COMMISSION OF THE EUROPEAN COMMUNITIES

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STUDY TO DETERMINE THE CRITICAL GROUPS AND THE SIZE OF THE POPULATION TO BE CONSIDERED FOR POLLUTANT CRITERIA

FINAL REPORT

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STUDY TO DETERMINE THE CRITICAL GROUPS AND THE SIZE OF THE POPULATION FOR POLLUTION CRITERIA

CONTENTS

Study to determine the Critical Groups and the Size of the Population for Pollution Criteria.

Introduction

The Action Programme of the European Communities requires the compilation of a bibliography, which should be as complete as possible, on the effects of pollutants on health, on man and his environment, and states that a critical analysis of this information should be undertaken. The pollutants for priority investigation include hydrocarbons with known or probable carcinogenic effects, sulphur compounds and suspended particles, nitrogen oxides, carbon monoxides, and photochemical oxidants.

Other studies had been carried out to determine the dose-effect relationships (criteria) for these pollutants. The present report concentrates on those diseases that correlate with air pollution, cause his mortality, and affect a large number of people, for instance bronchitis, certain cancers, and ischaemic heart disease.

SUMMARY

In this report mortality and hospital morbidity statistics in the United Kingdom and Ireland have been used to determine as far as is practicable the critical groups and the size of the populations affected by air pollution. It has been shown that the effects of air pollution influence profoundly both mortality and morbidity, particularly for certain conditions such as lung cancer, chronic bronchitis, ischaemic heart attacks and stroke, major causes of sickness and death in the countries of the European Economic Community.

General pollution criteria cannot be considered without also taking into account how the individual lives his life, for instance whether or not he smokes. A balance has to be reached between the standard of living that is desired and the degree of pollution in the environment that will be acceptable. In this report the concept of the acceptable risk is considered.

It is suggested that this pilot study should be extended to include other countries of the Community and a concensus reached as to what recommendations should be made for further action by the European Community.

CHAPTER 1: THE PROBLEM

. Contrary to popular belief, the expectation of life for middle-aged men in the western world is shorter to-day than it was 10 years ago. As a result, the difference in the expectation of life between men and women is increasing, and in many western countries women now live on average three or six years longer than men[1].

TABLE 1

Increase in mortality trends in middle-aged men but not in women
Rates/1,000

	Men		Women	
		England and Wales. Aged 65-74		
1946-50.	51.6		34.4	
1956-60	53.7	Increasing death rate	30.7	
1961-65	54.2	in men	29.6	Falling death rate in women
		Republic of Ireland		
1951-60	48.9	Following trend in	38.8	
1961-66	49.3	England and Wales	34.3	
		Aged 55-64		
1951-60.	19.3		14.1	
1961-66	20.1		12.5	

2. Before World War Two, we lived with the belief that removing poverty would solve most urgent medical problems; malnutrition, tuberculosis and other infections. We also believed that with detailed attention to the sick patient and to his symptoms, signs and pathology, the answer to most medical problems would be found. This indeed was true in the days when deaths from infections were very common. However, despite improved medical care and the disappearance of most infectious conditions, and greatly improved standards of living, new problems have developed which are causing a completely new shift in emphasis - a shift in emphasis from study of the individual

who is sick to studies of illness in population at risk. There is also a major shift of emphasis from the treatment of established disease to the need for the prevention of illhealth, particularly the major causes of mortality and morbidity among the developed nations, ischaemic heart disease, stroke, chronic bronchitis and the cancers, particularly lung cancer.[2]

3. Inheritance and Environment;

All illnesses result from an interaction of the seed and the soil - the inherited characteristics we receive from our parents and the environment in which we have lived from conception onwards. Twenty or thirty years ago it was believed that most chronic diseases were due to inherited factors and therefore beyond our control. Studies by such epidemiologists as Hill[3] and Doll[4] in the United Kingdom and Hammond[5] in the United States have shown that the environment and the way we live our lives are the major factors responsible for the major diseases affecting us to-day.

Among examples of chronic diseases with a large variation in prevalence between different countries are, for instance, deaths from chronic bronchitis which is very common in England and less than a quarter as common in an equally cold country, Norway.[6] Multiple sclerosis is another good example with a prevalence of at least 50 per 100,000 in Europe, and yeat no single patient with multiple sclerosis has yet been found among South Africa's 17 million Bantu, and it is only one-eleventh as common in Africaans-speaking white South Africans as it is in Europe.[7]

Great light on the environmental causes of diseases can be obtained by studying people who have migrated from one environment to another. For instance, the immigrants from Europe who carry with them a high risk of lung cancer of multiple sclerosis when they emigrate to South Africa but lose most of their risk of dying from chronic bronchitis.[8]

4. What is the Good News?

If the major diseases of modern man are due to the environment, they are therefore potentially preventable as long as we are prepared to change the environment and to pay the necessary cost. This cost has to be assessed by the community for the general environment - such factors as clean water, untainted food, clean air, and freedom from excess noise, and by the individual as far as his own life is concerned, for example his cigarette smoking, alcohol consumption, the food he eats, and the stress to which he subjects himself.

5. How can these changes be brought about?

In order to change the environment it is necessary that we should undertake studies which show clearly and conclusively how the environment does affect health and then to educate the general population so that they can understand the risks they are taking if the environment is not changed. The information on the environment is also necessary for politicians so that they can take into account public opinion and instigate the necessary changes in policy and environmental control.

6. The Need for a Balanced World.

If we are to improve the environment there is a need for a balance in the world between ourselves, homo sapiens, and other forms of animal and vegetable life. This means that in improving the environment it is necessary to consider such questions as family planning and the necessity that the number of people in a particular area should not use up the available resources faster than they can be replaced. Perhaps we need to change our attitudes to consumer goods, to consume less of the resources which have been built up in this world over many millions of years, such as our coal and oil resources. A need for a change in our philosophy towards the way we live is required if we are to improve the quality of life with all this entails. Perhaps this is one of the reasons why many eyes today are turned to non-capitalist societies, such as some of the societies of the East, where the emphasis is less on consumer goods and more on maintaining the balance of nature. For example, the more frequent use of a bicycle rather than a motor car. There is little doubt that at present the philosophy and the materialistic way of life of western society is being very much questioned, and also our institutions of health and of education.[9]

Environmental pollution plays a major contribution to illhealth and a Royal Commission in the United Kingdom has recently published their fifth report entitled "Air pollution Control: An Integrated

Approach, 1976"[10] and recommended that there should be domestic and industrial smoke control and that a study of the effectiveness of different countries systems of air pollution control through an international organisation should be undertaken, and that air quality quidelines should be developed and enforced by the necessary legislation.

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CHAPTER 2: HOW WE AS INDIVIDUALS LEAD OUR LIVES.

Smoking and its inter-relationship with air pollution.

The pollutants reaching the lungs come from various sources, such as city air, the working atmosphere and cigarette smoking. The inter-relationship between atmospheric pollution and cigarette smoke is particularly important as cigarette smoke contains many of the principal pollutants; such as carbon monoxides, nitrogen oxides and carcinogenic hydrocarbons.

Cigarette smoking is primarily of concern for the individual, although pollution of the atmosphere in restaurants, public transport etc., constitute a source of pollution for the general public. The risks to health that result from smoking have been described in various publications, including the Report of the Royal College of Physicians "Smoking and Health Now".[1]

The inter-relationship between smoking and air pollution is shown in many studies and two good examples are the studies on air pollution and health in Northern Ireland and Teesside in 1962 and in Teesside in 1974.[2,3,4] (Figs. 1 and 2).

In these studies the risk of lung cancer increased with the number of cigarettes smoked but at all levels of smoking, including the non-smokers, the risk of lung cancer was higher in the urban areas than in the rural areas. In chronic bronchitis the urban factor was even more marked.

FIGURE 1

NORTHERN IRELAND.

LUNG CANCER MORTALITY RATES OF MEN IN INNER BELFAST AND THE TRULY RURAL DISTRICTS

Per 100,000 per year, age standardised, 1960-1962 among men aged 35+

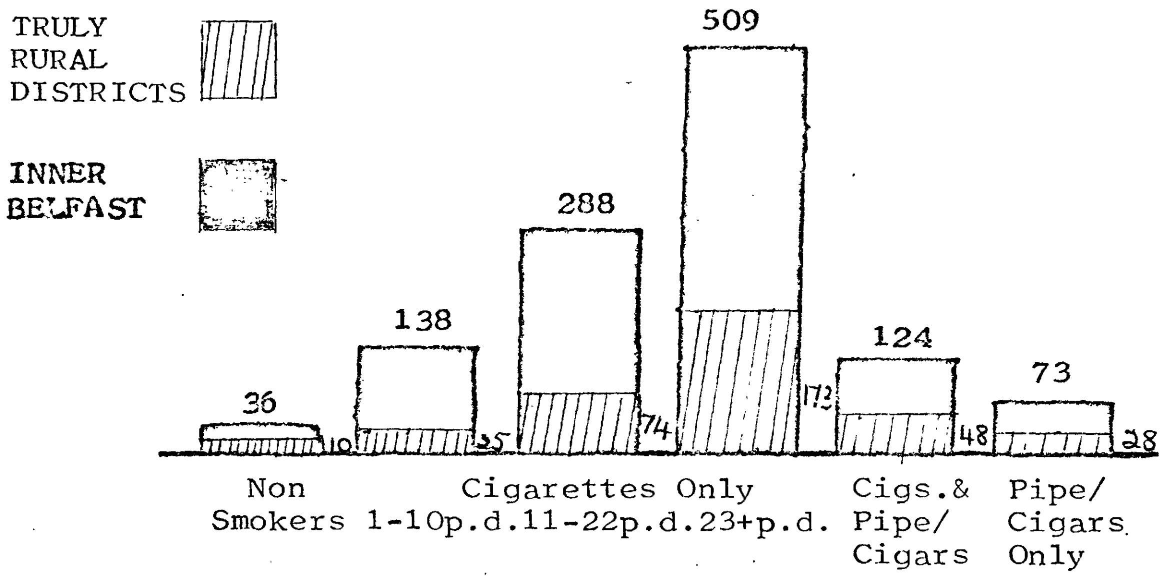
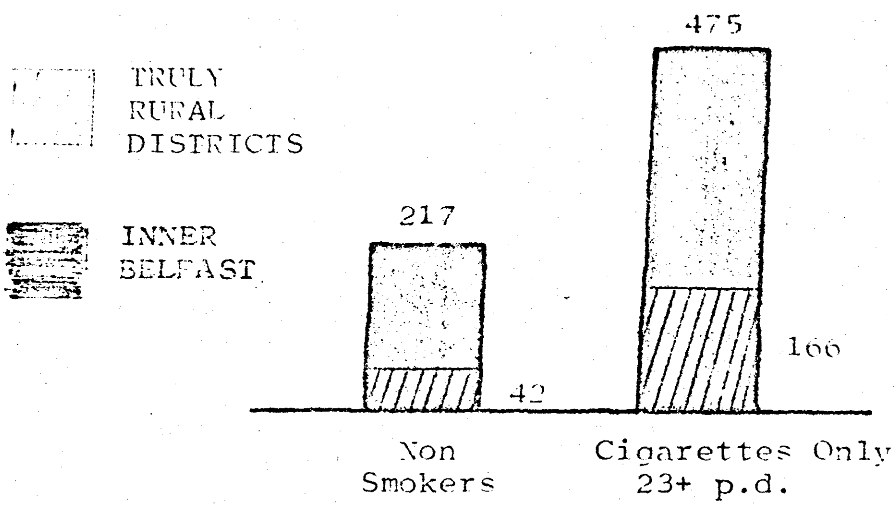


Fig. 2.

NORTHERN IRELAND.

BRONCHITIS MORTALITY RATES OF MEN IN INNER BELFAST AND THE TRULY RURAL DISTRICTS

Per 100,000 per year, age standardised, 1960-1962 among men aged 35+



2. Social Class

Social class is also related to air pollution and to smoking. For instance the upper social class who tend to live away from the centre of the city in pleasant residential areas are less inclined to be affected by repeated attacks of bronchitis in childhood and when they do get bronchitis is is more effectively treated so that they recover quicker and have less permanent lung damage.

Social class changes are very clear in Teesside.[4] Mortality rates in Teesside have been calculated for social classes defined in terms of the Registrar General's categories based upon occupation. For this purpose decedents' last occupation and living persons' current or last occupation were taken into account.

Table 1

	Social Class	Men 35+ Lung Cancer	Men 35+ Bronchitis	Women 35+ Lung Cancer	Women 35+ Bronchitis	Men 35-64 Heart Attack	Men 35-64 Stroke
I,II	Professional/ intermediate	156±42	43±24	16±16	23±27	337±82	52±19
III	Skilled	209±25	142±23	58±21	39±23	373±41	54± 9
IV	Partly Skilled	240±41	153±33	47±23	55±28	435±72	49±14
V	Unskilled	297±57	197±42	47±22	39±24	576±122	135±33
	Overall	225±17	207±16	39± 6	58± 7	401± 31	60± 0

For males the difference in mortality rates between the highest and lowest of the social groups is significant in the case of all four causes of death. There is an increase from one group to another in all cases except stroke, where the unskilled are sharply distinguished from the rest. For women the differences are not significant; and it should be noted in interpreting this, that only 47% of the female population were classifiable by the criteria used for social class distribution. The unskilled have a very much higher mortality for all four causes, and by far the highest death rates are from heart attacks.

It is possible to compare the social class variation reported above for males with data for all causes of death among men aged 15-64 years in England and Wales during the period 1959-1963. The following table shows percentage variations from the rate for all social classes.

Table 2

		Men 15-64	Men 35+		Men 35-64	
		All causes	Lung Cancer	Bronchitis	Heart Attack	Stroke
	% variation from mortality rate for all classes:	(approx.)				
I,II	Professional/ intermediate	-20	-38	-31	-17	- 16
III	Skilled	0	- 4	+ 4	- 8	- 13
IV	Partly Skilled	+ 5	+10	+12	+ 8	- 21
V	Unskilled	+45	+36	+44	+43	+118

For lung cancer, bronchitis and stroke the variation between social classes is similar to that for all causes, and thus appears to reflect a general factor. The results for stroke do not fit this pattern and may thus reflect a special factor associated particularly with men at the lower end of the social scale.

