

antibody decline in this subject was similar to that of maternal antibody in infants. We have infiltrated monkey serum into the distal phalanx of the thumb of a person bitten by a monkey from a colony in which B virus was known to have been circulating. This was done under ring block local anaesthesia; the only reaction was severe pain during the night after the anaesthesia had worn off. Though this was not unexpected with such a sensitive area as the pulp of the thumb, it makes the procedure less than ideal for wounds in these areas unless the risk of infection is high—as it was on that occasion.

If immunoprophylaxis is to be used for monkey bites or similar trauma it is essential that antisera or immunoglobulin should be held in laboratories where monkeys are used. Stocks of monkey sera are held by us at Porton Down and at the National Institute for Biological Standards and Control, London. We hope that these stocks will be converted into immunoglobulin and made available as freeze-dried preparations.

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Requests for reprints should be sent to Dr B Thornton.

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Smoking and drinking by middle-aged British men: effects of social class and town of residence

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Abstract

In 7735 men aged 40-59, selected at random from general practices in 24 towns throughout Britain, pronounced differences were noted in the prevalences of smoking and drinking between the social classes. Social class differences also existed for frequency and quantity of drinking, type of beverage, and several aspects of smoking behaviour. Increasing amounts of smoking were associated with higher prevalences of moderate to heavy drinking, particularly in daily rather than weekend drinkers. Between drinking groups, however, the relation with smoking was more U-shaped, with light and heavy drinkers smoking more than moderate drinkers. The lowest rates of moderate to heavy smoking were observed in frequent light drinkers, particularly in the non-manual workers. The proportion of moderate to heavy drinkers was no higher among ex-cigarette smokers than among current smokers. When the data were examined

by town of residence social class differences persisted. Controlling for social class still showed pronounced differences between towns in both smoking and drinking behaviour.

These data confirm that town of residence and social class have independent effects on smoking and drinking. The established regional and social class differences in cardiovascular disease may be due in part to the independent influences of town and social class on smoking and drinking behaviour.

Introduction

The pronounced regional differences in mortality from cardiovascular disease in Britain have interested observers for decades and led to several studies.¹⁻² The British Regional Heart Study is a further effort to investigate the problem.³⁻⁴ Researchers have noted associations between cardiovascular diseases and cigarette smoking and, to a less extent, drinking alcohol.⁵⁻⁸ Cigarette smoking has been positively associated with the prevalence and incidence of ischaemic heart disease,⁷ light drinking has been associated with lower blood pressure⁸ and less cardiovascular disease,⁹⁻¹⁰ and heavy drinking has been associated with both higher blood pressure⁴⁻⁸⁻¹¹ and more ischaemic heart disease.¹²⁻¹³ Probably at least part of the well-known regional variation in mortality from cardiovascular disease may be explained by regional variations in these two risk factors of smoking and drinking.

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We describe the drinking and smoking behaviour of 7735 men aged 40-59 at the time of enrolment in the British Regional Heart Study and the demographic factors associated with this behaviour. In particular, we report the associations of smoking and drinking with each other, with social class, and with the towns where the men live.

Subjects and methods

The British Regional Heart Study is a major epidemiological project with three phases. Phase 1 attempts to explain variations in cardiovascular mortality throughout Britain by analysing geographic, climatic, water quality, and socioeconomic data from 253 towns.³ Phase 2, which includes the clinical survey of the 7735 men selected from 24 towns in Britain, explores variations in the prevalence of different cardiovascular risk factors on a town basis and examines the determinants of blood pressure.⁴ Phase 3 is a prospective study of cardiovascular morbidity and mortality in these 7735 men.

This paper reports results obtained during the clinical survey in phase 2. Men aged 40-59 were selected at random from one general practice in each of 24 towns (fig 1). The towns were primarily selected from those in Britain with populations of 50 000 to 100 000 (1971 Census), and were chosen to represent all standard regions and a full range of cardiovascular disease mortality. The general practice selected in each town was required to have a social class distribution

representative of the men of that town. The men were then chosen at random from an age and sex register in the chosen general practice. Full details of the criteria for selecting the towns, practices, and subjects and of the methods of data collection have been reported.⁴ Nurses administered to each man an extensive and standard questionnaire that included questions on occupation, smoking habits, and alcohol consumption.

