

The results of the analysis showed that a significant excess of tumours developed within the alimentary tract and that the excess was confined to the small intestine and pancreas (including ampulla of Vater). At each of these sites the observed number of tumours was very significantly in excess of expectation and, also, they developed at a relatively early age compared with other sites within the digestive system. In contrast, the number of large bowel tumours was close to expectation.

Mortality in Rheumatoid Arthritis. R. T. BENN and P. H. N. WOOD (*Arthritis and Rheumatism Council Field Unit, Manchester*).

One-hundred and eighty-nine patients were admitted consecutively to the Royal Bath Hospital, Harrogate, seen by the same clinician, diagnosed as having rheumatoid arthritis (RA) according to standard criteria, and followed for about 20 years. All of the males and 91% of the females have been successfully traced. It was found that in both sexes and at all ages these patients show a higher mortality than the general population of England and Wales. Moreover, the mortality was correlated with the initial grade of functional impairment.

Death certificates have been obtained for the 116 patients who have so far died. Of these 12% give RA as the underlying cause and a further 38% mention it as a contributory cause, leaving 50% of the certificates with no mention of RA. These proportions were practically the same in both sexes. The ratio of about 1 to 3 of 'underlying' to 'contributory' mentions was also found in multiple cause tabulations supplied by the Registrar General. These figures give some indication of the extent to which mortality figures underrepresent the prevalence of the disease.

A number of investigators have suggested possible associations of other diseases with RA, and striking confirmation has been found for the suggested association with pulmonary tuberculosis, since no less than 6 of the 36 male deaths were attributed to this cause. This excess can only partly be explained by some of the men having increased occupational risk as coal miners. On the other hand, there were no marked deficits in cancer or stroke, both of which have been suggested to have negative associations with RA.

A Cardiovascular Survey in Six Hard and Six Soft Water Towns. F. STITT (*London School of Hygiene and Tropical Medicine*).

SEVENTH SESSION (*Chairman*; G. KNOX)

A Method for the Assessment of Hearing Impairment. J. PEARSON (*Dept. of Social and Occupational Medicine, University of Dundee*).

The most convenient test of hearing is the pure-tone audiogram, giving the threshold of hearing at 6 or 8 frequencies for each ear. This paper describes an attempt to derive a function, consisting of linear combination of these thresholds, which measures the degree of impairment of the hearing loss.

The data used consisted of (a) pure-tone audiogram, (b) questionnaires relating to difficulties with hearing, and

(c) speech audiograms, an objective measure of the ability to understand speech. This information was available for 96 long-service weavers, 96 controls, and 108 other subjects, who included many with otological abnormalities.

The main technique used in deriving the function was discriminant analysis. Some problems were encountered in defining the basic groups of 'deaf' and 'not deaf' persons on which the discriminant analysis was carried out, since absolute measures of deafness were not available. Two different definitions, one based on the questionnaire and a second based on the speech audiogram, were used.

In the two discriminant functions, the major contribution came from the same frequencies, and they had similar coefficients. The coefficients were averaged to give the final function which involved only three frequencies and had simple coefficients. This procedure improved the overall discrimination. The function consisted of: (threshold at 2kHz) - $\frac{1}{2}$ (threshold at 4kHz) + $\frac{1}{2}$ (threshold at 6kHz).

The derivation of the function was confined to the population of weavers, an occupational group exhibiting noise-induced hearing loss. The wider application of the function was shown by the satisfactory discrimination achieved in the other two groups of the study.

Grades of impairment were suggested in terms of the value of the discriminating function. The difficulties experienced by the subjects, and the proportion of the population affected at the various levels of the function, were used as the basis of this grading. Impairment was considered to start when the value of the function exceeded 35dB.

Alternative Methods for the Analysis of Complex Epidemiological Data. G. J. DRAPER (*Department of Social Medicine, Oxford University*).

Many epidemiological studies are analysed using methods of standardization or the concept of relative risk. These techniques are related to each other and to methods recently developed for the analysis of contingency tables. The latter can be readily applied to many types of epidemiological data and, by devising suitable computational methods (which are not unduly complicated), the usual types of analysis may be greatly extended.

Thus, in examining the effects of possible aetiological factors on mortality or the development of disease, it is possible not only to investigate associations between the factors and the disease but also to measure the magnitude of the effects of the factors and the way in which they interact with each other or are inter-related. The existence, within the population studied, of groups with unexpectedly high or low risks may also be investigated. (The methods considered are based on the log-linear model and measures of association in contingency tables rather than on multiple regression analysis.)

The use of relative risks and also, to some extent, the method of indirect standardization, implies that the factor or factors under consideration influence the risk of disease in an approximately multiplicative way. However, in certain cases it is more reasonable to suppose that risks