3. Ischaemic Heart Attacks

Two recent reports have shown that Ischaemic Heart Disease has fallen among those who take out life assurance with the Metropolitan Life Assurance Company who, by and large, would be among the better off members of the community although it has also fallen, though to a lesser extent, in the general white population of the United States.[5]

Table 3

Ages 35-64

Age-adjusted death rates per 100,000

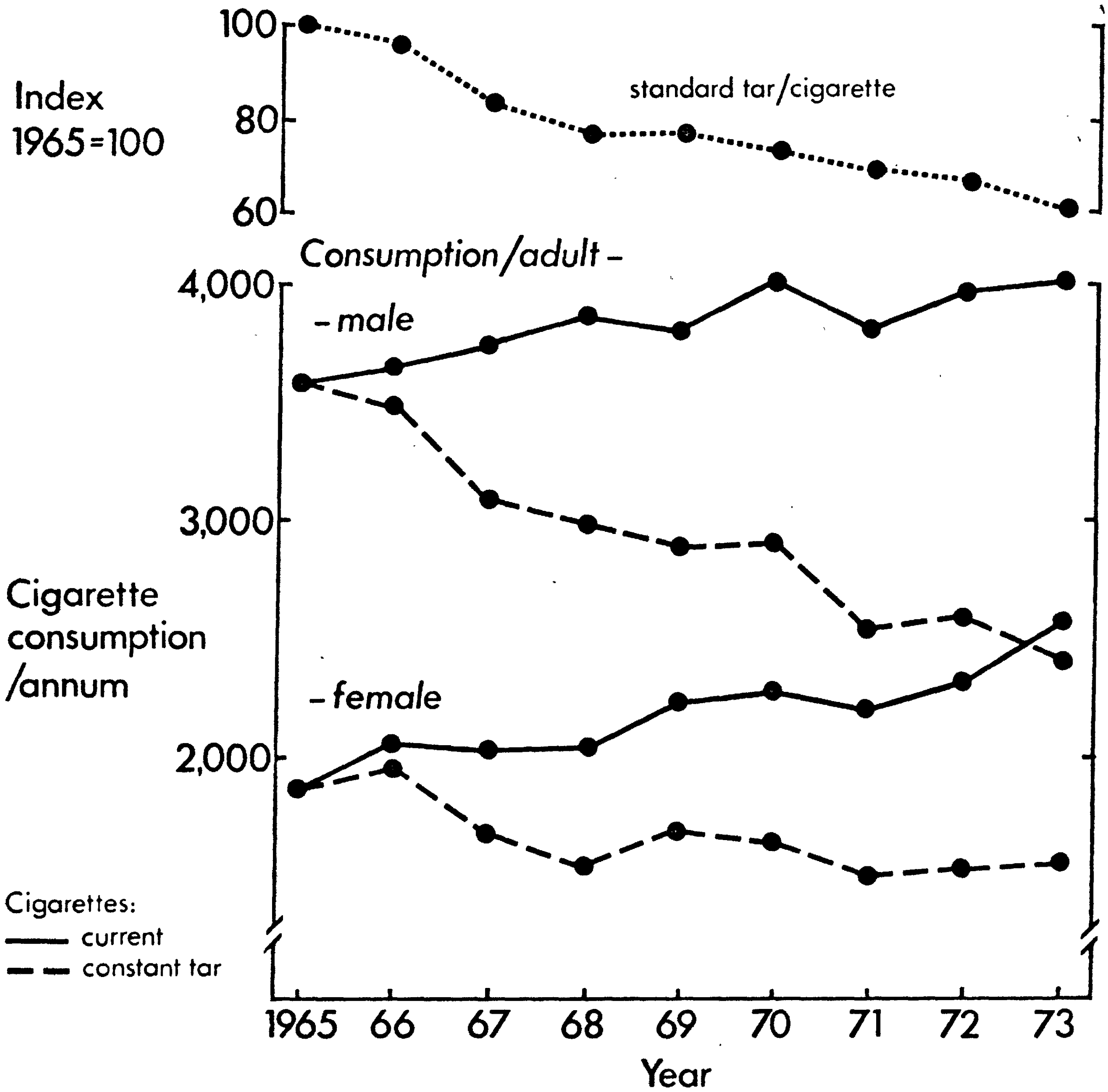
Year	Metropolitan Standard Ordinary Policy holders		United States White Population	
	Male	Female	Male	Female
1962	350.1	69.8	381.4	97.0
1967	336.1	72.4	381.2	93.7
1969	311.2	69.9	374.8	95.5
1973	258.0	68.1	344.6	89.5

Just as there are certain communities which by tradition are particularly liable to smoke and have high heart attack and lung cancer rates, for instance in the Channel Islands where the cigarette tax is low. In these islands,[6] not only are there high death rates from ischaemic heart attacks and lung cancer but also, because alcohol is also not taxed and it is therefore cheap, cirrhosis of the liver. Among women doctors in South Africa and Israel there is a very high death rate from ischaemic heart attacks, lung cancer, and chronic bronchitis because, unlike the men, they have remained heavy cigarette smokers.[7] Another well-known group of people with a high death rate from lung cancer and heart attacks are the Fins, particularly those living on the Karelian penninsula.[8]

Lastly there has been a swing from plain to filter cigarettes and a fall in the standard tar/cigarette since 1965 (Fig. 3).[9]

FIG. 3

Index of standard tar per cigarette, 1965 = 100, and U.K. cigarette consumption per adult, aged 15 or over, in terms of both current and constant tar cigarettes



In England and Wales, in the Republic of Ireland and in the other countries of western Europe, unlike the United States, there is still a continuing increase in deaths from ischaemic heart attacks at all ages. The death rates are higher in Scotland than in England and Wales (Fig.4)

THE SUNDAY TIMES, APRIL 18 1976

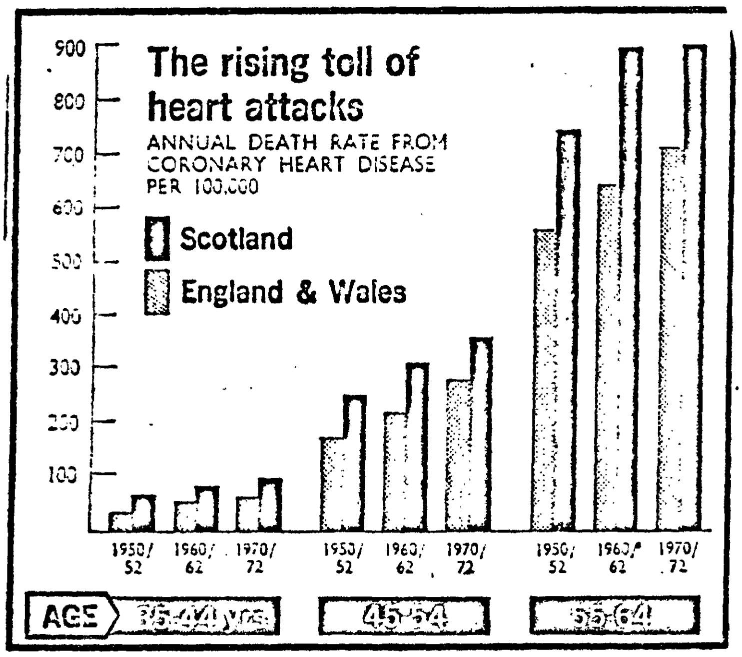


Fig.4

4. High Risk Occupations

Certain occupations by their nature subject those who take part in them to considerable air pollution. For example, those who work in radio-active mines, such as the Joachimstal mines of Czechoslovakia, and the uranium mines in the United States and elsewhere. They inhale radio-active radon and as a result have high lung cancer rates. Coal miners inhaling coal dust and silica on the other hand, are particularly liable to silicosis although because they do not smoke while down the mines, their lung cancer rates of each age group are not unduly high. Asbestos workers who inhale asbestos fibres have a greater risk

This risk is so great that even those working in the neighbourhood of certain asbestos mines have higher lung cancer and mesothelioma rates.(10) The risk of lung cancer in these examples is affected by personal factors, particularly the number of cigarettes smoked.

It is not only the urban dweller whose health can be affected by either the air pollution at work or the air pollution of the ambient air. The country dweller and farmer are also at risk, for instance from asthma due to pollen in the air, or in their occupation from inhaling fungal spores that can cause the very distressing illness allergic alveolitis, or farmer's lung, due generally to the fungus micropolyspora faemi which flourishes in mouldy hay.(11) There are other occupational risks for the rural dweller such as pigeon fancier's lung and histoplasmosis, or cave disease.(12)

In contrast to these high risk groups there are those who because of religious reasons do not smoke and do not take alcohol. For instance, among the Mormons many causes of death are lower than for the general population, and the expectation of life is above average. Their death rates from lung cancer, chronic bronchitis and ischaemic heart attacks are particularly low.

All illnesses result from the interaction of inheritance and environment, the seed and the soil, in lung cancer the environmental factor appears to be by far the most important, i.e. various forms of air pollution and cigarette smoking. In chronic bronchitis air pollution and cigarette smoking are about equally to blame.

We do not know all the factors responsible for coronary thrombosis but a number of prospective studies have made it clear which are the important ones; the best known is the Framingham study.[13]

i. Genetic factors:

(a) a genetic tendency towards high blood cholesterol and triglycerides.

(b) a genetic tendency to hypertension.

(c) a genetic tendency to diabetes.

(d) a genetic tendency to gout.

(e) a genetic tendency to be more extroverted and therefore more liable to take risks.

ii. Environmental factors:

Studies comparing, for instance, the different groups in South Africa, have shown very clearly that the environmental factors are generally the more important. Those in South Africa who live on a diet low in animal fats and low in sugar, for instance the Bantu, have a negligible ischaemic heart rate in comparison with those on a white man's diet.[14] Indians in India do not develop diabetes or become overweight and have a low risk of ischaemic heart attacks. Indians in South Africa, who have high fat and sugar intake, have a high incidence of diabetes, obesity, ischaemic heart attacks and strokes. Other factors such as exercise may also play a part.

5. Conclusion

It is noteworthy that whereas 20 years ago heart attacks were most common among upper social class males, they are now less common amongst this group because of the changes in their environment, in particular the reduction in cigarette smoking, and the change of diet, for example the reduction in the intake of cream, animal fats, and sugar. This is evidence that by making the effort to change the environment, ischaemic heart attacks can be greatly reduced. However, high the inherited tendency, the chance of having a heart attack is largely a matter of how we live our lives.

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CHAPTER 3: CIGARETTE SMOKING