Smoking—The men were classified by their smoking activity as never smoked, pipe or cigar smokers only; pipe or cigar smokers who were ex-cigarette smokers; ex-cigarette smokers; and light (1-19 cigarettes a day), moderate (20 cigarettes a day), and heavy (over 20 cigarettes a day) smokers.

Drinking—Information on both frequency and quantity of drinking was used to group the men into drinking categories by a method similar to that used in the General Household Survey.¹⁴ For frequency, the men were asked if they would describe their current alcohol intake as none, on special occasions only, once or twice a month, at weekends (Friday night to Sunday), or daily/most days. For quantity, the men were asked how much they normally took when they drank—namely, one or two drinks, three to six drinks, or more than six drinks. A drink was defined as half a pint (280 ml) of beer, one glass of wine or sherry, or one tot (gill) of spirits. No questions were asked about place of drinking or past alcohol consumption. There were 466 non-drinkers and six men whose drinking habits could not be classified. The remaining 7263 men were grouped into occasional, infrequent light, frequent light, moderate, or heavy drinkers. Occasional drinkers (1085) were those who drank on special occasions only, regardless of the amount consumed. A further 759 men drank once or twice a month, of whom 670 took no more than six drinks on each occasion and were classified as infrequent light drinkers and 89 took more than six drinks on each occasion and were classified as moderate drinkers. The remaining 5419 men drank at weekends or daily/most days; 1310 of these men took one or two drinks each day (frequent light drinkers), 2182 took three to six drinks (moderate drinkers), and 1927 took more than six drinks (heavy drinkers).

Social class—The longest held occupation of each man was recorded. The men were then grouped within one of the six social classes (I, II, III non-manual, III manual, IV, V) and one of the 17 socioeconomic groups of the Office of Population Censuses and Surveys.¹⁵ In most tabulations social classes I, II, and III non-manual were combined as a single group of "non-manual" workers, and social classes III manual, IV, and V as a single group of "manual" workers. There were 231 men in the armed services.

Missing data—Classification was not possible for smoking habit in 16 men, for drinking habit in six men, and for social class in 15 men. These missing data account for obvious discrepancies in numbers of men in the various tables and figures. The 231 men in the armed services are excluded from some tables and figures, and where this is done it is indicated in the legend or footnote. In our earlier publication⁴ we excluded eight men with inadequate blood pressure measurements; we have included them here, however, which accounts for minor differences in total numbers between the two papers.

Results

SMOKING AND DRINKING

Table I gives the number and percentage of men in each of the categories of drinking and smoking. Only 466 men (6%) described themselves as non-drinkers; 3065 (40%) were classified as light drinkers (occasional, infrequent light, and frequent light drinkers) and 4198 (54%) as moderate to heavy drinkers. In the smoking categories 1819 men (24%) had never smoked cigarettes, and these included 195 men who smoked a pipe or cigars. A total of 2715 men (35%) were ex-cigarette smokers; these included 607 men (8%) who currently smoked a pipe or cigars. Current cigarette smokers (light, moderate, heavy) accounted for 3185 (41%) of the men in the study.

AGE DIFFERENCES

Table II shows how the distribution of men within smoking and drinking categories changed with age. The youngest age group (40-44) smoked the least and drank the most; this group contained the greatest proportion of men who had never smoked (32%) and the highest proportion of moderate to heavy drinkers (60%). The proportion of men who were current smokers did not change greatly



FIG 1—Twenty-four towns of British Regional Heart Study. Britain divided into Wales (W); Scotland (S); and eight regions of England: north (N), Yorkshire-Humberside (Y-H), north-west (NW), East Midlands (EM), West Midlands (WM), south-west (SW), south-east (SE), and East Anglia (EA).

within the 20-year age range. There was, however, a steady decline with age in the proportion of men who had never smoked and a rise in the proportion of ex-smokers.

