

index, and the difficulties of computation of τ as compared with ρ seem to be more apparent than real, being based mainly on unfamiliarity with the methods required.

Coming to the detailed contents of the book, the most noticeable feature is the separation of practical application and mathematical theory into different chapters. The author points out that this was necessary because he desired to satisfy both practical users of rank correlation methods and persons whose main interest is in the theory. It appears that the practical users are assumed to possess little or no knowledge of general statistical theory. This leads to certain extra explanations which could well be omitted if a slight acquaintance with elementary statistical theory could be assumed. In the reviewer's opinion such a general knowledge of statistical theory should be obtained before reading any book on special statistical subjects, and not picked up in the course of reading such a specialist book.

A second valuable feature of the book is the set of tables provided. The tables on the distributions of rank correlation criteria appear for the first time in consolidated and handy form.

There is no point in cataloguing in detail the matters dealt with in the book. For those especially interested in rank correlation theory, everything of importance is there; others are not likely to read the book, but will rely on more general and condensed information available in *The Advanced Theory of Statistics* or elsewhere.

N. L. J.

Statistical Report on the Health of the Army, 1943-1945.

[Pp. x + 294. H.M. Stationery Office, 1948. £1.]

THIS Report will be found of value primarily to those concerned with army medical administration and to students of medical statistics, whether from the civilian or military standpoint. Certain features, however, are of interest to actuaries, and it has been thought appropriate to restrict this review to a consideration of such features.

The Report has had to be restricted to the triennium 1943-45, as it was found impossible to produce comprehensive medical statistics during the earlier years of the war, when statistical activities in the Army had to be limited to immediate necessities. The analyses and comments furnished cover a wide field, dealing with various aspects of morbidity, hospitalization, discharge and mortality, and providing a fairly detailed subdivision according to the various disabilities responsible for the Army medical wastage. An interesting and concise glossary defines the various statistical terms used in the interpretation of the data. Among the special subjects dealt with are the morbidity and health of troops in overseas areas, medical recategorization and physique (including height and weight sample analyses according to ages at recruitment), medical manpower and accommodation in medical units, and surgical casualties. A separate section is devoted to statistics of psychiatric treatment, indicating the importance of this science in the sphere of modern Army medicine. For those who prefer to absorb their statistics in coloured pictorial form, the Report concludes with some 46 charts illustrating the main features analysed.

In his introduction Prof. Hogben outlines the history of the contribution made by the Royal Army Medical Corps to the development of medical and mortality

statistics. As far back as 1835, two years prior to the creation of the General Register Office, an officer was appointed by the War Office to investigate and report to Parliament on the rates of sickness, mortality and invalidity experienced by the Army. Some of his results were presented in a paper to the (Royal) Statistical Society in 1838, these Army records ranking amongst the earliest British vital statistics. Again, in 1872 Dr Farr in the *35th Annual Report of the Registrar-General* was led to remark that 'the thing to aim at ultimately is a return of the cases of sickness as complete as is now procured from the Army in England'.

In the succeeding period this relatively high statistical standard does not appear to have been maintained, but during the later stages of the recent war the Directorate of Medical (Statistical) Research was set up, and has subsequently been established as a permanent branch of the Directorate of Hygiene. The issue of the present detailed study should go far to regain for the Army its former high reputation amongst those who appreciate the value of medical statistics.

Service in the Forces naturally tends to provide more precise, detailed and comprehensive records, whether of morbidity, hospitalization, wastage, or mortality, than are usually obtainable for civilian occupations, and unique opportunities are thus offered for studying medical problems by statistical methods. For example, the value of civilian hospital statistics is greatly impaired by the absence of the appropriate exposed to risk, a difficulty which should arise far less frequently in data derived from the experience of the Services, though even in this report there seems to be an undue tendency to omit absolute rates and calculate the less informative relative rates. In studying this volume it is, moreover, well to keep in mind the usual difficulties inherent in the appraisal of any occupational morbidity or mortality, e.g. the variations in physical standards required for entry into or retention in any particular occupation, and the occurrence of deaths attributable to that occupation after persons have been either transferred to a lighter occupation or invalided from work.

In particular, sickness, wastage, or mortality rates derived from military statistics are apt to be vitally affected by any changes or variations in the medical standards adopted for the purpose of hospitalization or discharge—a feature which leads one to doubt the validity or usefulness of many of the comparisons made in this Report between rates for the two sexes.

The actuary will be naturally inclined to turn first to the section in which the aspect of mortality is dealt with. In a rather brief treatment of this subject a comparison is attempted between the army mortality from disease in 1943 and 1944 and the corresponding mortality among the civilian population. A comparison is made between the central death-rates (from disease only) of civilian males in 1939 and 1940, these being the latest years for which the detailed mortality data of the Registrar-General were at that time available. After making due allowance for the adverse effect in 1940 of the recruitment of the healthier lives to the Forces, the 1940 rates are shown to represent an increase of roughly 15% over the 1939 level, such increase being attributed by the author to the stresses of war on the health of the civilian population. On this premise a civilian base line of the 1939 male disease mortality rates with a uniform loading of 15% was adopted for comparison with the corresponding army rates in the war years 1943–44; in the case of women the 1940 civilian rates unadjusted were considered a suitable basis.