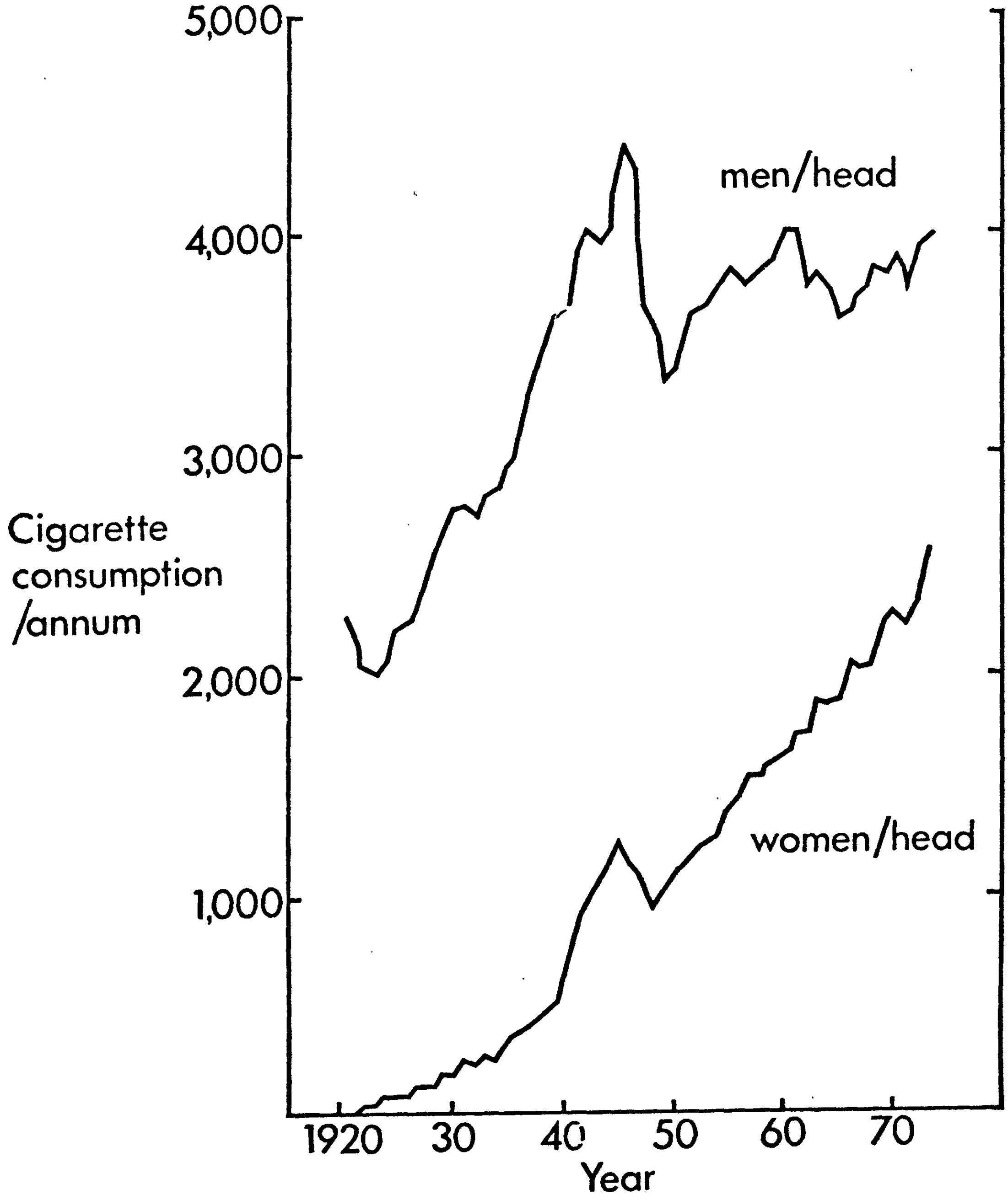
Changes in Smoking Habits

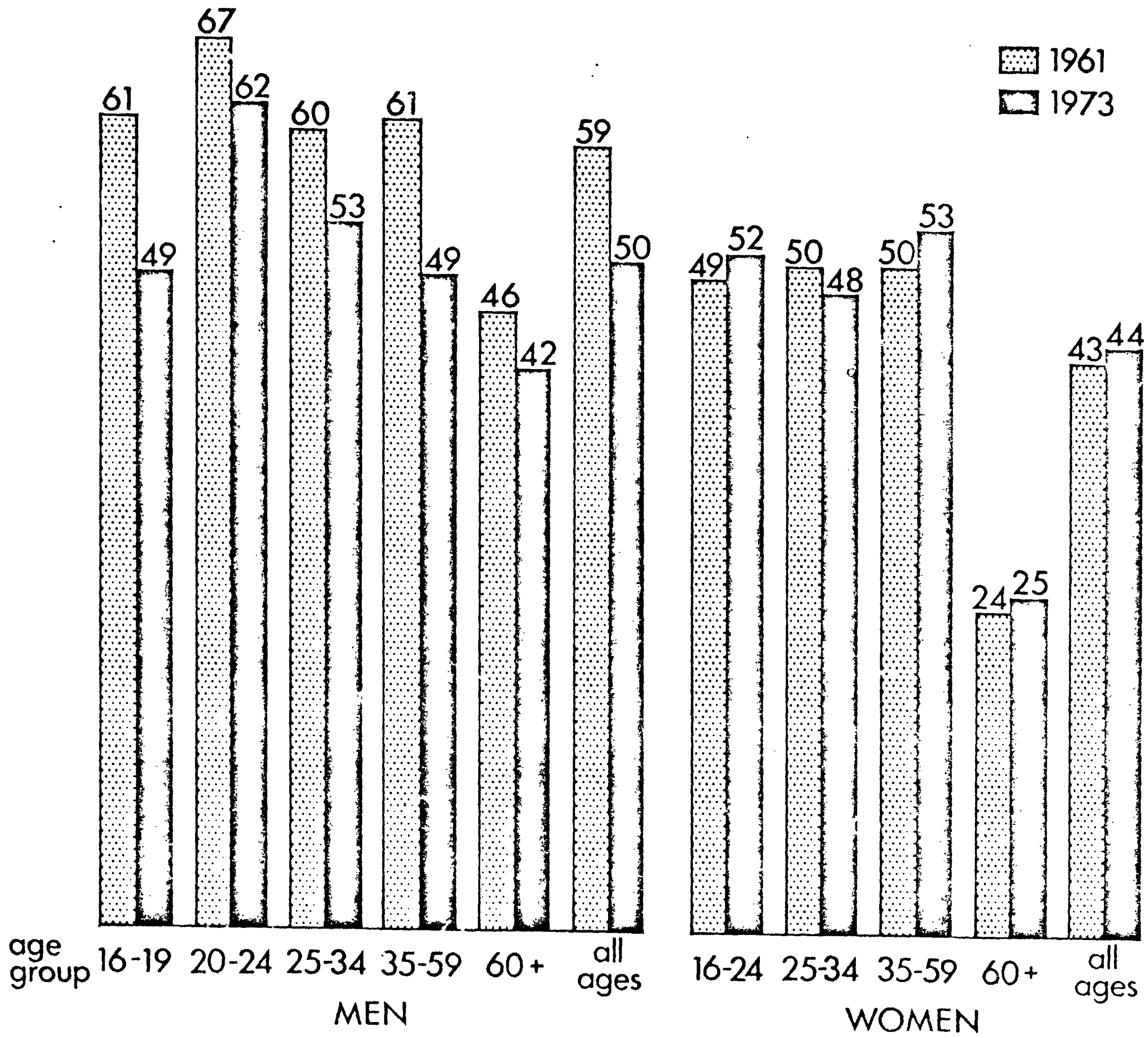
The changes in smoking habits in the United Kingdom between 1920 and 1975 are shown in Figs. 1 and 2.[1]

Insert Figs. 1 and 2.

FIG. 1

U.K. cigarette consumption per adult - aged 15 or over

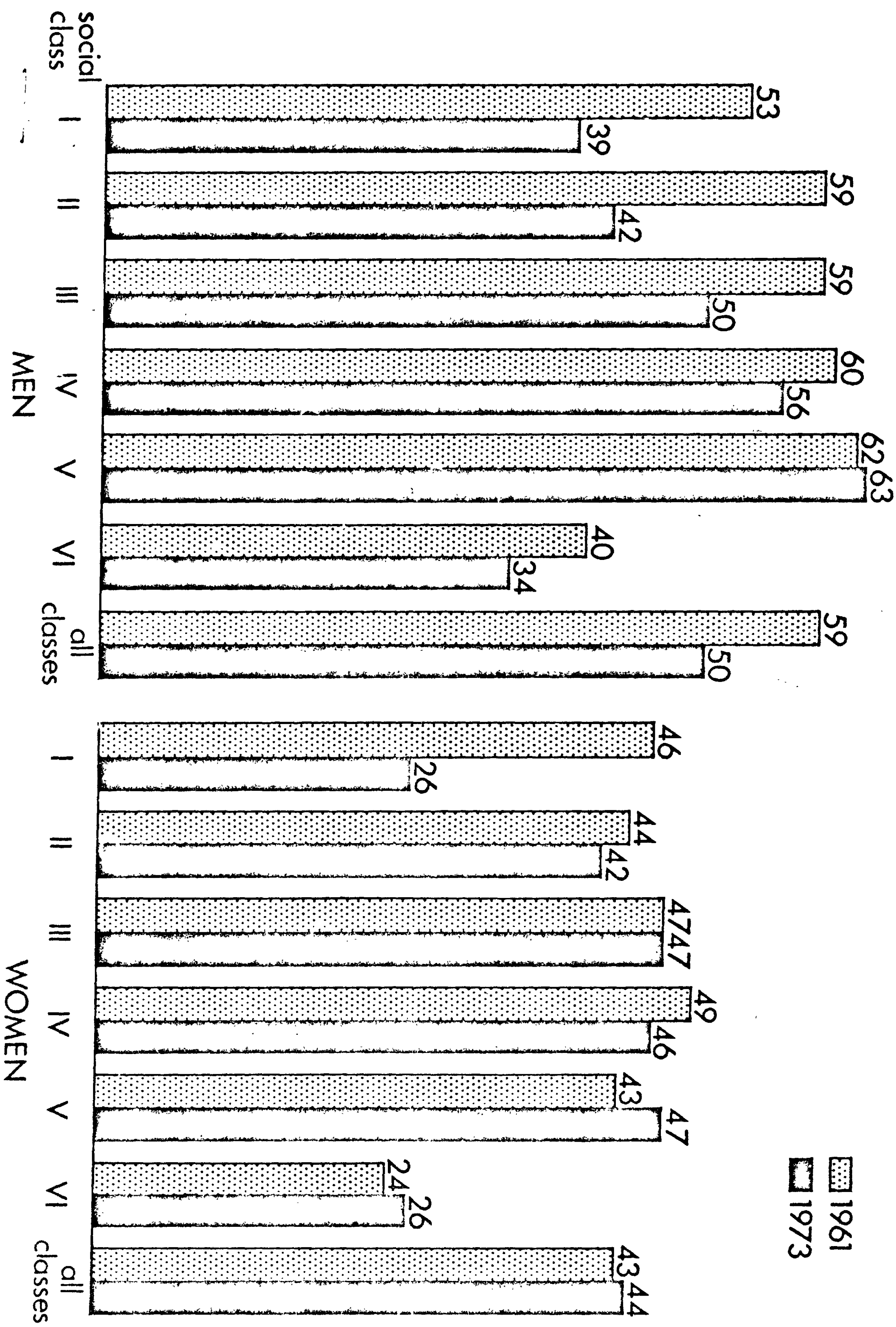



1961
1973
61
49
67
62
60
53
61
49
46
42
59
50
49
52
50
48
50
53
24
25
43
44
age group
16-19
20-24
25-34
35-59
60+
all ages
MEN
16-24
25-34
35-59
60+
all ages
WOMEN

Starting with doctors there has been a reduction in the percentage of cigarette smokers in social classes I-IV males but not in social class V.[2] In women the reduction is only marked in social class I (Fig. 3) in England and Wales.

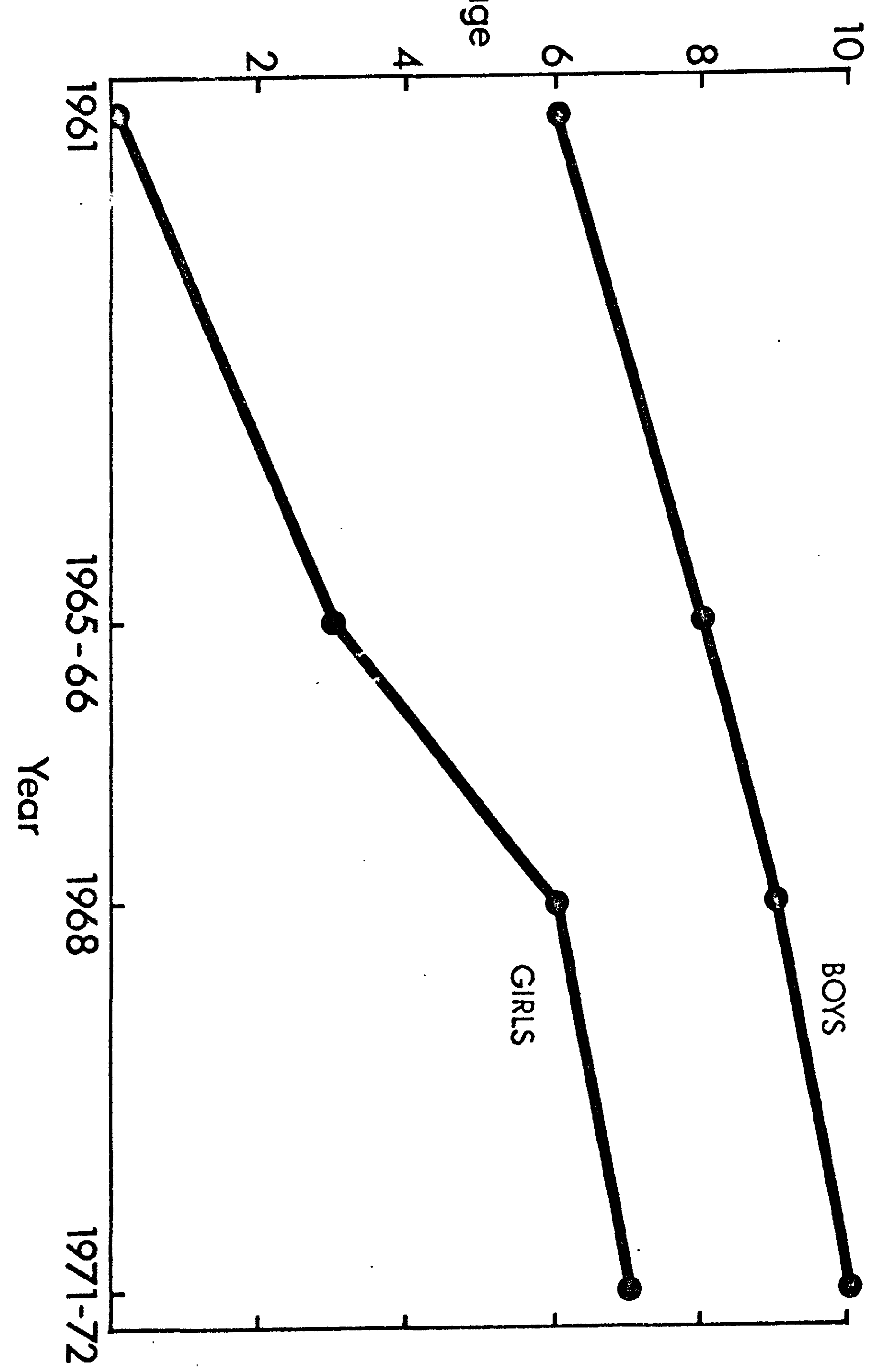
Fig. 3.

Percentages of manufactured cigarette smokers by sex and social class 1961 and 1973



There has been a great increase in the percentage of young girls smoking since 1961. Figure 4 shows the increase in England and Wales.(1)

FIG. 4

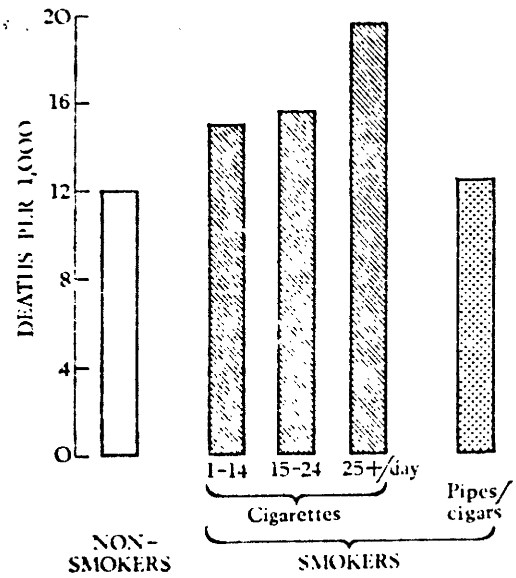


Percentage of boys and girls aged 14 who smoked at least one cigarette a day

2. Death Rates in Relation to Smoking Habits

Large surveys have been carried out on British doctors,[2] on American veterans,[3] on men and women in twenty-five States in the U.S.A.[4] (the largest of them all), and on Canadian veterans.[5] These four investigations all tell the same story. Cigarette smokers have shorter lives than non-smokers, and heavy cigarette smokers have shorter lives than lighter smokers. Those who smoke only pipes or cigars have death rates only a little higher than those of non-smokers (Fig. 5); most men who smoke only pipes or cigars are moderate smokers who do not inhale, and they have death rates similar to non-smokers; but the minority who smoke heavily (ten or more cigars or twenty or more pipes daily) and inhale, incur the same risk to life as do lighter cigarette smokers.[4,5]

FIG. 5



Number of deaths each year per thousand in male British doctors according to their smoking habits.

The percentage increase in death rates of cigarette smokers is higher at younger than at older ages, but the total number of excess deaths is higher at older ages. Thus in the largest American study,[4] from which Fig. 6 is derived, the number of deaths per thousand each year in men aged 35 to 44 is 2.1 in non-smokers and 5.5 in smokers of forty or more cigarettes a day. The rate is thus two and a half times higher in the heavy smokers, but because death rates at this age are low there are only 3.4 extra deaths per thousand each year. In men aged 65 to 74, the respective rates are 31.2 for non-smokers and 56.4 for the heaviest smokers. The heavier smokers' rate is less than twice that of non-smokers, but there are 25.2 extra deaths per thousand each year. Death rates for the heaviest smokers are similar to those of non-smokers ten years older.