TABLE I—Drinking and smoking classifications of men aged 40-59 years in British Regional Heart Study

	Proportion of men	
	No	%
<i>Drinking</i>		
Non-drinkers	466	6
Light drinkers:		
Occasional	1085	14
Infrequent light	670	9
Frequent light	1310	17
Moderate to heavy drinkers:		
Moderate	2271	29
Heavy	1927	25
Total	7729*	100
<i>Smoking</i>		
Never cigarette smokers:		
Never cigarette smokers	1624	21
Pipe cigars only	195	3
Ex-cigarette smokers:		
Pipe cigars	607	8
Ex-smokers	2108	27
Current cigarette smokers:		
Light	1188	15
Moderate	835	11
Heavy	1162	15
Total	7719†	100

*No data available for six men.
†No data available for 16 men.

TABLE II—Smoking and drinking habits of British middle-aged men arranged in five-year age groups. Figures are percentages of base numbers

Age group (years)	Base No	Smokers			Drinkers		
		Never	Ex	Current	Non	Light	Moderate to heavy
40-44	1838	32	31	37	5	35	60
45-49	1898	26	32	42	4	41	55
50-54	1974	18	37	44	7	40	53
55-60	2025	19	41	41	8	42	50
Total	7735*	24	35	42	6	40	54

*Base number represents total number of men in study, but no drinking data were available for six men and no smoking data for 16 men.

TABLE III—Smoking and drinking habits of British middle-aged men in various social classes. Figures are percentages of base numbers

Social class	Base No	Smokers			Drinkers		
		Never	Ex	Current	Non	Light	Moderate to heavy
I (Professional)	607	43	37	20	5	54	41
II (Managerial)	1735	30	40	30	3	50	47
III (Non-manual skilled)	720	28	36	36	6	47	47
III (Manual skilled)	3326	19	34	47	6	34	60
IV (Semi-skilled)	783	18	31	51	10	33	57
V (Unskilled)	318	17	29	54	9	25	65
Armed service	231	12	30	58	7	37	56
Total	7720*	24	35	41	6	40	54

*Excludes 15 men whose social group could not be assessed.
No drinking data available for six men, no smoking data for 16 men.

SOCIAL CLASS DIFFERENCES

Table III shows the distribution of smoking and drinking habits in the six social classes and the 231 men in the armed services. From social class I to social class V there was a progressive increase in the prevalence of current cigarette smoking (20% to 54%) and moderate to heavy drinking (41% to 65%); similarly, there was a steady decrease in men who had never smoked (43% to 17%) and in light drinkers (54% to 25%). Non-manual workers contained a much higher proportion of light drinkers (50% v 33%) and men who had

never smoked (32% v 19%), while among manual workers there were higher proportions of moderate to heavy drinkers (46% v 60%) and current smokers (13% v 49%).

TYPE, FREQUENCY, AND QUANTITY OF DRINKING

The large differences between men in non-manual and manual occupations extended to choice of drink (table IV). Over half of the men (56%) drank beer only, though 13% drank spirits as well. Spirits only and wine or sherry were much less popular overall and were consumed predominantly by the non-manual workers. When frequency and quantity were analysed separately manual workers had a pattern of heavier drinking carried out most often at weekends, and smaller quantities were consumed daily by the non-manual workers.

TABLE IV—Distribution of beverages drunk, frequency of drinking, and amount drunk by manual and non-manual classes of British middle-aged men

	Total (n = 7729*)		Non-manual (n = 3061)		Manual (n = 4425)	
	No	%	No	%	No	%
<i>Beverage:</i>						
Beer only	4329	56	1298	42	2902	66
Beer/spirits	1031	13	462	15	528	12
Spirits only	827	11	424	14	372	8
Wine/sherry	525	7	345	11	166	4
All four	552	7	398	13	143	3
Abstainers	466	6	134	4	313	7
<i>Frequency:</i>						
Special occasions	1085	14	409	13	647	15
Once or twice a month	759	10	334	11	388	9
Weekends	3056	40	1053	34	1912	43
Daily/most days	2364	31	1311	37	1165	26
<i>Quantity:</i>						
Two drinks or less	2340	30	1288	42	991	22
Three to six	2824	37	1225	40	1503	34
Over six	2100	27	413	13	1618	37

*Drinking data not available for six men. Armed services personnel included in first column only.

