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978-1-316-60363-5 - Mortality and Other Investigations: Volume I

H. W. Haycocks and W. Perks

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MORTALITY AND OTHER
INVESTIGATIONS

VOLUME I

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This volume forms part of a series of text-books published under the authority of the Institute of Actuaries and the Faculty of Actuaries and is designed to meet the needs of students preparing for the actuarial examinations.

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MORTALITY AND OTHER INVESTIGATIONS

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PREFACE

The subject of this book—Mortality and other Investigations—is divided between two sections of the examinations of the Institute of Actuaries. This division is in accordance with the principle of ‘progressive approach’ which was adopted for the new examination syllabus introduced after the Second World War and which has for its objective the parallel training of actuarial students in the three main classes of subjects making up the basic equipment of a qualified actuary: the mathematical subjects, pure and applied; the statistical subjects, general theory and actuarial applications; and the economic and financial subjects, including compound interest and investment of institutional funds. The first stage of the present subject for which this volume is intended to be the official reading is included in the second section of the statistical group of subjects along with the second stage of the general theory of statistics. The second stage of the present subject is included in the third section of the statistical subjects along with demography.

The scope and standard of the present volume are, therefore, determined by its purpose. With regard to scope the essential emphasis is on principles rather than a detailed treatment of investigations that have been made. The limits to its scope are defined negatively by reference to the examination syllabus—a detailed treatment of selection, of multiple decrements and of continuous exposed-to-risk formulae is not included. The standard of treatment is essentially determined by the normal equipment of the students for whose use the volume has been prepared. This includes elementary differential and integral calculus, algebraic probability, finite differences, elementary mathematical statistics and a first course in life and other contingencies. While every student using this book for his examinations will not necessarily by then have passed in all of these subjects the great majority will have read and sat for them in the examinations. A considerable equipment can, therefore, be assumed of the reader, although not all of it is required for present purposes.

Experience has shown over and over again that the real difficulty to the student in this subject is that for the most part his studies have hitherto all been in deductive subjects. For the first time he finds himself in the middle of a practical subject concerned with scientific observation and the mental processes of induction. Hitherto, for most of the problems that he has met there has been one answer to be logically deduced from the premises. Now there are vagueness, choice of procedure, approximation and decisions to be made that are directed to practical ends. Questions in test papers do not necessarily call for a specific answer—they often call for a discussion of pros and cons and the description of methods that are adequate, but not more than adequate, for the practical purposes to be served. The position of the student is the more difficult because he cannot fully weigh the significance of the practical purposes until a later date when his practical experience has reached a riper stage.

The exclusion of ‘a detailed treatment of continuous exposed-to-risk formulae’ has been very useful to us because it has forced us to abandon the traditional approach to the subject of exposed-to-risk by way of these formulae. The typical continuous exposed-to-risk formula is, after all, only a practical device that actuaries acquired in the embryonic stage of actuarial science. While in some circumstances it still plays a valuable part in practical work there is nothing fundamental about it, and a great deal of mortality and other investigation work goes on today without the use of continuous formulae. Then again, the traditional attitude to the census method is to treat it as something quite distinct from other methods. Our approach is to start from the simplest possible examples and to build up the subject from first principles by systematic stages embracing continuous and census formulae in the general development. For simplicity we have left the treatment of new entrants and withdrawals until the end, regarding these complications as little more than practical nuisances for which simple practical adjustments have to be made. The chapter on sickness and other rates follows the same general line except that for certain ‘other rates’, e.g. marriage and fertility rates, the reader is referred to P. R. Cox’s *Demography* after a short general discussion

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of some of the special difficulties and statistical dangers in this field.

The first chapter contains a general discussion of the features of actuarial statistics. Some readers may find it preferable to leave this chapter until the end! Little need be said about the concluding chapters, two of which deal with simple graphical and finite-difference processes of graduation and construction of life tables. The last chapter describes the processes used in the construction of the more recent English Life Tables.

H. W. H.
W. P.

July 1955