

REVIEWS

Pension and Widows' and Orphans' Funds. By R. J. W. CRABBE, F.I.A. and C. A. POYSER, M.A., F.I.A.

[Pp. viii+240. Cambridge. Published for the Institute of Actuaries and the Faculty of Actuaries at the University Press, 1953. 20s.]

THE publication of this volume marks yet another stage in the completion of the series of text-books published jointly by the Institute and Faculty of Actuaries for the use of students reading for the examinations. In the case of the Institute examinations the study of the simpler formulae for the valuation of contributions and benefits in Pension and Widows' and Orphans' Schemes is included in Part IIIA, and the reading for this is provided by *Life and Other Contingencies*, Vol. II, by P. F. Hooker and L. H. Longley-Cook. In the later stage of the examinations at Part IVB, the student embarks upon the study of Pension and Widows' and Orphans' Funds proper, and it is for this part that the new text-book provides the main reading. It is also included in the course of reading for those students who elect to study the subject at the advanced level in Part IVC(2).

In the case of the Faculty of Actuaries the whole of the study of Pension Funds is included in Part IVB, and the new text-book, together with the appropriate chapters of Hooker and Longley-Cook, will presumably form the greater part of the reading for this examination in the future.

The subject of Pension and Widows' and Orphans' Funds has in the past been usually looked upon as difficult for the average student. The reason for this is that the majority of students study this subject having had virtually no practical experience of it, and it follows that they have not only to learn the theory but also to become acquainted with the general background. The well-worn dictum that the best piece of advice for the student anxious to make progress in this subject is to 'find an actuary engaged in pension fund work and help him' is probably as true to-day as it has always been, and it is equally as difficult to follow this advice in practice to-day as it has always been. The need, therefore, for a comprehensive book on the whole subject is probably far greater in the case of Pension and Widows' and Orphans' Funds than in that of many of the other subjects which the actuarial student has to study. There is no doubt that the volume will be of the greatest value in meeting this particular need, and it may well be that future generations of students will study this subject with much more facility than those of the past, particularly those who read for this examination prior to the issue of Porteous's book in 1936.

One of the first decisions to be made in writing a text-book on this subject is whether or not to divide the volume into two distinct parts, one of which deals with Pension Funds and the other with Widows' and Orphans' Funds. In the earlier volume by Porteous the book was so divided, but in this book the authors have made no such watertight division, and have merged the two subjects together throughout. Although this point must be to some extent one of personal preference, the lay-out adopted by the authors appears likely to add to the difficulties of the student in trying to follow the logical development of the subject, and it is thought that the book would have gained in clarity had it been divided into two parts on the lines indicated.

The first few chapters of the book, in the words of the Foreword, are confined 'to matters which should provide a general background and the "feel" of the subject'. Accordingly, Chapters 1-5 are most valuable and indicate the various types of benefit which can be provided by both Pension Funds and Widows' and Orphans' Funds; they also give a summary of the several ways in which such Schemes may be financed. The book then passes in Chapters 6, 7 and 8 to a consideration of the actuarial bases to be used either in calculating contribution rates or in making a valuation of a Fund. These chapters examine in detail the elements of the service table and pensioners' mortality, although it is unfortunate, especially from the point of view of practice, that the effect of the recent war on each element is not discussed. The rate of interest is referred to summarily at this stage, the full discussion being postponed to Chapter 17, while the question of salary scales is only partly dealt with, the remainder of the discussion being deferred to Chapter 13. The rate of interest and the salary scale are usually in practice the most important factors in the valuation basis, and are also the most difficult to determine. Students are often inclined to ignore them in discussing the basis, and their divorce in the book from the main chapters concerned with bases may tend to perpetuate this outlook. Moreover, the fact that the basis should be considered as a coherent whole rather than a number of separate elements cannot be stressed too early nor too often.