ASSOCIATION BETWEEN SMOKING AND DRINKING

The important association between smoking and drinking may be analysed either by tabulating how much each drinking group smokes or by noting how much each smoking group drinks. We present the data both ways, subdivided by social class. For both non-manual and manual workers the frequent light drinkers contained the lowest

proportion of moderate to heavy smokers (fig 2). This was most striking for the non-manual workers. The percentage of moderate to heavy smokers increased rapidly, however, in both moderate and heavy drinkers, with heavy drinkers of both social groups containing the highest percentage of moderate to heavy smokers. This association between drinking and smoking was examined in greater detail by separating the last three groups in fig 2 into those who drank daily or on most days and those who were weekend drinkers (table V). Heavy daily drinking was associated with a higher prevalence of smoking than was seen in heavy weekend drinkers, the difference

being most pronounced in the non-manual workers. In the frequent light and moderate drinkers, separation into daily and weekend drinking did not show any pronounced differences in smoking habits.

When smoking habit was used as the independent variable (fig 3) a positive association between smoking and drinking was apparent,

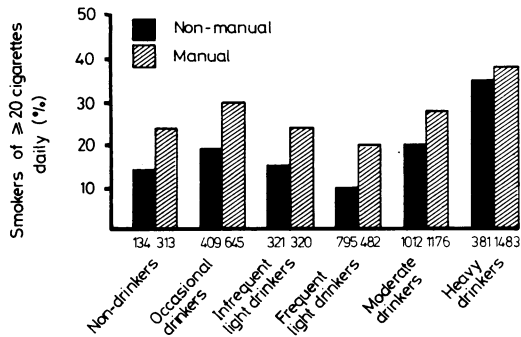


FIG 2—Percentages of men smoking 20 or more cigarettes daily by drinking habit and social class. Armed services personnel excluded. No social class data available for 15 men, no drinking data for six men, and no smoking data for 16 men.

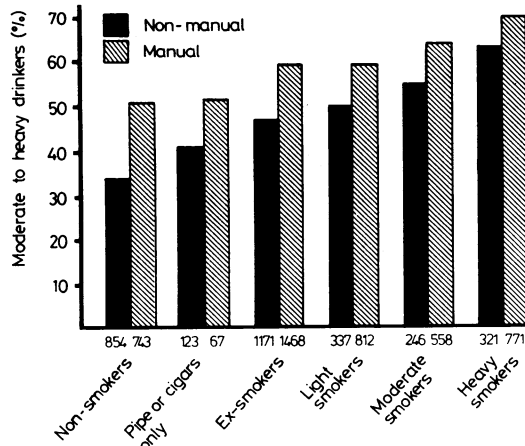


FIG 3—Percentages of men classified as moderate to heavy drinkers by smoking habit and social class. Armed services personnel excluded.

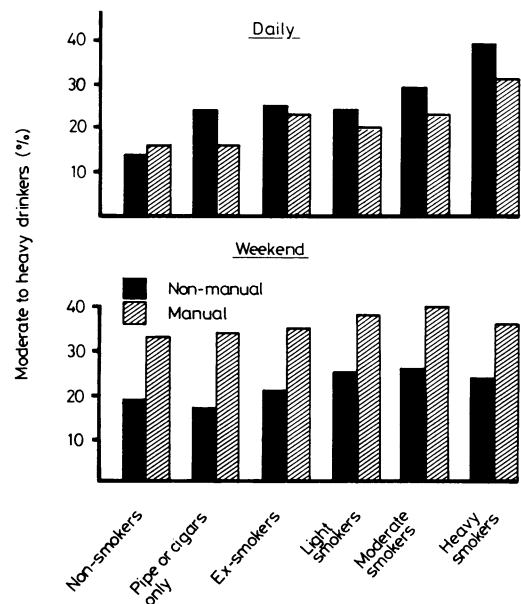


FIG 4—Percentage of men classified as moderate to heavy drinkers on a daily or weekend basis by smoking habit and social class. Base numbers in smoking groups are the same as in fig 3.