The earlier in life cigarette smoking begins the bigger the risk. Those who inhale run a greater risk to life than those who do not, but the latter have a greater risk than those who do not smoker at al.[3,4]

FIG. 6

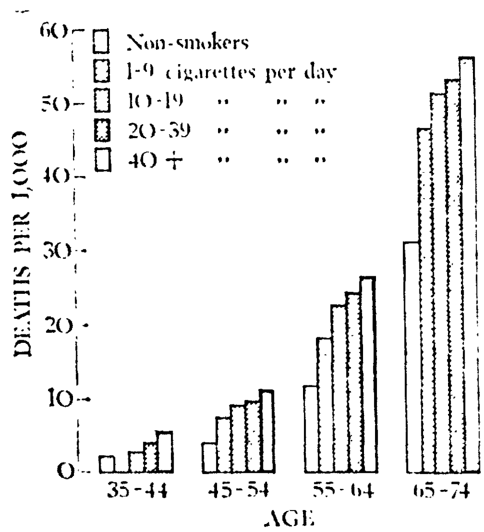


Figure . Number of deaths each year per thousand in American men at various ages according to numbers of cigarettes smoked .

3. Excess of Deaths in Cigarette Smokers in the United Kingdom

The total number of excess deaths each year in male smokers compared with male non-smokers in the United Kingdom may be estimated from the prospective study of British doctors.[2] From this source it is estimated that in 1968 in Britain there were some 31,000 more deaths in men aged 35 to 64 than would have occurred if they had all been non-smokers, and that some 20,000 of these deaths would not have occurred. Another estimate is that some 27,500 deaths would not have occurred in men and women aged 35 to 64 in 1968, if cigarettes had not been smoked.

4. Risk to Individual Cigarette Smokers

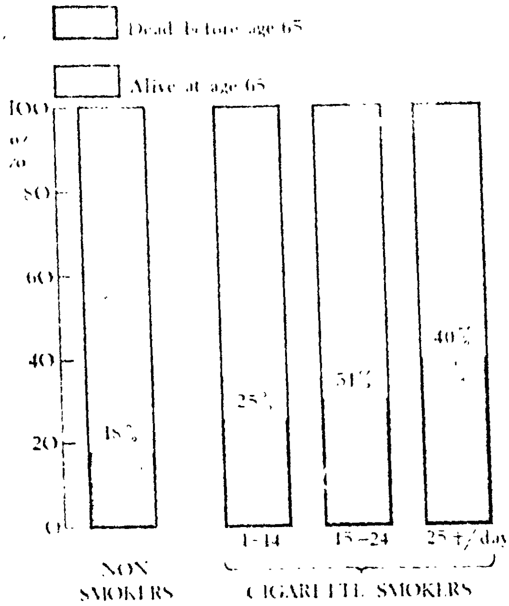
Statistics of excess deaths among cigarette smokers as a group may not give the individual smoker a clear idea of how much worse off he is than his non-smoking contemporaries. Table 1 derived from the study of British doctors, shows the chances that an average cigarette smoker who consumes various numbers of cigarettes per day has of dying within the next ten years, calculated for four decades between the ages of 35 and 74. The significance of these figures may be illustrated in terms of a lottery by supposing that for each ten-year period a man draws a ticket from a box containing one ticket marked 'Death' among a number of blanks. If he draws the marked ticket he dies within the next ten years. The ratios in Table 1 indicate the number of tickets among which the one marked ticket is placed. Thus, for a non-smoker aged 35, there is one marked ticket for the next ten years in a box of 75 tickets but for a heavy smoker of this age the marked ticket is one among 22.

Table 1

Decade	Non-Smokers	Smokers of: 1-14/Day	15/24/Day	25 or more/Day
35-44	1 in 75	1 in 47	1 in 50	1 in 22
45-54	1 in 27	1 in 19	1 in 13	1 in 10
55-64	1 in 9	1 in 6	1 in 5	1 in 4
65-74	1 in 3	1 in 2	1 in 2	1 in 2

Another point worth stressing is the chance of survival to the customary retiring age of 65. Figure 7 also based on the study of British doctors, shows the proportion of non-smokers and of light, moderate, and heavy smokers aged 35 who will survive to this age. The heavy smoker has a two in five chance of dying before the age of 65 while for a non-smoker the risk is only one in five.

FIG. 7



The amount by which a cigarette smoker's life is shortened at various ages, according to the number of cigarettes he smokes, was calculated for American men by Hammond (Table 2).(6) This shows the average expectation of life of men smoking different quantities of cigarettes at various ages, and the number of years of life the cigarette smokers lose compared with non-smokers. Thus, an average smoker of 15 cigarettes per day aged 30 will, by this estimate, expect to lose about five and a half years of life.

TABLE 2.

Life expectancy of American men at various ages, and 'years of life lost' by cigarette smokers [4]

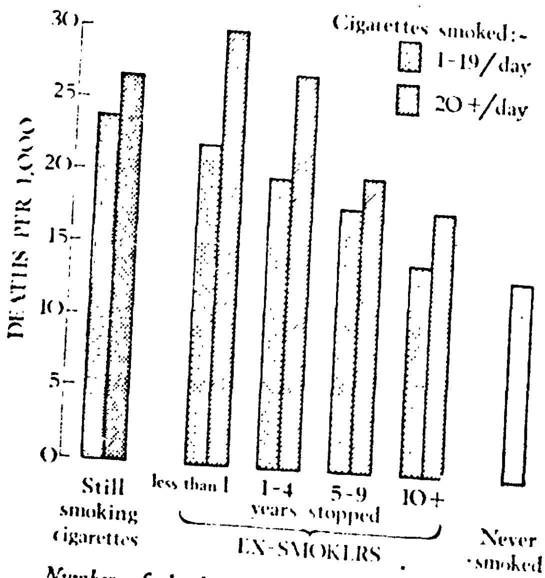
Cigarettes per day	*Life Expectation*	*Present age* 25	30	35	40	45	50	55	60	65
0	Years expected	48·6	43·9	39·2	34·5	30·0	25·6	21·4	17·6	14·[illegible]
1-9	Years expected	44·0	39·3	34·7	30·2	25·9	21·8	17·9	14·5	11·[illegible]
	Years lost*	4·6	4·6	4·5	4·3	4·1	3·8	3·5	3·1	2·8
10–19	Years	43·1	38·4	33·8	29·3	25·0	21·0	17·4	14·1	11·[illegible]
	Years lost*	5·5	5·5	5·4	5·2	5·0	4·6	4·0	3·5	2·9
20-39	Years expected	42·4	37·8	33·2	28·7	24·4	20·5	17·0	13·7	11·0
	Years lost*	6·2	6·1	6·0	5·8	5·6	5·1	4·4	3·9	3·1

* The decrease in the number of years of life lost by cigarette smokers as they get older (which may suggest that their outlook improves as they continue to smoke) is, of course, due to the shortening expectation of life. The *percentage* reduction of expectation of life gets greater with advancing age. Thus the smoker of 10-19 cigarettes per day has an expectation reduced by 11 per cent when he is 25, but by 21 per cent when he is 65.

5. Effect of Stopping Smoking

The individual will also want to know whether his risk of a shortened life could be avoided by stopping smoking. Prospective studies have all shown that when cigarette smokers cease smoking the difference between their death rate and that of non-smokers decreases steadily, and after ten years' abstinence has almost disappeared (Figure 8).(4) This reduction of excess risk among those who have stopped is found at all ages.

FIG. 8



Number of deaths each year per thousand in American men
(standardised for age) who are still smoking cigarettes, who have stopped for
various periods, and in those who have never smoked [3]. The lighter smokers
show a steady decline of annual death rates after stopping until, after
ten years, the risk is only slightly greater than that of those who have
never smoked. In the heavier smokers the increased number of deaths
in the first year after stopping is probably because some have ceased
smoking on account of illness; reduction of risk does not appear until
five years have passed and after ten years they still have a greater risk
than those who have never smoked. The reduction of the increased
risk on stopping smoking is observed in older as well as in younger
smokers so that except in those whose health is already seriously im-
paired the cigarette smoker's increased risk of dying can always be
reduced by stopping smoking.

Between 1951 and 1965 about half of British doctors who used to smoke cigarettes stopped smoking them. Many of them did this because of the evidence that it is harmful to health. A comparison of the years 1953-1957 with the years 1962-65 shows that the death rate of the sample of doctors aged 35 to 64 fell from 853 to 747 per 100,000, a reduction of 12.4 per cent, while in the total male population of England and Wales at the same ages it fell from 994 to 965 per 100,000, a fall of only 2.9 per cent (Table 3). That this contrast was due to the changes in doctors' smoking habits is indicated by the fact that for diseases which are not related to cigarette smoking the change in death rates was almost identical in both doctors and other men, while for diseases related to smoking the doctors' mortality fell by 10 per cent while the general mortality rose by 7 per cent.[7]

TABLE 3

Changes in death rates per 100,000, standardized for age in doctors and in all men aged 35 to 64 in England and Wales 1953–1957 and 1962–1965

Cause of death	*Male doctors*			*All men in England and Wales*		
	Period 1953–57	1962–65	% *Change*	*Period* 1953–57	1962–65	% *Change*
Coronary heart disease	294	277	− 6	219	290	+32
Other cardiovascular diseases	167	157	− 6	185	152	−18
All cardiovascular diseases	461	434	− 6	404	442	+ 9
Cancer of the lung	60	37	−38	113	120	+ 6
Chronic bronchitis	18	14	−22	74	71	− 4
Major diseases related to cigarette smoking	**539**	**485**	**−10**	**591**	**633**	**+ 7**
Other cancers*	130	99	−24	152	145	− 5
Other causes*	184	163	−11	250	188	−25
All unrelated causes	**314**	**262**	**−17**	**402**	**332**	**−17**
All causes	**853**	**747**	**−12**	**993**	**966**	**− 3**

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CHAPTER 4: THE INFLUENCE OF THE COMMUNAL ENVIRONMENT

1. Air Pollution

For four days in December, 1952, London was enclosed in still, cold air. The result was a dense fog in which air pollution reached an unusually high level. There was an immediate increase in the number of people dying in Greater London, and the mortality remained higher than was normal for the season (Fig. 1). It was estimated that the fog was responsible for the deaths of from 3,500 to 4,000 people either during the fog or soon afterwards.[1] In the week ending 13th December deaths in the Administrative County of London alone, at 2,484, were about three times the number that might have been expected at that time of the year. Table 1 shows that the largest relative increases were in deaths from bronchitis, pneumonia, and tuberculosis and other diseases of the lungs, with bronchitis heading the list. There was also an increased number of deaths from heart disease. Most of these deaths were in old people and the pollution probably hastened their end, but it should be noted that during December 1952 the number of persons under the age of 45 dying from bronchitis and pneumonia was also three times higher than was expected. The winter of 1952 provided a dramatic example of the deadly effect of air pollution, and was the starting point of a number of inquiries into the subject. (Table 1, Figure 1)

Table 1

Mortality Increase in the London Smog of 1952

Cause	Seasonal Norm	No of deaths in the week after smog	Relative increase
Bronchitis	75	704	9.4
Coronary disease	122	281	2.3
Myocardial degeneration	84	244	2.9
Pneumonia	37	168	4.5
Vascular Lesions of CNS	98	128	1.3
Respiratory tuberculosis	17	77	4.5
Cancer of lung	36	69	1.9
Other respiratory diseases	8	52	6.5
Other causes	410	761	1.9
All causes	887	2,484	2.8

The fog lasted from 5th December to 9th December. The graphs show the increased number of deaths during this period and also the rise in the amounts of sulphur dioxide (SO_2) and smoke in the air.(1) The pollution levels were measured at twelve different stations in London. (Fig.1)

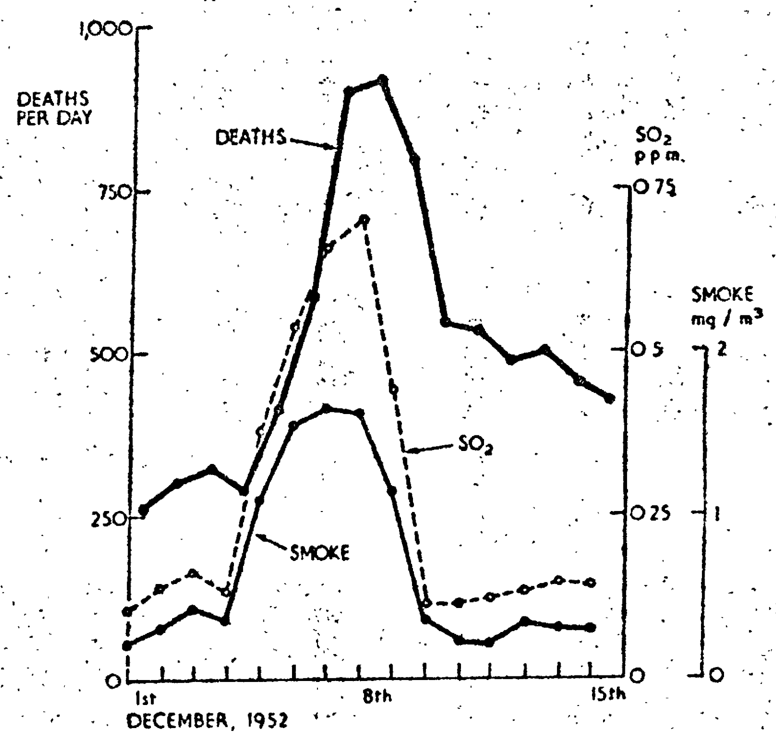

FIGURE I DEATH AND POLLUTION LEVELS IN THE FOG OF DECEMBER 1952

As a consequence of the 1952 fog in London the Clean Air Act was passed in 1956.(2) The Beaver Report, which formed the basis of the Government action, had stressed the risk to health from a heavily polluted atmosphere.(3) Other episodes indicated a similar relationship, for instance in 1930 sixty people died after a period of intense pollution of the air in a small Belgian village in the Meuse Valley.(4) In 1948 a similar episode had occurred in Donora, near Pittsburgh(5) and this, with the emergence of a lachrymatory haze of a different type of pollution in Los Angeles(6) stimulated the publication in the USA of a number of papers on the effects of air pollution on health.(7,8)

Pollution of urban air is almost entirely due to the combustion of carbonaceous fuels. For centuries raw coal was the main source of heat and other forms of energy in home and factory.

