A NOTE ON THE ASSOCIATION BETWEEN SMOKING AND DISEASE IN MEN IN THE SEVENTH DECADE

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The effect of smoking on disease has usually been assessed by comparing the smoking habits of persons with a specific disease with those of individuals believed to be representative of the general population of the same age and sex. This method has been criticized on various grounds, some of which are not very serious. Nevertheless it is admittedly difficult to assemble a control group which can be said with confidence to be wholly representative of the related population. The problem arises because there is no means of identifying the segment of the general population from which the affected individuals are drawn.

An alternative procedure which overcomes this and some other difficulties is an examination of smoking habits and disease incidence in a representative sample of the general population. This method has the merit that, if smoking is found to be associated with some diseases but not with others in the same population, one can have considerable confidence in the result. It has the disadvantage that a large sample is needed to give reasonable numbers of persons with any single disease. Investigations on these lines are those by Doll and Hill (1956) on approximately 40,000 registered medical practitioners in the United Kingdom, and by the Statistical Research Branch of the American Cancer Society on 188,000 men between the ages of 50 and 70. In both of these inquiries a history of smoking has been recorded, and is being related to subsequent mortality. So far as we are aware there are no data which relate the morbidity experience of a random sample of the general population to their smoking habits.

During 1956 the medical condition of a group of representative men in the seventh decade was assessed for the purposes of another inquiry, and the opportunity was taken to record their smoking habits. Eleven Birmingham general practitioners

attempted to interview and examine all men on their lists aged 60-69. There were 1,243 men, of whom 1,062 (85.4 per cent.) were examined, the remainder being either untraced (58), dead (21), or not examined for other reasons (102), usually because the individual was not at home at the time of the general practitioner's visits. Since doctors made a serious attempt to see all patients in their own homes or in their surgeries, we are satisfied that no significant bias has been introduced. It has been shown elsewhere (Brown, McKeown, and Whitfield, 1957a) that the age distribution of the men examined is approximately the same as that of the male population of Great Britain, as indicated by the one per cent. sample of the 1951 Census, and apart from a small deficiency in Class IV the distribution by social class is reasonably consistent with that of Birmingham men aged 15 and over. (The one per cent. sample unfortunately does not give the class distribution of Birmingham males aged 60-69.)

The method used in recording amounts smoked was that employed in other inquiries (Doll and Hill, 1950). A man was regarded as a smoker if at any time he had smoked one cigarette per day (or $\frac{1}{2}$ oz. tobacco per week) for a year. Smokers were asked at what age they started, how much they were smoking at the time of the inquiry, or, if they had given up smoking, the age at which they stopped and the amount smoked immediately before.

The medical data are derived from a full medical examination of "life insurance" type, performed by the general practitioners. In most cases it included a chest radiograph, and, whenever necessary, appropriate specialist investigation. In the case of coronary disease, which was the subject of a separate inquiry, all men with a suggestive history were referred to a hospital outpatient clinic for full investigation by one of us. (A.G.W.W.)

TABLE I
INCIDENCE OF DISEASE RELATED TO SMOKING HABITS

Disease	Per cent. of Men Affected among:							Number of Men Affected
	Non-smokers	Pipe Smokers	Pipe and Cigarette Smokers	Cigarette Smokers who have given up Smoking	Cigarette Smokers (number per day)			
					1-9	10-19	20 and over	
Bronchitis	16.5	14.6	13.6	21.6	27.1	30.6	34.1	253
Defective Hearing	17.6	18.0	16.0	25.9	22.6	23.2	22.5	227
Hypertension	23.1	15.7	28.4	17.3	14.3	14.0	12.3	175
Coronary A.D.	9.9	8.4	8.6	6.8	12.8	7.7	5.8	88
Peptic Ulcer	6.6	6.2	7.4	6.2	8.3	9.2	13.0	87
Defective Vision	9.9	10.1	7.4	6.8	9.0	7.7	5.8	85
Hernia	6.6	5.6	8.6	6.2	6.8	7.7	5.8	71
Arthritis	7.7	5.1	6.2	8.6	8.3	6.6	2.9	68
Number of Men at Risk	91	178	81	162	133	271	138	1,054

In examining the association between smoking habits and disease incidence, we are restricted to conditions which are both common and compatible with a reasonable period of survival. Unfortunately this excludes cancer of the lung and pulmonary tuberculosis, two of the diseases in which an association has been reported. Table I gives the incidence of the eight diseases most frequently encountered in the sample according to smoking habits. In three cases—bronchitis, defective hearing, and peptic ulcer—incidence is higher in smokers than in non-smokers. In one case—hypertension—incidence appears to be higher in non-smokers than in smokers. In the other four conditions—coronary disease, defective vision, hernia, and arthritis—there is no evidence of association between incidence and smoking habits. In view of the rather small numbers we shall examine the relationship more closely only in the three commonest conditions.