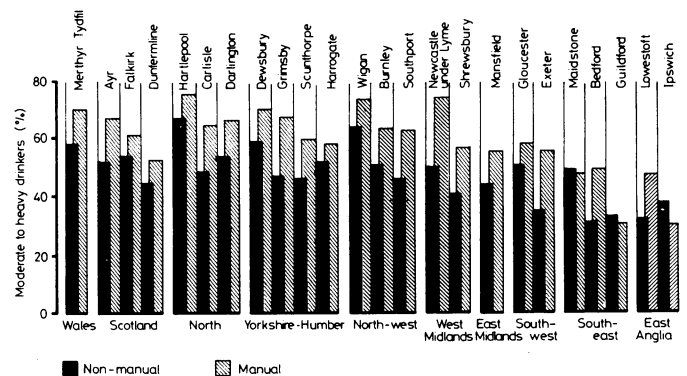


FIG 5—Percentage of men classified as moderate to heavy drinkers by town, region, and social class.

TABLE V—Percentage of men smoking 20 or more cigarettes a day by social class and drinking behaviour. (Numbers of men in sample given in parentheses)

	Frequent light drinkers		Moderate drinkers*		Heavy drinkers	
	Weekends	Daily	Weekends	Daily	Weekends	Daily
Manual workers	20 (n = 314)	20 (n = 168)	25 (n = 701)	30 (n = 407)	36 (n = 895)	42 (n = 588)
Non-manual workers	11 (n = 397)	9 (n = 398)	19 (n = 491)	22 (n = 509)	28 (n = 162)	39 (n = 219)

*Excludes men who drank moderately only once or twice a month.

with a progressive increase in the proportion of moderate to heavy drinkers from non-smokers to heavy smokers. Ex-cigarette smokers apparently drank at much the same rate as light smokers and, indeed, drank less than moderate or heavy smokers. When this trend was examined separately for daily and weekend drinking behaviour (fig 4) it became evident that the overall trend shown in table V was produced almost entirely by the smoking and drinking relations in the daily drinkers, in both non-manual and manual groups. In the weekend drinkers no consistent trend was seen in the various smoking categories.

TOWN VARIATIONS

When we examined the drinking and smoking activities of the men grouped by their town of residence we noted large differences between

the towns (figs 5 and 6). For example, 72% of the men in Hartlepool were moderate to heavy drinkers, whereas only 34% of the men in both Guildford and Ipswich consumed alcohol at a comparable rate. Similarly, in Grimsby 39% of the men were moderate to heavy cigarette smokers compared with only 11% in Guildford. Since these large differences in towns might have been due to the distribution of social class we controlled for this effect. We examined the prevalence of moderate to heavy drinking and smoking in each town separately for non-manual and manual workers.

These figures convey several important findings. Firstly, within towns there were pronounced differences between the two social class groupings. In Bedford, for example, the prevalence of moderate to heavy cigarette smoking in manual workers was 2.6 times that observed in non-manual workers. Secondly, within the same social class group there were large differences in drinking and smoking activities between

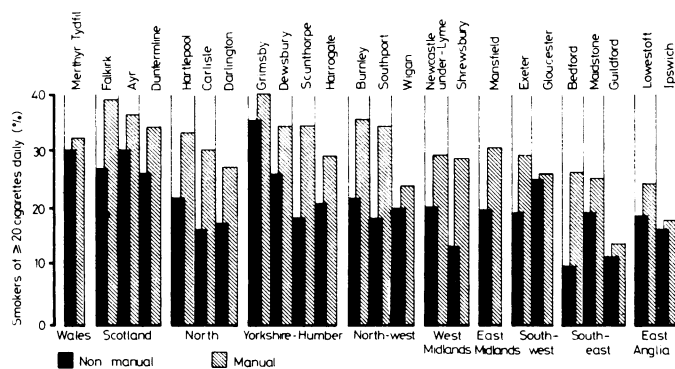


FIG 6—Percentage of men smoking 20 or more cigarettes a day by town, region, and social class.

the towns. In Hartlepool, for example, the prevalence of moderate to heavy drinking in manual workers was 2.5 times that of manual workers in Guildford. Thirdly, there appeared to be a north-west to south-east gradient in smoking and drinking behaviour regardless of social class.