Electricity, gas, and oil now play an increasing part in meeting the need for energy, fuel oil being more and more used in central heating plants and in industry and petrol in cars.

2. Other Pollutants

Most of the particles in the air come from the combustion of fuel. Even with apparently complete combustion most fuels still pollute the air, particularly with sulphur dioxide. Practically all the sulphur in oil, and between 80 and 90 per cent of that in coal and coke go up the chimney as sulphur dioxide, one of the most important gaseous contaminants in urban air. Some of it - up to 5 per cent - may be further oxidised to sulphuric acid.

Some other pollutants of interest in relation to health are emitted by motor vehicles, for instance all oxides of nitrogen. Contamination of the air by unburnt or by cracked hydrocarbons is serious in Los Angeles and other cities where strong sunlight and stable air produce a 'photochemical smog'. Petrol engines emit large quantities of carbon monoxide. In Britain, concentrations of 10 to 20 ppm are usual in busy streets, with occasional peaks up to 100 ppm.(9) Organic lead compounds are commonly added to petrol as 'anti-knock' agents. Much of the lead is emitted with the exhaust in inorganic form; the concentrations found in busy streets are very small. Those in the air of Fleet Street in London have been found to be about 3 ug/m^3. The concentration of pollutants in urban air may increase rapidly when 'temperature inversion' occurs.

Only since 1961 have stations for sampling the atmosphere been systematically set up throughout the United Kingdom. The Warren Spring Laboratory of the Ministry of Technology organises and publishes regular reports of this National Survey.(10)

3. Chronic Bronchitis and Allied Diseases

Of diseases affecting the lungs, chronic bronchitis is one of the major causes of disablement and death in Britain, particularly among middle-aged and elderly men. In 1967, 5,253 deaths in men aged 45 to 64 (6.8 per cent of all male deaths in the same group) were attributed to bronchitis, and 1,134 deaths in women of the same age (2.6 per cent of all female deaths in this group).(11)

Just over thirty million working days are lost to industry each year because of bronchitis,[12] and the consequent cost of lost production and medical care has been estimated to amount to £65 million a year. It is therefore of great importance to the public health and to the economy to discover the causes of the disease and the effects on it of contamination of the air.

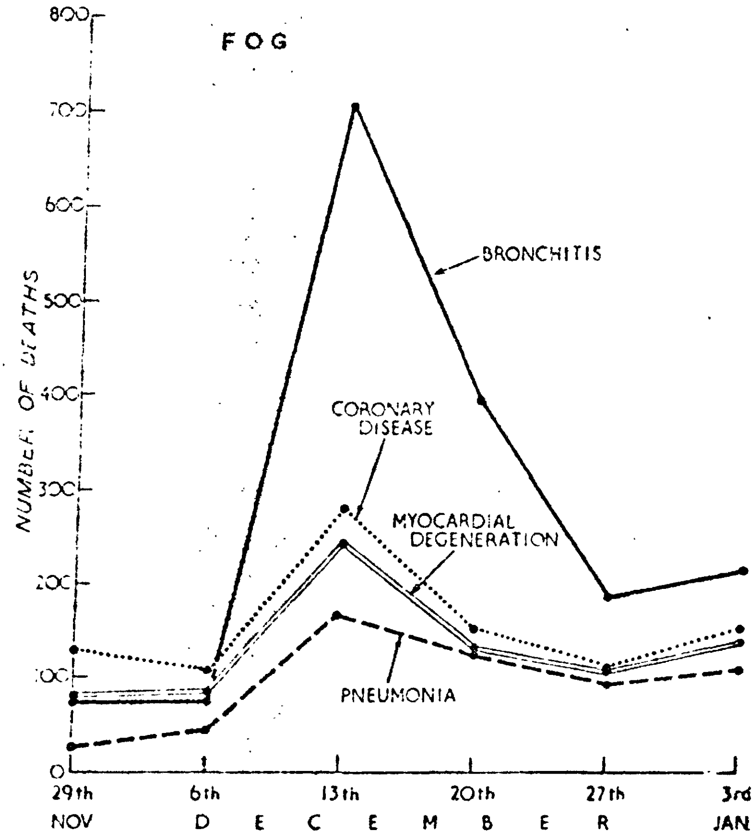

FIGURE 2 DEATHS FROM DISEASES OF THE LUNGS AND THE HEART AT THE TIME OF THE FOG OF DECEMBER 1952

It will be seen that the number of deaths from bronchitis, pneumonia and the two forms of heart disease rose during the fog and continued in excess for the rest of the month. (Fig.2)

The effects on bronchitis of sudden changes in weather and contamination of the air have been shown in other ways. Patients with bronchitis have been asked to record in a diary changes in their symptoms from day to day.[13] Figure 3 shows that deterioration coincided with increase in the concentration of both smoke and sulphur dioxide; it was less closely related to either falls in temperature or variations in relative humidity.

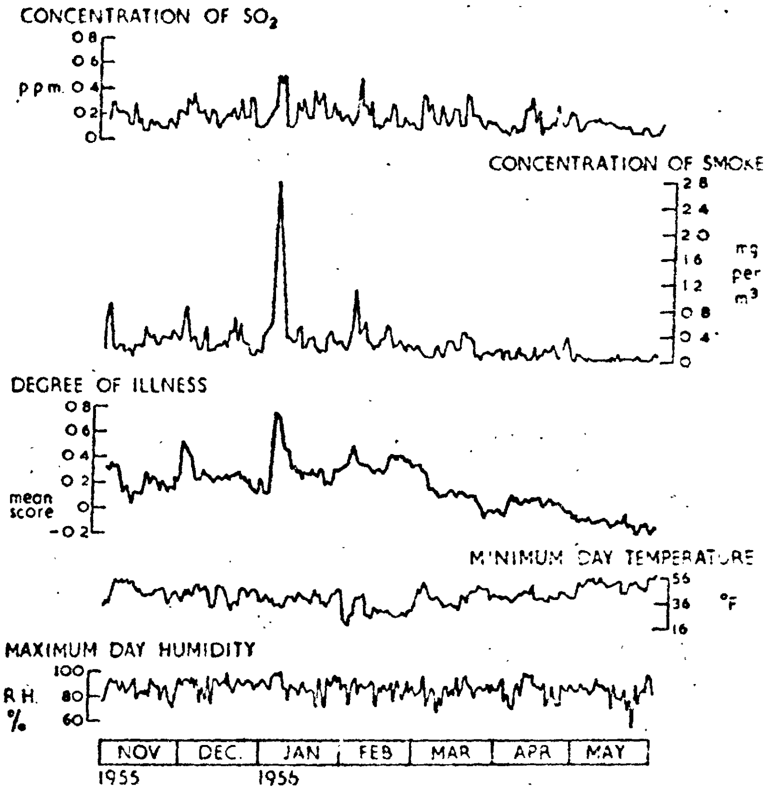

FIGURE 3 EFFECTS OF CHANGES IN WEATHER AND POLLUTION ON PATIENTS WITH BRONCHITIS

It will be noted that the sharp peak in concentrations of smoke and sulphur dioxide coincided with aggravation of the disease. Changes in temperature and humidity had little effect.

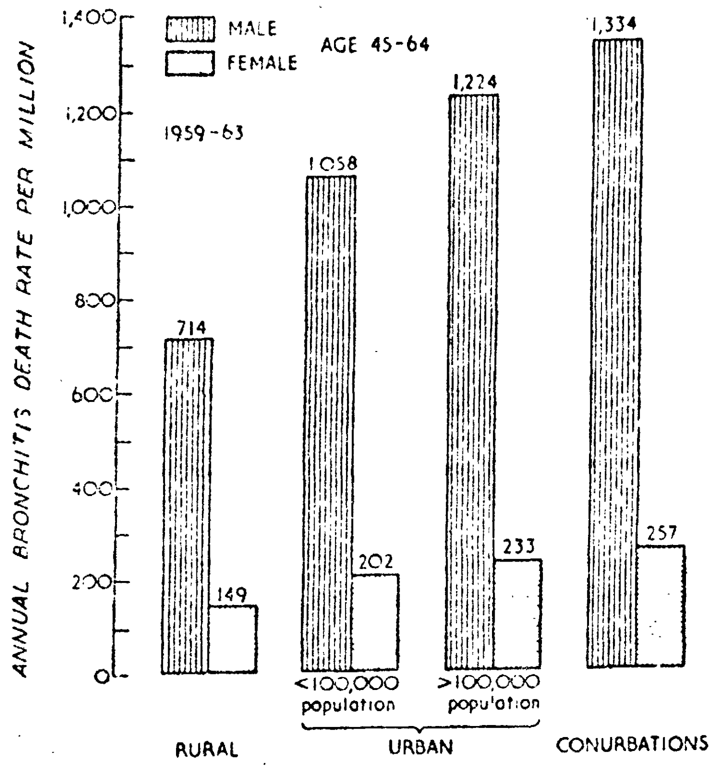

FIGURE 4 DEATH RATES FROM BRONCHITIS IN MIDDLE AGE IN RURAL AND URBAN AREAS (ENGLAND AND WALES, 1959–1963)

Figure 4 shows the great excess of bronchitis in men as compared with women. The absolute difference in the death rate as between rural areas and conurbations is particularly striking among men.(14)

Statistics of sickness absence have been related to atmospheric changes. For example, in London during the last war the monthly absence rate of postmen with bronchitis rose sharply when fog cut visibility below 1,000 metres.(15) A study of factory and office workers in London showed that rates of absence from work began to rise when 24-hour averages of 200 ug of smoke or 250 ug/m^3 of sulphur dioxide were reached.(16) And temperature changes had no additional effect. A review of medical certificates in Salford(17) disclosed that there was a doubling of the rate of absence attributed to bronchitis after periods when smoke concentration exceeded 1,000 ug/m^3.

The changes over a period of time in deaths from bronchitis among men and women can be looked at in another way. The ratio of male to female deaths at ages 55 to 59 in people born in successive five-year periods from 1866-70 onwards is illustrated in Fig.5 The change in mortality from bronchitis in middle-aged men first appeared in 1935 among those born around 1880; and increased steadily to a peak in those born in succeeding five-year periods. Yet the relative exposure to air pollution between men and women was unlikely to have varied during this time.

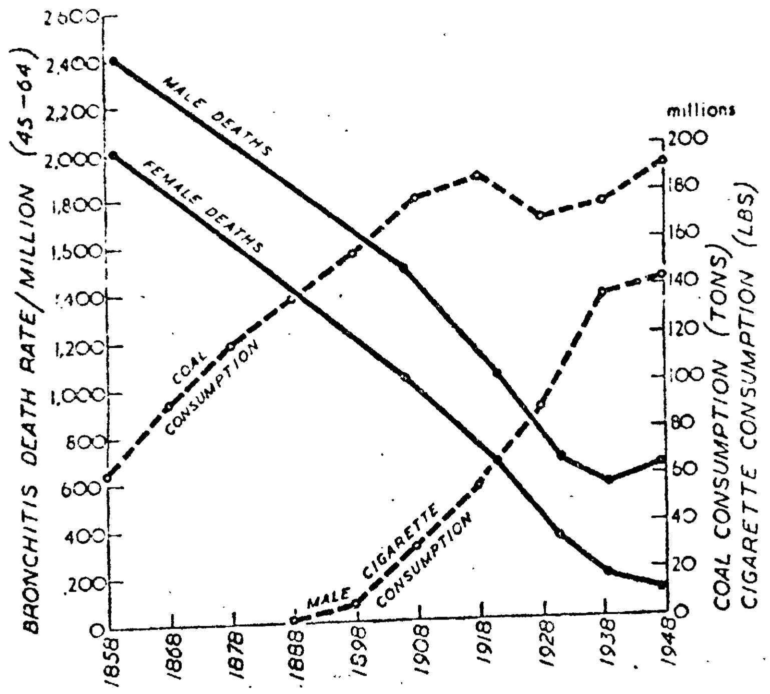

FIGURE 5 LONG-TERM TRENDS IN MORTALITY FROM BRONCHITIS RELATED TO CONSUMPTION OF COAL AND TO CIGARETTE SMOKING

Between 1858 and 1940 the death rates from bronchitis in men and women fell steeply. After 1940 the death rate from bronchitis in males rose again. In the preceding forty years, cigarette smoking among men had increased rapidly.

One study has shown that British physicians, when certifying death from the same clinical condition, usually state 'chronic bronchitis' on the certificate, whereas American and Norwegian physicians use terms such 'emphysema' or 'bronchiectasis'.[18] These and similar differences in diagnostic classification and differences in certification limit the value of international comparisons. A detailed comparison of the hospital and postmortem records of patients dying from all causes in Bristol and San Francisco has shown, however, that when the same diagnostic conventions are used there remains an excess in the death rate from chronic disease of the lung in Bristol.[19] Britain has the highest death rate in the world from chronic lung disease in middle-aged men.[20]

In rural districts air is cleaner, and there are fewer people among whom infection might spread. The death rate from bronchitis of men and their wives, standardised for age, is about five times greater in the unskilled working classes than in the professional classes, and intermediate classes have an intermediate mortality.(21)

Whatever the index of air pollution employed, all investigations in Britain have so far shown a close correlation between presumptive pollution level and mortality from bronchitis in middle life.