The most consistent results are those for chronic bronchitis, which also has the highest incidence. For pipe smokers and mixed smokers incidence is approximately the same as for non-smokers; for cigarette smokers it is considerably higher, and increases consistently with increasing amounts smoked. Since bronchitis is known to be relatively more common among individuals in unfavourable social and economic circumstances, it was thought of interest to attempt to assess the relative importance of smoking habits and social class, defined in the usual way according to occupation. Table II gives the incidence of chronic bronchitis in men who have never smoked cigarettes and in cigarette smokers in relation to social class (mixed smokers, and cigarette smokers who had given up smoking are excluded). Because of small numbers, Classes I and II are combined. Among men who have not smoked cigarettes, the incidence of bronchitis is apparently unrelated to social class, whereas among

smokers it increases sharply (from 20 per cent. in Classes I and II to 45.1 per cent. in Class V).

The last column of Table II gives an index of relative risk of the disease in smokers and non-smokers for each social class. It suggests that in Classes I and II an individual increases his risk of the disease very little by smoking, whereas in Class V the risk is trebled. It seemed possible that this result might be explained in part by variation in the number of cigarettes smoked by smokers (for example by an increase in amounts smoked from Classes I and II to Class V).

The fact that the mean number of cigarettes smoked daily is approximately the same for all classes (Table II) suggests that the different effect of tobacco in different social classes is probably attributable to variation in response rather than in the amounts of tobacco smoked. When it is remembered that some other infective diseases affecting the respiratory tract (for example pneumonia) are also more common in less favourable social circumstances, it is scarcely surprising that there should be variation in the response to tobacco in respect of a disease such as bronchitis.

TABLE II
INCIDENCE OF BRONCHITIS RELATED TO CIGARETTE SMOKING

Social Class	Men who have never smoked Cigarettes		Men Smoking Cigarettes			Relative Risk (b) (a)
	Number	Per cent. with Bronchitis (a)	Number	Mean Number of Cigarettes per Day	Per cent. with Bronchitis (b)	
I and II	56	16.1	70	14.5	20.0	1.24
III	141	15.6	333	13.1	28.2	1.81
IV	29	13.8	57	13.5	36.8	2.67
V	43	14.0	82	12.9	45.1	3.22
Total	269	15.2	542	13.3	30.6	2.01

In Table III the data related to defective hearing have been prepared in the same form as Table II. The influence of social class is less consistent than in the case of bronchitis. While the observations leave little doubt that the incidence of defective hearing is higher in smokers than in non-smokers, the relative risk does not appear to increase regularly as social circumstances deteriorate. Nevertheless it is considerably higher in Class V than in the other three groups. It should perhaps be added that hearing was assessed with the use of aids, if they were normally used, and it is possible that the class variation reflects the use and quality of aids as well as of ears. It is unlikely, however, to affect a comparison according to smoking habits within the same class.

TABLE III
INCIDENCE OF DEFECTIVE HEARING RELATED TO CIGARETTE SMOKING

Social Class	Men who have never smoked Cigarettes		Men Smoking Cigarettes		Relative Risk (b) (a)
	Number	Per cent. with Defective Hearing (a)	Number	Per cent. with Defective Hearing (b)	
I and II	56	8.9	70	10.0	1.12
III	141	20.6	333	23.1	1.12
IV	29	24.1	57	24.6	1.02
V	43	16.3	82	31.7	1.94
Total	269	17.8	542	22.9	1.29

Finally, Table IV gives the same data in respect of hypertension. For the purpose of this assessment a man was regarded as hypertensive if his diastolic or systolic pressure were above 100 or 200 mm. Hg respectively. Elsewhere (Brown, McKeown and Whitfield, 1957b) we have examined mean arterial pressures according to smoking habits, and the results were consistent with the conclusion referred to above: pressures were lower in smokers than in non-smokers. It was also noted that both systolic and diastolic pressures tend to rise as economic and social circumstances become progressively less favourable (*i.e.* from Class I to Class V). However, Table IV does not suggest that the association between hypertension and smoking is consistently related to social class.

TABLE IV
INCIDENCE OF HYPERTENSION RELATED TO CIGARETTE SMOKING

Social Class	Men who have never smoked Cigarettes		Men Smoking Cigarettes		Relative Risk (b) (a)
	Number	Per cent. with Hypertension (a)	Number	Per cent. with Hypertension (b)	
I and II	56	8.9	70	10.0	1.12
III	141	19.9	333	13.8	0.69
IV	29	24.1	57	8.8	0.37
V	43	20.9	82	20.7	0.99
Total	269	18.2	542	13.8	0.76

SUMMARY

Observations on a little over 1,000 representative men in the seventh decade have been used to examine the incidence of the eight most common diseases according to smoking habits. Chronic bronchitis, defective hearing, and peptic ulcer were more frequent in smokers than in non-smokers; hypertension was more frequent in non-smokers than in smokers; and the incidence of coronary disease, defective vision, hernia, and arthritis was not consistently related to smoking habits.

It is shown that the well-known association between the incidence of chronic bronchitis and social circumstances is manifested only among cigarette smokers, incidence in those not smoking cigarettes being approximately the same in all social classes.

We are very greatly indebted to Drs. F. G. Alexander, S. G. Burnie, D. L. Crombie, G. Forrest-Hay, M.B.E., W. B. Gough, R. N. E. Hinchley, J. E. Kerton, R. J. F. H. Pinsent, C. A. Readett, and J. A. J. Wiseman, who carried out the field work of this investigation, to Dr. H. M. Kent and Dr. A. B. D. Mackie, M.B.E., who also kindly participated, and to the Endowment Fund of the United Birmingham Hospitals for a grant to cover the expenses.

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