Figures 5 and 6 show the towns grouped into their standard regions, and the regions are arranged in a more or less north-west to south-east pattern from left to right. This shows that English towns in the more northern regions—north, Yorkshire-Humberside, north-west—had a higher prevalence of both moderate to heavy smoking and drinking than towns in the more southern regions, such as the south-west, south-east, and East Anglia.

Discussion

The most important findings of this clinical survey were, firstly, the close relation between smoking and drinking patterns; secondly, the strong effect of social class on smoking and drinking activity; and, thirdly, the appreciable influence of town of residence, independent of social class.

ASSOCIATIONS BETWEEN SMOKING AND DRINKING

The known positive association between smoking and drinking was confirmed. The relation was not, however, a simple linear one. Figure 3 shows that the more a group of men smoked, the greater was the prevalence of moderate to heavy drinking. Figure 2, however, shows that the converse was not true when the men were grouped by their drinking habits: non-drinkers and occasional and infrequent light drinkers all smoked more than the frequent light drinkers, especially the non-manual light drinkers. In both figures, however, moderate to heavy smoking was associated with moderate to heavy drinking and vice versa. Social class did not confound these observations because the overall patterns were similar for both non-manual and manual workers. Ex-cigarette smokers apparently did not drink more than light smokers (fig 3) and, indeed, had lower rates of moderate to heavy drinking than men smoking 20 or more cigarettes a day.

The strong association between drinking and smoking is of considerable importance, particularly for those who study diseases related to these factors. Whereas smoking has long been considered to be a classic risk factor for cardiovascular disease, researchers have only recently begun to analyse alcohol consumption in the same way. Increased alcohol consumption is associated with a greater prevalence of raised blood pressure^{4 8 11} and a higher incidence of cardiovascular events,^{12 13} deaths from all causes,^{16 17} cirrhosis, accidents, and violence.^{18 19} In contrast, more moderate drinking of alcohol may be a negative risk factor—it is not only “healthier” than heavy drinking but it may be “healthier” than complete abstinence.^{5 8 16} Whether this is an artefact remains to be seen, for the apparent benefits of relatively light alcohol consumption may be partly due to less cigarette smoking, and the apparently negative effects of abstinence may be partially due to the greater amount of cigarette smoking by

teetotalers and occasional drinkers when compared with frequent light drinkers. Some of our findings may have been due to changes in drinking habits; such changes could not be identified in this study.

Interestingly the smoking rate of heavy daily drinkers was much greater than that of heavy weekend drinkers (table V), and the positive relation between smoking and drinking was most pronounced for daily drinkers (fig 4). These findings suggest that the heavy daily drinkers were different in some way from the heavy weekend drinkers. This could be a straightforward matter of daily drinkers consuming more alcohol overall than weekend drinkers and smoking having a direct positive association with alcohol consumption. The lack of a positive trend between smoking and weekend drinking, however, suggests that some other mechanism could be implicated. The possibility of a difference in the underlying reasons for being a daily or a weekend drinker might be worthy of further investigation.

SOCIAL CLASS EFFECT

Social class, represented by occupational group, emerged as a powerful influence on drinking behaviour and, to a less extent, on smoking activity. A man's social class affected his choice of drink, how often it was consumed, and the amount imbibed on drinking occasions (tables III, IV). Social class was also associated with appreciable differences in mean age when smoking began (17 non-manual, 16 manual) and mean number of years spent smoking (20 non-manual, 22 manual). Similar social class differences have been noted in other surveys^{14 20} and in expenditure figures for alcohol and tobacco products.^{21 22} We think that these differences are important and may explain part of the social class differences in the prevalence and incidence of cardiovascular disease.

TOWN EFFECT

Where a man lives also seems to affect his smoking and drinking behaviour. We observed pronounced differences between the 24 towns in the prevalence of moderate to heavy drinking and smoking (figs 5 and 6), as well as what appeared to be a north-west to south-east downward gradient. We controlled for some sociocultural influences by using the six social classes of the Office of Population Censuses and Surveys and the differences persisted (figs 5 and 6). In separate analyses we controlled for additional social and cultural differences by using the 17 socioeconomic groups of the Office of Population Censuses and Surveys and by comparing towns with the same socioeconomic distribution using the classification developed by Webber and Craig.²³ Again the town differences and the north-west to south-east gradient in smoking and drinking remained (specific data not given here).