Another approach is to compare the frequency of absence of postmen from work because of bronchitis in different parts of the country with widely differing conditions of pollution, as indicated by the frequency of thick fog in the districts where they worked.(22) Even after density of population and domestic overcrowding were taken into account, the rates for premature death or disablement and for absence from work because of bronchitis were highest among those working in the most polluted areas. The same method of study, with uniform occupational groups, disclosed that among both postmen and bus crews the highest rates of disability from bronchitis were among men working in the centre and north-east of London, where the concentration of air pollution was highest compared with the rest of london.(23,24)

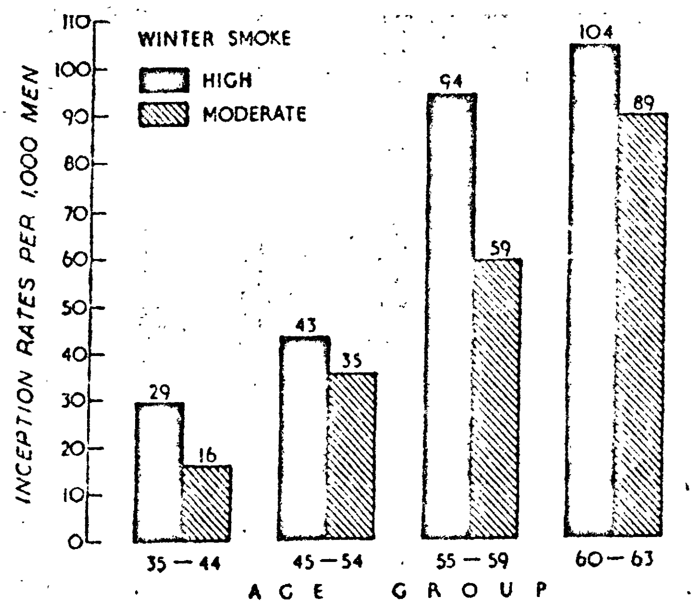

FIGURE 6 SICKNESS RATES FROM BRONCHITIS IN AREAS OF DIFFERENT POLLUTION IN LONDON

The frequency of absence from work because of bronchitis increases as men grow older. Within the London area, climate is uniform but inception, i.e. attack, rates are higher in every age group in districts where smoke concentrations in winter are also high.(25) (Fig.6).

A nation-wide survey of symptoms by standardised techniques conducted by the Royal College of General Practitioners in 1961 showed that after age, sex, social class, and tobacco smoking had been taken into account, bronchitis was twice as frequent in large towns as in the rural areas of Britain.[26]

4. Effects of Air Pollution and Cigarette Smoking

In Northern Ireland a retrospective inquiry into mortality from bronchitis gave useful information on exposure to different urban and rural environments as well as to dustiness of occupation, smoking habits, social class, and other personal factors.[27,28] Questions about these aspects of life were put to the relatives of patients who had died from chronic bronchitis and to relatives of a representative control sample of the population matched for sex and age. The death rates in the two groups illustrated the major importance of smoking habit and social class in this disease; but even when age and smoking differences were taken into account there remained a marked residential gradient in mortality ranging from 73 per 100,000 in rural districts to 310 per 100,000 for the centre of Belfast.

The immediate effects of a rise in pollution above normal winter levels have been seen in the aggravation of existing bronchitis, increased sickness absence, more demand for hospital beds, and greater mortality among patients already suffering from chronic disorders of the lung. Results from the many studies on these acute effects reviewed here point to the direct influence of pollution in addition to any attributable to low temperatures, but the actual pollutant responsible have not been identified.

5. Respiratory Disorders in Young People

TABLE 2

DEATH RATES (PER 100,000) FROM INFLUENZA, BRONCHITIS AND PNEUMONIA AT AGES 0–14 YEARS, 1957–61

	Males	*Females*
Northern Ireland	40	31
Scotland	37	31
England and Wales	35	28
France	33	19
Norway	20	16
Denmark	18	15
Netherlands	14	12

TABLE 3

BRONCHITIS DEATH RATES (PER 100,000), ENGLAND AND WALES (MALES AND FEMALES), 1960–63

	0–4	5–14	15–44	45–64
Conurbations and Urban 100,000+	16	0·4	2·2	75
Urban 50,000 to less than 100,000	13	0·5	1·9	61
Rural	11	0·8	1·4	43

Table 2 shows that the death rates from respiratory disease in children are higher in England and Wales than elsewhere in North West Europe, and double the rates in Scandinavian countries. Excess of deaths from bronchitis in pre-school years in British towns is shown in Table 3; and the same trend is observed in those over the age of fifteen years.

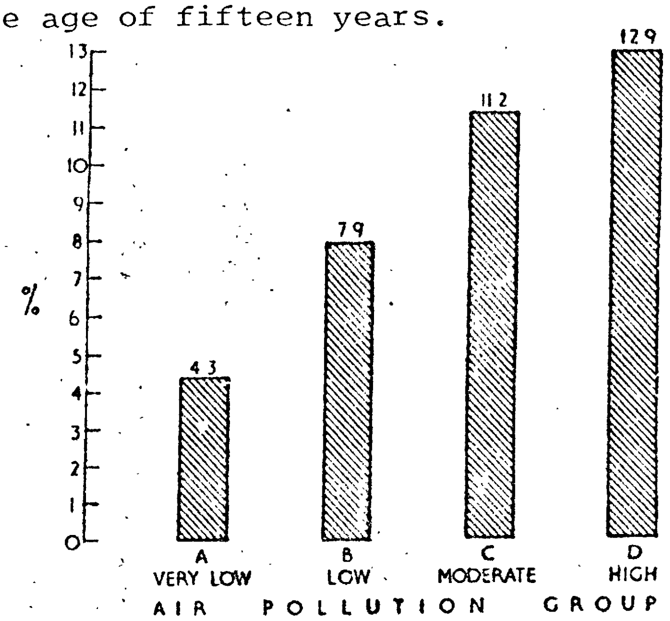

FIGURE 7 BRONCHITIS IN CHILDREN AT LOCAL LEVELS OF AIR POLLUTON

The diagram shows that the percentage of children having repeated attacks of bronchitis increases with the amounts of air pollution.(29)

Death rates from respiratory diseases (influenza, bronchitis, and pneumonia) in British children up to the age of 14 are about double those in Scandinavian countries and the Netherlands.

Surveys in Britain have shown that bronchitis in children is especially frequent in areas where there is much air pollution. But it is also common in South Wales, where pollution is relatively low. There is some evidence that air pollution particularly affects children from working-class homes.

Children with bronchitis are more liable to disease of the ear and nose than children free from bronchitis. Discharging ears or damaged ear drums are commoner among urban than in rural children. Evidence that air pollution affects the upper as well as the lower respiratory tract is suggestive but not, as yet, conclusive.

5. Field Surveys of Lung Cancer

In Northern Ireland, for people with similar smoking habits the risk of dying from lung cancer rose from 47 per 100,000 per annum in the rural areas consistently through urban districts to a maximum of

157 per 100,000 among those who had spent most or all of their lives in central Belfast.(27,28) From the results obtained it was calculated that if the death rate from lung cancer for a symptomless non-smoker living in a rural area is taken as the irreducible minimum, the risk of death from the disease would be about doubled for a man living in an urban area, but increased twenty-fold if he smoked more than 20 cigarettes a day.(30)

Among cigarette smokers the death rate from cancer of the lung in doctors under the age of 65 rises from 40 per 100,000 in rural areas to 64 per 100,000 in the conurbations of Britain.(31)

These results, and those of retrospective inquiries and comparisons of mortality statistics, demonstrate that there is an association between urban residence and the risk of dying from lung cancer, independent of the influence of current smoking habits.

TABLE 4

RURAL/URBAN GRADIENTS IN LUNG CANCER MORTALITY IN THE UNITED STATES AND ENGLAND AND WALES ADJUSTED FOR AGE AND SMOKING

Population of area	Standardised Mortality Ratios (per cent)* Males (US national male rate =100%) US	England & Wales	Females (US national female rate =100%) US	England & Wales
500,000+	123	231	132	236
50,000—	111	195	144	216
<50,000	107	194	106	149
Rural	79	177	78	134

*The death rates from lung cancer for non-smokers and those smoking varying numbers of cigarettes each day found in a US national survey (32) have been used to calculate the number of deaths in corresponding smoking groups in each type of area in England and Wales that would have occurred if the inhabitants had the same risk of dying from lung cancer as the Americans as a whole. The Standardised Mortality Ratio expresses the number of deaths from lung cancer actually reported in these areas as a ratio to the number that would have been expected on this basis.

7. Experience of Migrants

The death rates from cancer of the lung among British-born people living in the less polluted atmospheres of New Zealand, South Africa, the United States, and Canada, lie between the lower rates of those born in these countries and the higher rate for Britain itself.(33,34,35,36,37) This suggests that there is an enduring effect of British conditions or habits on the risk of developing lung cancer; and this might be due to exposure to high levels of air pollution in early life. In South Africa the British immigrant, with apparently identical smoking habits and living in the same areas as his South African-born contemporary, still has a higher rate of mortality from cancer of the lung.[34] Table 5 shows death rates from lung cancer for British and Norwegian migrants to the United States, for residents in the United States born there, and for Britons and Norwegians staying in their own countries.[36] The rates are highest for Britons and lowest for Norwegians staying in their own countries, with United States citizens coming in between.

Table 5

Age-Standardised Lung Cancer Death Rates.

Per 100,000 per Annum
(Males aged 35-74)

Norwegian-born residents in Norway	31
Norwegian-born residents in the United States	48
US-born residents in the United States	72
British-born residents in the United States	94
British-born residents in Britain	151

While British emigrants to South Africa had a higher lung cancer risk than the white South Africans, who had smoked more, they had a lower risk than if they had stayed in Britain.[38] On the other hand, the British immigrants lost most of their high risk of dying from chronic bronchitis and in South Africa had only one third of the risk occurring in England and Wales.[34]

8. Other Effects of Air Pollution

The effects of relatively high amounts of carbon monoxide in the blood are well documented, but recently there has been a renewal of interest in the possible effects of concentrations below those causing symptoms such as headache. In such instances, visual threshold and discrimination may be impaired, as, it is suggested, may be the performance of various other tests of psychomotor performance and perception.[39, 40,41]

9. Cardiovascular Disease

During the intense fog of December 1952 the death rates from degenerative heart diseases increased above the normal. An analysis of the death rates from cardiovascular disease in larger county boroughs of England and Wales showed little correlation with the index of air pollution as measured by local coal consumption, once social and other factors were taken into account.(42)

10. Cancer of the Stomach

Death rates from cancer of the stomach and intestine have been found to be significantly related to levels of atmospheric pollution in thirty English county boroughs.(43) In South Africa, British migrants have a lower death rate from gastric cancer than white South Africans presumed to have been less exposed to air pollution.(34) In the absence of further evidence a causal link between air pollution and gastric cancer must remain no more than a speculation.

11. Effects of the Clean Air Acts

In London, implementation of the Clean Air Act of 1956 has markedly reduced the amount of smoke emitted and lowered its concentration. The emission of sulphur dioxide in the air has changed little, but better dispersion has also produced lower concentration of this pollutant in London air.

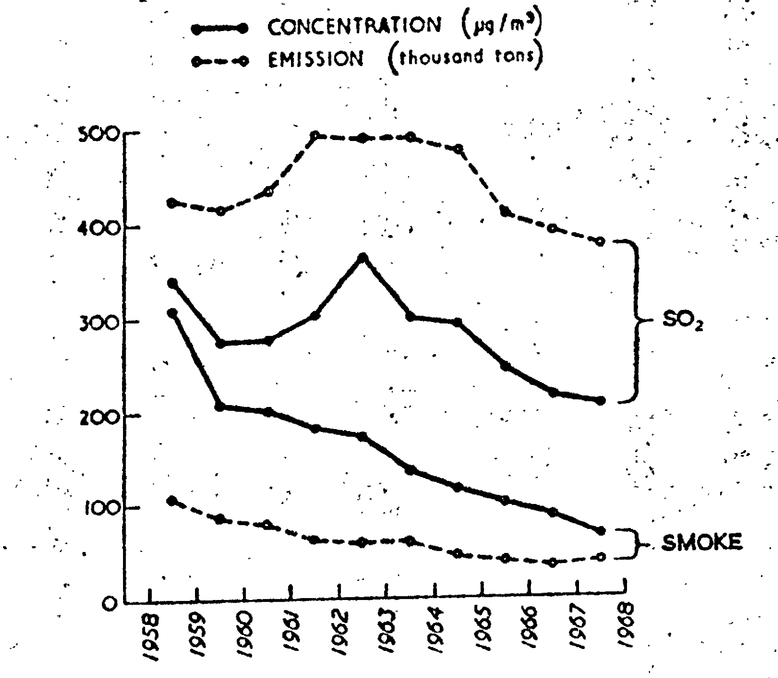

FIGURE 8 CHANGES IN THE EMISSION OF SMOKE AND SULPHUR DIOXIDE AND THEIR CONCENTRATION IN LONDON AIR

The Clean Air Act has been applied most effectively in London.

The most striking result was seen in December 1962 when the atmospheric conditions that caused the fog of December 1952 were closely simulated, but there were not the deaths that occurred in 1953 because the air pollution was much less.

Since the passing of the Clean Air Act in 1956 a close watch has been kept on the relation between fogs and mortality from bronchitis in London. The definite association observed in the previous decade between excessive mortality and peaks in air pollution can no longer be demonstrated. During bad fogs there used to be more calls for emergency admission to London hospitals. The correlation between air pollution and demand for beds has now virtually disappeared.

Recent advances in the Assessment of Health Effects of Environmental Pollution were reported at an International Symposium held by the Commission of the European Communities, the World Health Organisation and the United States Environmental Protection Agency in Paris in June 1974 [45]. We would like to acknowledge the assistance of the Air Pollution Control Unit of the Medical Research Council of Great Britain and the report by the Royal College of Physicians on Air Pollution and Health [46].

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CHAPTER 5: THE ACCEPTABLE RISK

It is not always easy emotionally to accept the theory of probability. Most of us have heard the story "My uncle smoked 40 cigarettes a day and lived to be 85, therefore cigarette smoking cannot be responsible for the deaths from lung cancer or chronic bronchitis". This argument, which is very often used, occurs because of a lack of understanding of the theory of probability. While it is true that some people may smoke heavily, eat too much, take no exercise, and still live to a good age, the probability of their doing so is very much less than those who do not. A good example of this is that those who smoke 20 cigarettes a day have only half the probability of reaching retirement age of 65 as those who do not smoke at all.(1) In order to study the risks, it is valuable to compare the population living in an ideal community with those living in a most adverse community, and this can be done with each of the diseases under consideration.

1. Lung Cancer

If we take the example of lung cancer or bronchial carcinoma, the risk of the non-smoker living in a truly rural area developing lung cancer is extremely low, perhaps at the risk of 10 per 100,000 per year, but nevertheless there is this risk. A further complicating factor is that the type of cancer occuring in a non-smoker in an ideal situation is often different to that occuring amongst the smokers. It is more likely to be an adeno-carcinoma than a squamous carcinoma. These differences were very well illustrated by the studies in Northern Ireland,(2) in South Africa,(3) and in North East England,(4) and by the studies comparing mortality among the British immigrants to the United States with that of the Norwegians.(5)

2. Chronic Bronchitis

Chronic Bronchitis, which is known as the English disease, is undoubtedly associated with air pollution and with cigarette smoking, but climate alone does not appear to be the important factor, for instance Norway has a worse climate than that of England and yet the chronic bronchitis rates are much lower there than they are in England, and Reed and his co-workers have shown that this is also true of the Norwegian immigrants to the United States in comparison to the immigrants to the United Kingdom.[5] Chronic bronchitis appears to result in about equal measure from cigarette smoking and from the various factors that pollute urban air.

