STUDIES OF COMPARATIVE PREVALENCE OF CARDIO-RESPIRATORY DISEASE IN ENGLAND AND THE UNITED STATES

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I would like to begin by saying that this work has been largely stimulated by Professor D. D. Reid and has been done in conjunction with Dr. G. A. Rose of the London School of Hygiene; Dr. T. Mork and Dr. S. Humerfelt of the University of Bergen, Norway; Dr. E. B. Raftery, Dr. R. Seltzer and Mrs. P. McPherson of the Johns Hopkins University, School of Hygiene; Dr. R. Markush of the National Heart Institute and Dr. R. W. Stone of the New York Telephone Company.

Dorn has shown a wide disparity between the United States and Great Britain in mortality from coronary heart and chronic respiratory disease. In view of the many factors which can affect the recording of mortality from particular diseases in different countries it seemed worthwhile to investigate whether these differences reflect a real difference in the prevalence of these diseases in Great Britain and the United States.

At first glance it would appear that one should examine a random sample of the total population of each country to achieve this goal. This is obviously beyond our resources. Surveying the population of one or more areas in the two countries would also not serve our purpose as no one area is representative of the country as a whole. Comparison of hospital admissions or discharges in the two countries suffers from the drawback that criteria of admittance to hospitals differ greatly because of different medical care arrangements.

The intention in our studies has been to select one factor at a time in order to test hypotheses erected on the basis of these mortality studies. In order to compare disease prevalence in different geographic areas we have used occupational groups. We have thus obtained populations which are reasonably uniform as to job, age, social class and sex. The aim of our studies has been to examine all men in a particular area aged 40 years or more, who are doing a certain job, i.e. we have used small "chunk" samples. We have tried to select groups doing similar work in each area. Medical criteria for employment, discharge and disability are also similar. It has been possible to obtain ancillary information such as deaths, retirements and sickness absence in the last three years in the groups surveyed so that some of our comparisons can also be retrospective.

In London we examined Central Post Office van drivers. To compare with these we used Post Office van drivers and men classified as van drivers by the Telephone Company in three English country towns (Peterborough, Norwich and Gloucester). In England the postal and telephone services are both under the same management. In the United States we examined outside telephone workers in three areas -- Washington, Baltimore and Westchester (N.Y.). These are men employed by the Plant Department of the Telephone Company, all of whom are classified as drivers, who do such jobs as construction, installing and repair work. These are all men who mainly work outdoors. The results from the postal and telephone employees, in England, did not differ, and so have been combined. The examinations have all been performed during May and June of 1960, 1961 and 1962. Excellent co-operation was secured from both Management and Union in all areas. Scheduling of the men for examination was the responsibility of Management, while persuasion to attend was the task of the Union.

Each examination lasted about thirty minutes. We used the British Medical Research Council Questionnaire for respiratory disease symptoms. For cardio-vascular disease we used a questionnaire developed by Dr. G. A. Rose, and approved by W.H.O., to elicit symptoms of angina pectoris, possible myocardial infarction and intermittent claudication. Questions on residence and smoking habits were also asked. A 13-lead electrocardiogram was obtained on each individual. Blood pressure was measured in random order both by the standard method and one designed to reduce observer variation. Lung function was determined by use of a simple machine (McKesson Vitalor) which measures the one-second Forced Expiratory Volume. Weight, standing and sitting height, and skinfold thickness (triceps and subscapular sites) were measured, and all these examinations were always performed in same order. Each man on leaving the survey team was given a small container in which he was asked to collect all sputum brought up from his chest in the first hour after arising the next day.

Great care was taken to reduce observer variation. I participated in all three surveys. Various methods were utilized to ensure standardized use of the questionnaires. These included listening to special records of real and simulated interviews designed to illustrate some of the problems. Prospective observers also performed test interviews with trained observers present. All interviews, in any case, were recorded and checks on the observers were made both during and after each survey. A special caliper (developed by Dr. G. A. Rose) was used for placing the chest electrode uniformly in taking the electrocardiogram. Uniform instructions were given in the performance of the lung function test.

