and analysis of assembled facts, sought in the chaos of innumerable recorded observations whether there existed general rules or laws governing groups of phenomena. They succeeded in demonstrating that such laws exist and that the value of all inferences and conclusions is directly proportional to the number of observations and the care devoted to their accurate compilation.

Of course there are theories and technical expedients associated with some branches of statistical practice which involve the use of advanced mathematics, but, on the other hand, there are numerous statistical processes which are simple and require no more than the four rules of arithmetic—and it is the simple processes which can be extensively and profitably used by public health officers.

The pages which follow will be concerned solely with the discussion of these simple processes, and primarily with their use by workers in the tropics, in order to show how it becomes possible to give expression to multitudinous experiences and phenomena,

¹ Cf. "The Scope and Methods of Statistics," H. Westergaard, *Jour. Amer. Stat. Assn.*, Vol. XV, 1916, pp. 225-91.

in such a manner that comparisons and relationships between several factors and influences may be determined and numerically expressed compactly and explicitly. Properly applied the four rules of arithmetic may be employed in the field of public health to supply answers, wholly or in part, to such questions as—

What is happening ?

How and when do specific happenings occur ?

Why do these specific happenings occur ?

If reasonably dependable answers to such questions as these are discoverable, then the medical problems they involve are well on their way towards solution.¹

As regards the value of this kind of work, it may be said at once that the importance of vital records in any public health service can scarcely be over-estimated. Public health work may be defined as warfare directed towards the prevention and cure of disease, the removal of insanitary conditions, and the promotion of better health conditions in general. In any kind of warfare victory largely turns upon the relative efficiency and sufficiency of the intelligence services of the opposing forces. *Vital records are the intelligence services of public health* provided an organized system ensures (a) the prompt assembly of reliable facts, (b) the intelligent interpretation of data, and (c) that information thus made available is acted upon with promptitude.

In medical statistics workers have a means of exercising and satisfying the much under-estimated and often neglected virtue of professional curiosity—a virtue which, when exercised, has contributed so largely to the physical betterment of the human

¹ "l'expérience et l'observation fournissent les premières matériaux des sciences . . . le complément indispensable de tout travail scientifique," *Principes Généraux de Statistique Médicale*, Jules Gavarret, Paris, 1840. Cf. *Annual Medical and Sanitary Report, Tanganyika Territory*, 1936, p. 6, Government Printer, Dar-es-Salaam. "A very special advantage here has been the application of numerical methods," p. 5, *Medical Notes and Reflections*, by Henry Holland, M.D., F.R.S., London, 1839. "If Governments can do little by direct enactments for the diminution of sickness, it is nevertheless their duty to determine by statistical enumerations the actual state of the public health and the extent to which it has deteriorated." This extract is taken from an article under the title of "Suggestions as to the Means of Promoting the Public Health," by William Farr in Vol. II of *A Descriptive and Statistical Account of the British Empire*, by J. R. McCulloch, London, 1837.

race and to the extension of the boundaries of scientific knowledge. In the tropics especially, there persist innumerable influences prejudicial to health and life. Patient investigation, aided by statistical methods, may succeed in isolating and assessing the force of some of these influences and assist in replacing a dusky twilight of uncertainty and conjecture, by a certainty nearly absolute in so far as the cause and treatment of some ailments are concerned.¹

It will be obvious that public health work offers infinite opportunities for the application of statistical methods, and that facts may be assembled as a result of a variety of activities—population records, together with facts relating to births, deaths, and notifiable diseases, the results of laboratory examinations and findings, data assembled during the course of special field investigations—these and other sources of information are all capable of supplying the raw material for statistical analyses. But whatever the source or nature of the raw data the same fundamental principles of statistical technique may be applied for their interpretation; on the present occasion attention will be confined to the consideration of *official vital statistical records* in the tropics,² their place in the public health programme, to emphasize the importance of assembling and analysing facts concerned with the physical well-being of a people as a whole, and to showing how by simple technical expedients these “masses of dry figures,” which are real counters of thought, can be persuaded to reveal their meaning in balance sheets as lucid as pages of print.