3. Ischaemic Heart Attacks

It has often been commented that ischaemic heart attacks must have been rare 100 years ago. It is, for instance, of great interest that they are not recorded in any detail by Osler in his text book of medicine,[6] and yet he was such a keen observer that if it had occurred he would certainly have noticed it. As has been stated already, heart attacks are multi-factorial - a combination of genetic and environmental factors. Some people are born into a family with a greater risk, perhaps because of a high blood fat of one type or another, or perhaps for hypertension or diabetes. Nevertheless, however adverse the genetic factors, whether or not the attack takes place depends to a very great extent on the environment, and this has been well illustrated in South Africa where ischaemic heart attacks were almost unknown among the Bantu until recently, and are very common, more common than in most European countries, amongst the South African white population.[7] Today, ischaemic heart attacks are starting to occur among the well-to-do Bantu traders who are smoking cigarettes and earing a white man's diet.

4. Stroke

Stroke cannot be considered as one condition as there are two major types of stroke; cerebral haemorrhage and cerebral thrombosis, there is a less common type often affecting young people which is the rupture of a congenital aneurysm.

Cerebral haemorrhage is strongly related with high blood pressure and while high blood pressure in its essential form usually occurs in families, although it may develop from diseases such as renal disease, if it is controlled by the use of modern anti-hypertension drugs, the risk of cerebral haemorrhage can be greatly reduced.[8]

Cerebral thrombosis, although the reasons are not very clear, is not only strongly associated with lower social class males, it is also associated with cigarette smoking. Those who smoke 20 cigarettes a day have twice the risk of cerebral thrombosis.

The rupture of a cerebral aneurysm is much less common than the other two forms of stroke and in this form, unlike the other two, the genetic factor would appear to be of primary importance.

5. An Acceptable Model

In practice, there is acceptance of a threshold of acceptable risk and this threshold will change with increasing knowledge and increasing standard of living and ability to alter the factors concerned. For an example of how the acceptable threshold works, whilst urban air pollution is a major factor contributing to chronic bronchitis, and to a lesser extent to lung cancer it was, during the 1939/45 was, a deliberate policy in the United Kingdom to encourage the factories to produce as much smoke and air pollution as possible so as to blanket the cities from air attack.

Another example which comes to mind is the high level of cancer of the oesophagus that occurs at epidemic proportions in certain areas such as the Transkei of South Africa and in parts of Iran, and to a lesser extent in Brittany. But these risks are still accepted.

Perhaps the most important breakthrough in our understanding of many of the cancers and the intractable neurological diseases such as multiple sclerosis and Parkinson's disease is an appreciation that these diseases, while they may have a genetic component, are in the main environmental. The evidence for this is the huge difference in the incidence of disease in people of the same genetic stock living in different environments, and how they carry with them when they move from one environment to another the higher or lower risk of the area from which they came. Some examples of this are the British immigrants to South Africa, who carry with them a high risk of lung cancer and colon and rectum cancer, whether they settle in cities, in other urban areas, or in rural areas.(7)

5. Lead Poisoning

Lead absorption is among the most important hazards to health.[9] Lead may be absorbed from the atmosphere, for instance from the exhaust gases of cars and in the vicinity of lead mines and smelters. It can also be absorbed by mouth from food, water and, for example, paint containing lead in children.

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CHAPTER 6: CRITICAL GROUPS AND THE SIZE OF POPULATION AFFECTED

Definitions of Various Areas

The intensity, and therefore the effects of air pollution, tend to increase as population density increases. Population areas can be classified so that they cover as wide a range as practical of population densities from the most concentrated to the least concentrated population aggregates.

The urban/rural aggregates currently adopted is that of the analysis of mortality statistics published in the Registrar General's annual "Statistical Review of England and Wales" and it consists of:

Conurbations
Areas outside conurbations
Urban areas with population of 110,000 and over
" " " " " 50,000 and under 100,000
" " " " " under 50,000
Rural districts

Todd has used such a classification as follows:

London - Total
" - Central
" - North
" - South
Conurbations
County Boroughs
Other urban areas
Rural districts - Total
- Truly rural
- Other rural

"Truly rural" areas in this analysis were those which satisfied the following three conditions as defined in the Registrar General's "Statistical Review of England and Wales, 1953"(2)

i. Industrialisation index of one or less (i.e. not more than 1 per cent of total rateable value is assessed as industrial property).
ii. Not contiguous with town or urban district, or group of such, with population of 25,000 or more.

iii. Density of population not greater than one person per four acres.

It would certainly seem desirable, if it is practical, to include these two extremes of central London boroughs and the truly rural areas in any classification of urban/rural aggregates for the purpose of pollution studies. Without these two categories the true range of variation in pollution in England and Wales could be seriously under-stated. Further, the average so-called rural area in England and Wales tends to have a greater population density and to contain more industrial establishments than the average rural area in other countries. For some international comparisons, comparative studies on the basis of truly rural areas are therefore to be preferred. Death rates for groups of London boroughs and for truly rural areas of England and Wales have been provided in the past. Table 1 shows a normograph of age standardised mortality ratios for cancer of the lung and bronchus.(3)

Table 1

Cancer of lung and bronchus: Standardised mortality ratios by sex in the urban and rural aggregates, and in selected rural ("truly rural") areas within regional groups, 1950-53 and 1954-57, England and Wales.

	Males		Females	
	1950-53	1954-57	1950-53	1954-57
ENGLAND AND WALES	100	100	100	100
Conurbations	126	124	121	127
Areas outside conurbations				
Urban areas with populations of 100,000 and over	111	109	101	94
Urban areas with populations of 50,000 and under 100,000	95	96	89	92
Urban areas with populations under 50,000	84	86	86	79
Rural districts	64	69	76	77
"Truly rural" areas				
North of England	48	48	67	64
Midlands and Eastern	47	51	66	39
South of England	49	62	67	71
Wales	33	43	56	57

From these figures it can be seen that the male lung cancer deaths are three times greater in the urban conurbations than say in the "Truly rural" areas of Wales, and the female lung cancer deaths are more than twice as high in the conurbations than in the "Truly rural" areas of Wales.

The numbers of deaths and death rates from lung cancer and bronchitis of men and women in truly rural areas of Northern Ireland during the years 1960-62 were summarised and analysed in a study by Dean (1966) and Wicken (1966).[5] This type of analysis was of particular value in distinguishing between the health effects of air pollution and cigarette smoking.

TABLE 2

Lung cancer and bronchitis mortality rates per 100,000 per year in Northern Ireland, 1960-62, among men and women aged 35+

	Lung Cancer	Bronchitis
Males	100	144
Females	17	63

TABLE 3

Age-standardised lung cancer mortality rates per 100,000 per year of men (aged 35+) in various smoking-habit and area groups in Northern Ireland.

	Inner Belfast	Outer Belfast	Urban Districts	Small Towns	Environs of Belfast	Truly Rural Districts	Northern Ireland
Non-smokers	36(6)	40(10)	21(7)	-	16(1)	10(9)	18(33)
Past and present smokers of:							
Cigarettes only							
1-10 per day	138(37)	140(25)	121(33)	71(3)	60(6)	25(12)	87(116)
11-22 " "	288(90)	207(43)	171(57)	260(9)	192(16)	76(46)	168(261)
23+	509(75)	430(53)	515(60)	772(11)	716(13)	173(40)	383(252)
Cigarettes and pipe/ cigars	124(15)	156(13)	81(10)	134(2)	204(6)	48(11)	94(57)
Pipe/cigars only	73(18)	62(11)	57(17)	13(1)	65(3)	28(31)	41(81)
Total population (1961) (thousands)	43.7	40.8	59.8	6.6	19.9	121.4	292.3

The numbers in brackets are the number of deaths in the sub-group

TABLE 4

Age-standardised lung cancer mortality rates per 100,000 per year of women (aged 35+) in various smoking-habit and area groups in Northern Ireland.

	Inner Belfast	Outer Belfast	Urban Districts	Small Towns	Environs of Belfast	Truly Rural Districts	Northern Ireland
Non-smokers	16(23)	11(12)	12(17)	15(3)	10(4)	9(29)	11(88)
Past and present smokers of cigarettes only:							
1-10 per day	33(6)	13(3)	27(5)	73(1)	50(2)	11(2)	25(19)
11-22 " "	172(4)	101(6)	68(7)	73(1)	-	56(7)	74(25)
23+	78(5)	155(3)	615(5)	-	-	40(5)	210(18)
Total population (1961) (thousands)	54.8	52.8	77.2	7.8	21.7	120.7	334.9

TABLE 5

Age-standardised bronchitis mortality rates per 100,000 per year of men (aged 35+) in various smoking-habit and area groups in Northern Ireland.

	Inner Belfast	Outer Belfast	Urban Districts	Small Towns	Environs of Belfast	Truly Rural Districts	Northern Ireland
Non-smokers	216(38)	81(20)	44(16)	-	68(5)	42(45)	64(124)
Past and present smokers of:							
Cigarettes only:							
1-10 per day	411(107)	315(56)	152(41)	-	191(13)	63(28)	189(245)
11-22 " "	327(100)	333(63)	242(62)	363(11)	277(16)	93(48)	220(300)
23+	475(68)	222(28)	366(37)	161(2)	554(5)	166(28)	284(168)
Cigarettes and pipe/cigars	158(20)	128(11)	103(12)	-	-	76(19)	99(62)
Pipe/cigars only	339(80)	186(40)	148(47)	126(7)	110(7)	67(108)	118(289)

TABLE 6

-standardised bronchitis mortality rates per 100,000 per year of women (aged) in various smoking-habit and area groups in Northern Ireland.

	Inner Belfast	Outer Belfast	Urban Districts	Small Towns	Environs of Belfast	Truly Rural Districts	Northern Ireland
-smokers	116(162)	68(81)	57(104)	39(5)	48(15)	34(123)	58(490
ast and present kers of cigarettes y:							
-10 per day	112(19)	125(13)	72(12)	-	39(3)	46(10)	77(57)
-22 " "	323(7)	260(5)	126(5)	-	-	48(3)	118(20)
.	53(3)	63(1)	407(9)	355(1)	-	40(1)	201(15)

In all areas of residence the risk of dying from lung cancer increased with the number of cigarettes smoked, but at each level of smoking the cancer risk was greater in Inner Belfast than in the truly rural areas. In chronic bronchitis the urban factor was even more marked.

Using these figures it is possible to calculate the number of lung cancer deaths expected (a) if no one smoked cigarettes, (b) if everyone lived in the pollution-free truly rural areas and continued to smoke as at present, (c) if everyone both stopped smoking and lived in the clean atmosphere of the truly rural areas. Similar calculations can be undertaken for chronic bronchitis.

For instance, if no one smoked cigarettes in Northern Ireland the lung cancer rates would be reduced for males aged 35 and over from 100 to 18 per 100,000 per year - less than one-fifth - and for females from 17 to 11 per 100,000 per year. For chronic bronchitis the reduction for males would be from 144 to 64 per 100,000 per year - about half - and for females from 63 to 58 per 100,000. If everyone lived in pollution-free areas of truly rural Northern Ireland and smoked as at present, the male lung cancer deaths would be reduced one-third, from 100 to 28.5, and the male chronic bronchitis deaths halved, from 144 to 67.4 per 100,000 per year.

. Non-Smokers in Rural Areas

One of the important questions that have been asked in relation to mortality from lung cancer and bronchitis is: "What is the death rate from lung cancer and bronchitis in the absence of both smoking and urbanization?".

Table 7

Age-standardised lung cancer and bronchitis mortality rates per 100,000 per year among non-smokers (aged 35+) in Northern Ireland 1960-62

	Lung Cancer		Bronchitis	
	Males	Females	Males	Females
Inner Belfast	36(6)	16(23)	216(38)	116(162)
Outer Belfast	40(10)	11(12)	81(20)	68(81)
Total Belfast	38(16)	14(35)	137(58)	94(243)
Urban districts	21(7)	12(17)	44(16)	57(104)
Small towns	-	15(3)	-	39(5)
Environs of Belfast	16(1)	10(4)	68(5)	48(15)
Truly rural districts	10(9)	9(29)	42(45)	34(123)
N. Ireland (average)	18(33)	11(88)	64(124)	58(490)

Table 8 summarises the estimated of the lung cancer and bronchitis mortality rates of non-smokers in rural areas that are available from enquiries carried out in the United Kingdom.

Table 8

Lung cancer and bronchitis mortality rates of non-smokers per 100,000 per year

	Lung Cancer	Bronchitis
Truly rural districts N.Ireland, men aged 35+ age-standardised rate, 1960-62	10(9)	42(45)
Rural areas, U.K., male doctors aged 35+ standardised rate Nov. 1951-Oct. 1961	12(1)	
Jersey men aged 35+, 1952-61	18(2)	
North Wales seaboard men aged 35-74, standardised rate 1952-55	22(5)	
Four rural districts, N.Riding of Yorkshire, men aged 35+ standardised rate 1952-62	29(5)	31(7)
Guernsey, Alderney, and Sark, men aged 35+	33(4)	

The figures in Table 8 are orders of magnitude. Although the Channel Islands are not industrialised, it may not be wholly accurate to regard them as rural areas. Even with these limitations on comparability, the figures in Table 8 show more variation than might have been expected, possibly as a result of the smallness of the numbers on which the rates are based. According to the largest study, however, the lung cancer mortality rate for non-smokers in truly rural districts of Northern Ireland was 10 deaths per 100,000 per year for men and 9 deaths per 100,000 per year for women. The corresponding mortality rates for bronchitis were 42 for men and 34 for women.