In Chapter 9 the preliminaries to the making of an actuarial valuation and the preparation of the data are discussed, and chapters 10 and 12 set out the fundamental Pension Fund formulae. There is, of course, no standard notation for formulae in Pension Fund work, but the system of notation as set out in §10·9 is notable in that it marks an effort to define the principles and develop the notation on logical lines. It is, however, unfortunate that the authors did not carry this a stage further and adopt, as has been done previously, a simple notation for the scheduled valuation data which are to be multiplied by the various valuation factors. For example, the valuation data to be multiplied by the valuation factor developed in §10·12 are denoted by ΣS_x , but the same data when multiplied by the factor developed in §10·17 are there denoted by S_x . At this and other places in the book formulae are sometimes developed with reference to an individual member aged x and sometimes, though less frequently, with reference to the group of members aged x . The reviewer's preference is for the development of formulae with reference to the group of members aged x to which in practice they are applied, but in any case the need for a simple consistent notation and method cannot be over-emphasized.

The development of the formulae also does not appear to follow a uniform system, and it is of the greatest importance that students should, at an early stage, adopt a method of defining symbols and developing formulae and use the same throughout. The method adopted by King in his paper, *J.I.A.* xxxix, 129, leaves nothing to be desired; first he set out the factor in terms of the fundamentals Σ , v , r , a , etc., and successively defined and substituted the commutation symbols line by line until the final factor was obtained. This treatment of valuation data and formulae is perhaps the point of criticism of the book on which the reviewer feels most strongly, since the masses of formulae with which the student is confronted in Pension Fund work should be developed by a uniform simple method using a consistent and clearly defined notation. It would also have been an advantage if a key to the notation on the lines of that given in King's paper had been included as an Appendix to the book.

In Chapter 11 the important question of checks on the valuation is discussed,

and there is a most welcome summary of the headings which may form the basis of the Actuary's Report. Although in practice the client usually sees nothing more than the report, and the actuary's ability is often therefore judged by its clarity, this appears to be the first time that it has been referred to in actuarial literature in this country.

In Chapters 14, 15 and 16 the collective and reversionary methods of valuing Widows' and Orphans' Funds are described, and these chapters give a detailed description of the basic formulae and the relative merits of each method are argued. The basic formulae by each method are illustrated with reference to four examples of typical schemes and the treatment in each case is clear and concise.

In Chapter 17 the consideration of the rate of interest is continued together with the income-tax position and investment policy, while the book closes with chapters on the Inauguration of a Fund, Analysis of Surplus, Emerging Costs and Local Government Schemes. There is little comment to be made on these chapters except to say that the chapter on Superannuation of Local Government employees sets out the position briefly and clearly, and will undoubtedly be a great help to students unfamiliar with this type of Fund. There are three appendices, the first containing various relative provisions of the Income Tax and Finance Acts, although the Finance Act of 1947 which might have been included for completeness is omitted. The second appendix contains a specimen clause limiting the duration of the Trust, and the third appendix gives a comparative table of references between earlier legislation and the consolidating Income Tax Act, 1952.

A number of misprints have been noted in the book, mainly in the formulae developed in chapters 10 and 12, while line 16 on p. 172 is also printed as line 11 on p. 176. It would, therefore, appear that the proof checking has been somewhat lax.

Summing up, we have undoubtedly in this volume an up-to-date and exhaustive text-book on this particular subject from which there is virtually nothing omitted in either the practical or the theoretical aspects. The book will certainly be a great help to students in the future, and also to actuaries who, having studied the subject some time ago, may require a book of reference. On the other hand, in points of detail, the book is capable of improvement and no doubt will reach a higher standard when the second edition is published. G. H.

Report of the Ministry of Health covering the Period from 1 April 1950 to 31 December 1951. Part III. On the State of the Public Health.

[Cmd. 8787, H.M. Stationery Office. 6s. 6d. net.]

THIS annual report of the Chief Medical Officer of the Ministry of Health for the year 1951, besides being of widespread general interest, is, for an official publication, exceptionally easy to read. The descriptions of how the sources of certain outbreaks were detected are, indeed, quite gripping.