Before discussing the results I would like to emphasize that though I may appear to be generalizing to the population as a whole, I am well

aware that this is quite unjustifiable at this stage. I would certainly welcome any comments that you may have on the use of such small "chunk" samples in such studies. I hope I will be forgiven for using such euphemisms as London, Country Towns and the United States. I must also point out that though tests on uniformity have been performed on data from the Country Towns, no such procedures have yet been carried out on the American data, and pooling may not be justifiable. I should also like to say that the results presented are based on preliminary hand tallies and are subject to alteration.

RESULTS:

(1) Respiratory Symptoms

There is very little difference in the frequency of single symptoms such as cough or phlegm between the three areas. Londoners have, however, more shortness of breath than the others.

When, however, symptoms recorded for an individual are combined, differences between the three areas appear. Thus, persistent cough and phlegm with one or more episodes of increased cough and phlegm are almost twice as common in each age group in Londoners as in country dwellers and Americans. An even greater difference is seen in the frequency of individuals who have persistent cough and phlegm as well as dyspnoea grade III or more (this is one of the proposed definitions of chronic bronchitis).

It would thus appear that while the prevalence of the single symptoms of respiratory disease is the same, there is a difference in severity.

(2) Sputum

This difference is also reflected by the sputum returned. There are many more specimens of muco-purulent sputum in the English groups than in the American, and furthermore the distribution of the volume of the samples returned shows a gradient London - Country Towns - United States.

(3) Smoking Habits

Before considering disease manifestations in different geographic areas any further, it is important to look at the smoking habits of these groups. It is seen that the English groups resemble each other closely. There are, however, a greater percentage of non-smokers in the American groups than in the English, but those who do smoke in America, smoke more heavily.

(4) Smoking and Respiratory Symptoms

There is a great difference between smokers and non-smokers in each area in the prevalence of respiratory symptoms. Smokers have more symptoms than non-smokers in each area.

(5) Lung Function

As a measure of lung function we have used the one-second Forced Expiratory Volume, which is one of the simplest and best single measures of bronchial obstruction. This measure of lung function decreases with age in each area; it is lowest in Londoners and highest in the United States group.

As smoking habits differ within each age group we have calculated the regression coefficient of forced expiratory volume on age and have used this to standardize the $F.E.V._{1.0}$ of each individual to age 40. By this means the effect of smoking on the $F.E.V._{1.0}$ is also evident in each area and the differences between areas remain.

(6) Sputum Production and Smoking

The effect of smoking on sputum production is shown in the distribution of volume of sputum. In each area smokers bring up more sputum than non-smokers, but the differences between areas persist after allowance for smoking. Smoking habits appear to have little effect on the type of sputum returned.

(7) Prevalence of Cardiovascular Symptoms

It may be seen that while there is little difference between London and the United States in the prevalence of angina, there is a marked difference in the prevalence of a possible past history of myocardial infarction. The latter is more common in the United States.

(8) Blood Pressure

Mean systolic and diastolic blood pressure is lowest in each age-group in London. This difference between town and country dwellers has also been demonstrated by others. In the 50-59 year age-group, mean blood pressure is higher in the United States group than in country towns. This difference in means is not a result of a few extreme values in one series.

(9) Electrocardiographic Abnormalities

The electrocardiograms which were obtained in the surveys were classified by actual changes rather than by diagnostic categories. The method of classification was devised by Blackburn of Minneapolis and is designed to reduce inter- and intra-observer variation. All English tracings were read by one observer, while all American tracings were read by another. No comparison between these two observers has yet been made. No consistent difference in frequency of abnormalities between the three areas are seen, except that shown by Q and QS changes and T-wave changes both of which are indicative of a major Ischaemic event, such as an infarction. These changes are commoner in the United States group than the English, but until comparisons between the observers have been made no firm conclusions can be drawn.

(10) Anthropometric Measurements

It may be seen that the English are not only shorter and lighter, but also less fat than those surveyed in the United States.

In conclusion, I believe that the methods described are useful in measuring the prevalence of disease in different geographic areas. The differences in mortality from respiratory disease in England between town and country, and between Great Britain and the United States are reflected by these studies when comparisons are based on combinations of marked symptoms. The difference in severity of disease in these areas is also shown by differences in sputum production and lung function. Differences in cardiovascular disease are less clear-cut. While there is a difference in the prevalence of possible past myocardial infarction, no such difference is evident for angina.