Henceforward these statistical activities will be defined as *Human Book-keeping*, for the work is concerned with the maintenance of accounting systems in which the entries are descriptive of phenomena characterizing human lives from birth to grave. Such records as these will serve to throw light upon the physiological and economic aspects of births, diseases, deaths, race fertility, and other features of evolution, provide bases for the better understanding of the subtle tides of population changes,

¹ “One of the many obvious applications of the facts will be to the promotion of practical medicine. . . . Medicine is beginning to abandon vague conjecture . . . and to substitute numerical expressions for uncertain assertions, etc.,” pp. 86-9, *First Annual Report, Registrar-General, England and Wales*, London, 1839.

² Cf. *Vital Records in the Tropics*, P. Granville Edge, London, 1932.

their direction and rate of movement, and supply a means of assessing the effectiveness or failure of public health measures applied for the reform of insanitary conditions. Public health authorities lacking the information made available by such systems of book-keeping, or relying on systems functioning irregularly or inefficiently, must to no little extent remain ignorant of the physical condition of their peoples as a whole, of the prevailing diseases and their age, sex, local and seasonal distribution, and will lack the accurate knowledge indispensable to the framing of future legislative measures in the interests of public health.

No one with a modicum of common sense would venture to invest money in any concern where accounts were not properly maintained and regularly audited—not merely audited at the end of a year's activities, but from day to day, and week to week, for it is only by such means that the directors of successful commercial enterprises are kept informed of the exact state at all times of all branches of their business. Only an infinite capacity for self-delusion can encourage the belief that the fading parchment of the mind is capable of retaining an adequate knowledge of all the bewildering details characterizing health and disease, or that medical policies that are not submitted to *regular and objective audits throughout the year*, can be framed and made to function successfully.

It is true that in practically all parts of the tropical world human book-keeping systems ranging from the primitive to the complete are being tried out, and in some cases with conspicuous success. However, many of them still remain "systems" in little more than name, function erratically and deliver data which must be regarded as unable to serve the purposes which their assembly envisages.¹ A knowledge of the methods adopted for the collection of data in highly developed States will of course be useful when the establishment of a book-keeping system is contemplated, but it by no means follows that procedures and practices successfully applied in Europe are equally applicable to the conditions of life encountered in the tropics.

¹ "The statistical information available as to the general health of the Territory's population is negligible in quantity and unreliable in quality," p. 2, *Annual Medical Report, Northern Rhodesia*, 1936, published 1937. "Any analyses of any figures which are now available, even with the most careful reservations, would almost inevitably be misleading," p. 17, *Annual Medical Report, Kenya*, 1936, published 1937.

Often a mistaken belief in the applicability of western ideas and methods in tropical and oriental fields has led to failure and disappointment and in no little degree accounts for the ineffectiveness of the Census "*Laws*" and Registration "*Acts*" enacted in some territories, but only to remain thereafter dead letters so far as their usefulness is concerned. Legislation in this field of work is by no means the facile expedient it is supposed to be, for such systems as are envisaged cannot be brought into being and made to function efficiently merely by the promulgation of a series of nicely worded legislative enactments; sometimes such action might more surely impede than accelerate progress.¹

Sound judgments in the field of public health work, whether in the tropics or elsewhere, can be reached only by careful reflection and reasoning on the basis of accurately recorded facts. Facts are stubborn things and often seem dull, yet they are the seeds of imaginative ideas which the wit of man is often able to transmute into practical realities. Medical explorers might profitably adopt, with slight amendment, the dictum of a French statesman and say, "*Faites nous de bonne statistique et nous vous ferons de bons resultats,*"² for whatever principles characterize future endeavours of medical workers in the tropics, the book-keeping aspect of the business must prove of paramount importance.

In every part of the tropical world medical workers are continuously engaged in the necessary spade-work of scientific cultivation, yet however large and industrious this army of workers may be, if, by gathering and recording a fragment of knowledge here and there, they are merely engaged in accumulating facts of every description without scrupulous regard to selection and method, their labours satisfy little more than the demands of a profitless and meaningless routine. Alternatively, the efforts of others may be individual and as such discontinuously applied, therefore lacking that combinative force and economy of effort without which the most extreme enthusiasm can rarely achieve dependable results nor long survive the monotony of plodding

¹ Cf. "The Demography of British Colonial Possessions," P. Granville Edge, *Jour. Roy. Stat. Soc.*, Vol. C, Part II, 1937, pp. 182, 188-9, 199-208, etc.

² Baron Louis, French Finance Minister, 1830, who said, "*Faites nous de bonne politique et je vous ferai de bonnes finances.*"