Certain sections, in particular those dealing with the experience of specific diseases, will be of special interest to the profession, whether or not the view is taken that investigation of causes of death is a useful aid to the study of mortality rates.

The publication can be criticized for its frequent, though not invariable, reliance upon numbers of deaths or crude death rates rather than rates of

mortality according to age. This is usually an inevitable feature of publications based on national statistics, since the exposed to risk can only be estimated. It is, however, disappointing that this failing has not been overcome when reporting on a year in respect of which close estimates should have been available from the census data. In many instances no reference is made to age-groups, and even when such reference is made the complete picture is somewhat masked by the use of too wide groupings. Nevertheless, provided too much is not expected from the statistics actually quoted in the publication, there is much to be gained from the general information given and from the further ideas which a document written in this easy style may stimulate.

The report opens with an introduction which is a *précis* of sufficient of the conclusions which are to follow to make the reader wish to continue; it is written in a style which at the same time captures one's interest and gives the feeling of personal acquaintance with the numerous doctors named as having been responsible for the various sections. As with many detective stories, the opening chapter describing the setting for the subsequent action is perhaps the best in the book.

While the chapter on epidemiology is important and interesting—it is to be hoped that the passages concerning food hygiene will be given wide publicity—the chapters which are of greatest importance to the actuarial profession are perhaps those on tuberculosis and cancer, in view of the relatively high incidence of these diseases in late middle age, and those on morbidity statistics.

The positive advantages shown to have resulted from mass radiography are an important feature of the chapter on tuberculosis. The decline in the incidence of death from respiratory tuberculosis has continued, but it is a pity that more detailed statistics of mortality from this cause are not quoted as evidence that the age-incidence of these deaths still follows markedly different curves for the two sexes. This question of age-incidence is one which is completely masked by the use of crude death rates or Comparative Mortality Indices.

The criticisms just made apply equally to the chapter on cancer and to the special report on cancer of the lung. For example, the latter report might add to the various facts, views and conclusions summarized the fact that the peak of the male mortality curve from this cause is, over the course of years, becoming progressively later in age. This is not commented on in the brief reference to Table 2, which is not surprising as the table obscures the peak of the curve by grouping the ages decennially; yet this table has been given p. 184 to itself, although it occupies only one-third of it. How much more useful and informative it would have been, without requiring any additional space, if the age groupings could have been quinquennial and the statistics represented graphically!

This special section wisely avoids committing itself as to the cause of the increase in lung-cancer deaths, none of the theories having yet been conclusively proved. It gives a brief summary of the investigations into the various possible causes, and gives a welcome prominence to the distribution of these deaths between urban and rural districts. It also recalls a paper by the late Professor A. F. B. Shaw published in 1924, and frequently ignored by those taking part in this interesting controversy, which drew attention to the possibility of correlation between lung cancer and past visitations of influenza and speculated whether the then recently high incidence of influenza might cause an increase in the other disease in the future. To those interested in the subject this reference might be linked with the remark on p. 168, concerning the increased severity (compared with previous years) of the respiratory infections caused by the

influenza epidemic early in 1951, although the fact that the late Professor Shaw's suggestion has not been proved should preclude pessimistic speculation on the effect which that epidemic might have on future incidence of lung cancer.

This has brought us back to the chapter on morbidity statistics, which considers the incidence of sickness, according to calendar half-year, sex and age, occupation, and nature of illness, in turn, amongst samples of the population. It is, perhaps, unfortunate that the term 'sickness rate' is employed to denote the proportion sick, but it is open to question whether this is not a better meaning of the term than that usually ascribed to it by actuaries. In any case, the desirability of standardization of such expressions is obvious, but it may be stated that the report takes the laudable precaution of giving a clear definition of the four types of rate quoted in this section, i.e. sickness rate, prevalence rate, incapacity rate and medical consultation rate.

It is hoped that the minor criticisms made in this review will not discourage actuaries from reading this most interesting and instructive document.

H. A. R. B.