It is now fairly widely acknowledged that, contrary to general expectation, the strain of war had no immediate adverse effect on the mortality of the civilian

population. This may be broadly demonstrated by calculating from the Registrar-General's returns the crude mortality rates for the total population (including non-civilians), eliminating all deaths due to violence (including those due to operations of war and road accidents). The following table shows the percentage ratios of crude mortality rates of this type to those for 1939, taken as 100:

Year	Males	Females
1939	100	100
1940	111	109
1941-42	98	95
1943-44	97	95
1945	96	94
1946	97	95

If due account were taken of the increase during the period in the proportion of the population at the older ages, a somewhat greater fall from the pre-war 1939 level than is shown by the above percentages would probably be revealed.

In view of the very severe influenza epidemic which occurred in 1940, the civilian deaths from influenza, bronchitis, and pneumonia being about 40% greater for men and 35% greater for women than in 1939, it is unfortunate that the 1940 level of mortality should have been assumed to be broadly the same as that in 1943-44. If the substantially lower 1943-44 level (based on the above ratios) were substituted for the level used by the author as a base line for comparison with the Army 1943-44 rates, the following percentage ratios of Other ranks/Civilians disease mortality would be obtained:

Age group	Males	Females
Under 22	68	29
22-25	96	17
25-28	101	20
28-31	97	42
31-34	84	44
34-37	68	33
37-40	57	65
40-43	57	55
43-46	59	41

The marked variations in these ratios may to some extent be a reflexion of differences in the medical standards required both at recruitment and discharge, not only as between males and females but also as between the younger and older age groups. In the case of women the degree of medical selection appears to have been far greater than for men; at ages over 37 the numbers of female deaths were probably too small for much reliance to be placed on the mortality rates recorded. Further evidence of this relatively higher standard of medical selection in the case of the A.T.S. is afforded by the following comparison of the average number of days spent each year in hospital or convalescent depot in this country as a result of disease or accidental injury:

	Disease	Accidental Injury	Total
Men	8½	2¼	10¾
Women	5	½	5½

If the time spent in reception stations is also included, the difference between the sexes is decreased, but still remains substantial, the above totals being increased to about 12 days for men and 8 days for women.

In the case of men the tendency for the above percentage ratios to fall with increasing age leads one to infer that medical boards may have been less inclined to take recruits at the older ages, particularly where useful and responsible civilian work was already being performed. A further possible factor influencing this fall in the percentages might be a greater willingness to grant discharges to partially impaired lives at the older ages. At the younger ages the proportion accepted for service was probably substantially higher, and the probability of foreign service greater, so that the effect of the medical selection at these ages appears to have been largely offset by an increased risk of mortality through disease.

S. P. B.

The Elements of Actuarial Science. By R. E. UNDERWOOD, M.B.E., F.I.A.

[4th edition, pp. 166 + viii. London: Sir Isaac Pitman and Sons, Ltd., 1948. 10s.]

As the author points out in his preface, this edition is little more than a reprint of the previous one. No doubt that is why he has not accepted the advice of the reviewer of the third edition (*J.I.A.* Vol. LXVII, p. 302) that the modern symbol '!' should be used to denote the factorials.

The book was originally intended as a text-book for the subject of Actuarial Science in the syllabus of the examinations of the Institute of Chartered Accountants. Although the subject was removed from the syllabus some years ago the demand for the book continues to such an extent that a fourth edition has been found necessary. It is evident that students for the examinations of other bodies which include elementary compound interest and elementary life contingencies in their syllabi find the book helpful.

P. F. H.

Superannuation Schemes. By GORDON R. HOSKING, F.I.A., Member of the Institute of Taxation, and R. C. B. LANE, M.A., B.Sc., F.I.A., F.S.S.

[Pp. viii + 323. Sweet and Maxwell, Ltd., 1948. £1. 15s. od.]

MANY years have passed since a book on pension funds, designed for the non-actuarial reader, has been published in this country. In view of the wide general interest now being taken in the subject, the timely appearance of this book will be welcome.

In the introductory chapter the authors point out that pension schemes may differ widely among themselves, and that there is a wide range of features to be examined when considering the suitability of a particular scheme in relation to any special conditions affecting the staff to which it is to be applied. One overriding consideration is stressed, viz., that the contributions must be adequate in relation to the benefits provided—a salutary reminder to any who may fail to appreciate how pension charges may grow over a long period.

The thirty-eight chapters of the book deal with schemes, whether privately administered or arranged by means of contracts effected with life assurance companies, the effect of taxation, investment, actuarial aspects, National