The thrust of our argument is that men of similar age and occupation tend to smoke and drink in a manner strongly influenced by where they live. Studies confirm that men smoke²⁴ and drink²⁵ for different reasons. Edwards *et al*²⁵ noted that some people drink alcohol for its tranquillising effects; others use it when dining; while for some people alcohol is an important ingredient of social interaction and contact. It is certainly easy to see how these reasons might differ from town to town and such regional differences in behaviour must be considered when researchers are trying to explain regional differences in disease.

OTHER BRITISH STUDIES

Many of our observations confirm the findings of the General Household Survey,¹⁴ which included men and women and had a wider age range (18 to over 65). The prevalences of smoking and drinking in our study (table I) were roughly comparable to those found by the General Household Survey for men aged 45

to 64 (n=3269) despite some differences in the method of grouping men into drinking categories. Like the General Household Survey, we observed less smoking and more light drinking in the non-manual socioeconomic groups, and heavier smoking and more moderate to heavy drinking in the manual groups. Though the General Household Survey reported north-west to south-east decline in heavy drinking when tabulated by standard region, it did not control for socioeconomic group, nor did it analyse smoking by town of residence. Wilson has conducted valuable inquiries on drinking habits in England and Wales for the Department of Health and Social Security.^{26 27} He reported a decline in drinking with age but in contrast with our findings did not observe many differences in consumption between social classes. Wilson used a different estimate of alcohol intake from that used in our study and the General Household Survey and included only 924 men aged 18 to over 65. Like the General Household Survey, Wilson tabulated drinking by standard regions and observed a slight north-west to south-east decline in alcohol consumption, but social class and age were not controlled, and the base numbers in each region were very small (from 39 to 169).

DESIGN OF REGIONAL HEART STUDY

In its design the British Regional Heart Study has several features which lend credence to our observations and allow generalisations to be made. It is a large study that collected a considerable amount of data, allowing analysis by many relevant variables. It enrolled a fairly narrow age range and only one sex, thus diminishing two confounding variables. The questionnaires were completed by the interviewers rather than the subjects, thereby avoiding misinterpretations, which occur when subjects respond by post or complete the questionnaires independently. Also the study was not presented to the subjects as a specific analysis of drinking and smoking; inquiry into these activities were, in a sense, buried within the much larger general study of cardiovascular disease. We think that this minimised any dissembling by the men when they were asked about their smoking habits and particularly their drinking habits. There appeared to be a fair degree of accuracy in the drinking reports, for a quarter of the men stated that they drank heavily by our definition, and that was unusually high compared with other surveys. By selecting predominantly medium-sized towns of 50 000 to 100 000 we avoided confusion over urban or rural effects. But the central feature of the regional heart study is that it included men living in many different areas of Britain. We were therefore able to analyse the important variable of town of residence.

Conclusions

Smoking and drinking relate to several diseases and are described variously as causal agents, as risk factors, or as confounding variables. Our analysis of data from the British Regional Heart study emphasises the complexity of the relation between behaviour and disease. The data suggest that before smoking or drinking can be related specifically to diseases there must be a clear appreciation of the complicated interaction of the two behaviours, of the powerful effect of social class on smoking and drinking, and of the independent effect of town of residence on how a man engages in these two activities. These conclusions also need to be remembered by those engaged in the prevention of diseases related to smoking and drinking.

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Requests for reprints should be sent to Professor A G Shaper.

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I LATELY attended a patient who had almost a constant hiccup for above nine weeks. It was frequently stopped by the use of musk, opium, wine, and other cordial and antispasmodic medicines, but always returned. Nothing however gave the patient so much ease as brisk small-beer. By drinking freely of this, the hiccup was often kept off for several days, which was more than could be done by the most powerful medicines. The patient was at length seized with a vomiting of blood, which soon put an end to his life. Upon opening the body, a large scirrhus tumour was found near the pylorus or right orifice of the stomach.

(Buchan's *Domestic Medicine*, 1786.)