It is of particular interest that the lung cancer mortality rate for male non-smokers in the truly rural districts of Northern Ireland - that is, in the presence of only minimal air pollution - should be as low as 10 deaths per 100,000 per year. In a study of lung cancer in South Africa(6) the lowest lung cancer death rate encountered was the rate for male non-smokers aged 45-64 who had been born in South Africa, who lived in rural districts, and who were non-smokers. Their lung cancer mortality rate was 8 deaths per 100,000 per year. However, the age groups covered by the South African study - namely 45-64 - differed from those covered in the Northern Ireland study (35+); but, putting the Northern Ireland study on the same basis, there were only four male non-smokers aged 45-64 who lived in the truly rural districts of Northern Ireland and who died of lung cancer in the period 1960-62. This number of deaths is equivalent to a rate of 9 per 100,000 per year for men aged 45-64. The lung cancer mortality rate of male non-smokers in truly rural districts of Northern Ireland was therefore practically the same as the South African figure for locally born men, despite the great differences between the climates of the two areas. The Northern Ireland rate was also not very different from the rate of 14 found by Mills (1960)(7) for male non-smokers aged 40-69 in rural Ohio in 1947-55.

If the male lung cancer mortality rate in the United Kingdom may be taken, in the absence of smoking and air pollution and other contributions by urbanization, as being about 10 deaths per 100,000 per year, then the higher mortality rates than this found for rural non-smokers in the other surveys suggest that air pollution may have had a more widespread effect, or that urban dwellers had moved to rural areas to a greater extent, than had been previously appreciated, even though the smallness of the numbers involved may also have contributed to some of the unexpectedly high figures.

It has been argued, for example, that in the absence of smoking, an urban factor makes little or no significant contribution to lung cancer.[8,9] Sufficient figures are now available for non-smokers to show that both the lung cancer and bronchitis mortality rates of non-smokers are significantly higher in urban than in rural areas.[4]

3. Social Class

In the Northern Ireland enquiry the possible association of lung cancer mortality and bronchitis mortality with four other factors was examined. These factors were social class (as represented by occupation), other chest illness, morning cough three years or more prior to death, and frequency among relatives of deaths from cancer or bronchitis. The association of male lung cancer and bronchitis mortality rates with social class is shown in Table 9.

Table 9

Lung cancer and bronchitis mortality rates per 100,000 per year among men (aged 35+) in various social class groups in Northern Ireland, 1960-62

Social Class	Lung Cancer	Bronchitis
Professional and intermediate occupations	75(144)	98(221)
Skilled occupations	121(362)	154(434)
Partly skilled and unskilled occupations	114(285)	199(534)

There are significant social class differences in the incidence of both lung cancer and bronchitis in men. A social class gradient in male lung cancer mortality rates in all or parts of England and Wales has also been found by the Registrar-General.[4]

4. Statistical Conclusions of the Northern Ireland Study and their Implications

The main statistical conclusions that emerged from this enquiry were:

1. The male and female lung cancer mortality rates and the male bronchitis mortality rate, but not the female bronchitis mortality

rate in Northern Ireland were substantially below the corresponding rates for England and Wales.

2. The range of variation between the lowest and the highest lung cancer mortality rates found in the various sub-groups of the adult population of Northern Ireland indicated that lung cancer mortality among both men and women during the years 1960-62 was more strongly associated with smoking than with any other environmental factor examined.

3. Bronchitis mortality in Northern Ireland among both men and women during the years 1960-62 was associated mainly with urbanization and smoking habits.

4. Among male non-smokers lung cancer and bronchitis mortality rates in Northern Ireland were three to four times as high in Belfast as in truly rural districts, but the trend was not completely consistent for intermediate levels of urbanization, possibly owing to the smallness of the numbers.

5. The lung cancer mortality rates of male non-smokers aged 45-64 in truly rural districts of Northern Ireland were about the same as those for South Africa, despite the differences in climate between the two countries.

6. Both the lung cancer and the bronchitis mortality rates of men in Northern Ireland were inversely associated with social class, but the association was much greater for bronchitis than for lung cancer.

7. Morning cough at least three years before death was much more common in lung cancer subjects of both sexes than in the controls, and the percentages in both groups having cough increased with the number of cigarettes smoked per day.

8. No association was found between month of birth and mortality from lung cancer or bronchitis.

9. The association of male bronchitis mortality with smoking habits and social class was confined to the chronic form of bronchitis. Deaths from acute bronchitis were not associated with

these factors.

10. Bronchitis was the cause of almost twice as many deaths in Northern Ireland as lung cancer, and, in addition, bronchitis as a secondary cause of death further contributed to about two-thirds as many deaths as those of which it was a primary cause. Bronchitis as a contributory cause of death was also associated with urbanization in Northern Ireland.

11. The group of men characterised by heavy cigarette smoking, chronic morning cough, residence in Belfast, and partly skilled or unskilled occupation had the highest mortality rates for both lung cancer and bronchitis.

These statistical conclusions followed fairly directly and objectively from the figures emerging from the study. Subjective factors were involved in the main only in assessing the probabilities of possible errors or biases. But, in considering whether the statistical associations reflect cause-and-effect relationships or can be used in preventive medicine, personal characteristics can unconsciously give different weight to different parts of the evidence. Sir Austin Bradford Hill (1965)[10] rightly suspected that deductions about causation from the evidence relating to an observed association "must turn upon personalities". I have assessed the evidence with, like many others, a profound concern for human health and well-being and this concern has inevitably affected the deductions made.[4]

England and Wales 1971

Using the figures from the Registrar General's Statistical Review 1971 (Table 10)[11] it is possible to calculate the number of deaths that would be reached in 1971 for cancer of the lung and bronchus, ischaemic heart disease, cerebrovascular disease, and bronchitis and emphysema. The standardised mortality ratios (S.M.R.) are much lower in the rural districts than in the conurbations.

Table 10

Number of deaths and standardised mortality ratios by region (1971)

		Ischaemic heart disease		Cerebrovascular disease		Cancer of lung and bronchus		Bronchitis emphysema	
		N	SMR	N	SMR	N	SMR	N	SMR
gland & wales	M	83,036	100	31,049	100	25,142	100	20,481	100
	F	60,088	100	48,878	100	5,612	100	6,690	100
rth	M	6,284	114	2,386	117	1,834	110	1,499	111
	F	4,684	126	3,356	112	394	108	417	100
rkshire & mberside	M	8,907	110	3,380	113	2,540	103	2,312	116
	F	6,622	115	5,107	110	514	94	757	118
rth West	M	12,308	112	4,714	117	3,793	113	3,391	127
	F	8,984	109	7,393	111	792	101	1,323	144
ast Mid-ands	M	5,466	96	2,218	105	1,555	90	1,343	96
	F	3,739	98	3,040	98	334	92	411	96
West Mid-ands	M	7,679	98	3,114	110	2,301	95	2,083	110
	F	5,115	96	4,439	103	440	84	616	103
East Anglia	M	2,751	87	1,086	89	819	87	518	65
	F	1,865	87	1,711	97	145	75	164	69
South East	M	27,113	92	9,472	85	9,298	104	6,518	89
	F	20,102	90	16,426	90	2,371	117	2,277	92
uth West	M	7,013	95	2,635	92	1,751	80	1,425	76
	F	5,133	95	4,365	99	410	85	369	62
les 1 (South East)	M	3,872	118	1,324	109	886	88	1,056	131
	F	2,769	125	1,941	108	153	70	258	103
les 11 (Remainder)	M	1,643	106	720	120	365	79	336	86
	F	1,075	95	1,100	119	59	57	98	78
nurbations	M	26,565	102	9,206	97	9,653	121	7,424	118
	F	19,369	99	15,003	95	2,230	121	2,762	127
ban areas p.100,000	M	11,703	105	4,180	101	3,706	110	2,970	108
	F	8,646	105	6,703	100	748	98	920	100
ban areas p.50-100,000	M	8,239	100	3,079	99	2,327	94	1,996	98
	F	6,119	97	5,036	98	568	100	691	99
ban areas p.50,000	M	19,559	103	7,730	107	5,111	90	4,512	95
	F	14,285	102	12,101	106	1,129	88	1,349	87
Rural stricts	M	16,970	90	6,854	96	4,345	77	3,579	77
	F	11,669	96	10,035	102	947	81	968	71

). Hospital Morbidity

Information about hospital discharges in the United Kingdom and Ireland can be obtained from the hospital in-patient enquiry scheme (H.I.P.E.). It has two main purposes, for administrative use and for epidemiological use, i.e. to provide information on a national and regional basis about illness among hospital patients as a guide to morbidity occuring in the community.

The enquiry system in England and Wales is based upon a one-in-ten sample of in-patients' records from the National Health Service (N.H.S.) hospitals in England and Wales, excluding hospitals confined to the treatment of psychiatric diseases but including mental handicap.[12] The enquiry data relates to hospital discharges and deaths during the year and not to individual patients. In Scotland and in the Republic of Ireland a similar system is used but which in addition separate out persons admitted to hospital from total admissions.[13] One great difficulty in making comparisons with hospitalised morbidity is that the number of beds occupied depends to a great extent on the number of beds available in an area and this can account for greater admissions for some conditions in one area than in another. However, in all areas patients requiring admission for serious conditions, for instance most cancers, would be admitted although their length of stay might be reduced if beds were greatly needed.

The hospital in-patient enquiry system has been used in this report to study diseases of the respiratory system, heart disease, and lung cancer; conditions which appear to be related to air pollution.

Table 11 shows the estimated total discharges by diagnostic group from 1963 to 1972 and it also shows for 1972 the number in a sample by diagnostic group and the estimated discharge rate per 10,000 population. It can be seen that while there is an increase in acute respiratory infections and influenza, there has been some fall between 1963 and 1972 in admissions for bronchitis and emphysema but not for asthma. Admissions for all diseases of the respiratory system remain fairly constant during the ten-year period, 1963 to 1972. For heart disease, admissions for acute myocardial infarction increased from 57,000 in 1963 to 93,000 in 1972, and for other ischaemic heart disease from 25,000 in 1963 to 41,000 in 1972. Rheumatic heart disease on the other hand has fallen somewhat during the ten-year period. Admissions for lung cancer increased from 37,000 in 1963 to 45,000 in 1972 Annex 1 and for ischaemic heart attacks from 82,000 in 1963 to 136,000 in 1972 and during the same period deaths from both causes have also increased.

Annex 2 shows the rates for all discharges from hospital for 1972 by diagnostic group and region of residence, and shows the mean waiting time in weeks per 10,000 population. The variations in discharge rates for the various areas of residence can be seen. The Table also shows a high mean waiting time in areas with low discharge rates.

Table 13, Annex 3 shows the discharges from hospital by sex, age-group, region of residence, and diagnostic group, and also shows the number of deaths and hospital fatality ratios for all regions. There are differences in the age distribution of the patients between the various areas of residence. East Anglia and Wessex are two good examples of areas of low atmospheric air pollution when comparisons are made with other areas of residence.

It is possible to calculate the admission rates to hospital which could be expected if all admissions were those that are occuring in East Anglia and Wessex - areas of low air pollution - that is to say, the best picture, and they could also be used to calculate the rates if all of England had the same admission rates as the North West Metropolitan area, an area of high pollution.

The beds occupied per million population for the conditions under study are shown in Table 14 and from this Table it is possible to calculate the number of beds saved if the beds per million for the whole country were the same as those for Wessex. For instance, the beds occupied per million for Wessex in 1972 for bronchitis and emphysema were 45.7 and for all regions of England and Wales 75.4. If all of England and Wales had the Wessex bed occupancy the total average daily bed occupancy would be reduced from 3,696 to 2,240. Similarly for acute myocardial infarction and other ischaemic heart disease combined, the bed occupancy for Wessex is 98.4 and for England and Wales is 156.7, and if all of England

and Wales had the same heart attack bed occupancy as Wessex the average number of beds occupied daily would be reduced from 7,681 to 4,823. For cancer of the lung, if all of England and Wales had the same bed occupancy as Wessex the average daily bed occupancy would be reduced from 2,380 to 1,315. Annex 4

7. The Age Distribution of Hospital Admissions

The number of deaths increases understanding with the age of the patient and the age distribution of the populations at risk must be taken into account. Annex 5

8. The Cost

It is very difficult to cost the results of mortality and morbidity suffered by the critical groups as a result of air pollution. Loss of life expectancy and earnings - for instance cancer survival rates - can be compared with the normal life expectancy tables.

1. Cancer Survival Rates

The latest cancer survival statistics were those published a short time ago in the Registrar General's Statistical Review of England and Wales.[15] The relevant survival statistics for cases registered in 1963 were:

Table 11

		Male	Female	Total
a.	Number of cancer cases registered	64,884	61,907	126,791
b.	Number dead at 5 years	54,290	43,419	97,709
c.	Number alive at 5 years	9,337	16,858	26,195
d.	Number lost at 5 years	1,257	1,630	2,887
e.	Crude 5-year survival rate	14.5%	27.5%	20.8%
f.	Crude 5-year death rate	85%	72%	79%

The corresponding death rates in the latest available figures of the Birmingham Cancer Registry were:

	Male	Female
Crude 5-year death rate	86%	71%

Corresponding figures are not available for the South West Thames Region but the standardised registration ratios in South West Thames in 1968-70 as a percentage of those in Birmingham were:

Men	98%
Women	97%

The most illuminating survival figures from some points of view are the median survival times - i.e. the time in months (from diagnosis) at which half of the patients had died. The figures of the Birmingham Cancer Registry were:

Men	5 months
Women	15 months

2. Hospital Care

The cost in hospital bed days can be estimated from the H.I.P.E. scheme and how this can be done has already been shown. The cost per bed day varies from condition to condition. It is, for instance, greater in an intensive care unit after a heart attack than in a general ward for a mild attack of chronic bronchitis.

3. Home Care

The cost of home care can be judged from the cost of the proportion of general practitioner care given to patients at home suffering from illness caused in whole or in part by air pollution.

4. Drugs

The cost of drugs, where there is a National Health Service or a comprehensive insurance scheme, can be calculated.

5. Time Lost from Work

Time lost from work can be calculated from the periods during which sickness benefits are paid.

6. The Intangible Loss

The suffering and grief in the family after an early death is very real although almost impossible to quantify.

Main Elements of a Future Control System

The Royal Commission on Environmental Pollution (Fifth Report 1976 HMSO United Kingdom) considered "that air quality guideline bands should be established for suspended particulates (smoke), sulphur oxides, nitrogen oxides, lead and carbon monoxide, and possibly some other pollutants.[16] Such guidelines would give the public, the controlling authorities, industry and government a valuable indication as to whether or not the air at a particular time and place should be considered unacceptable polluted."

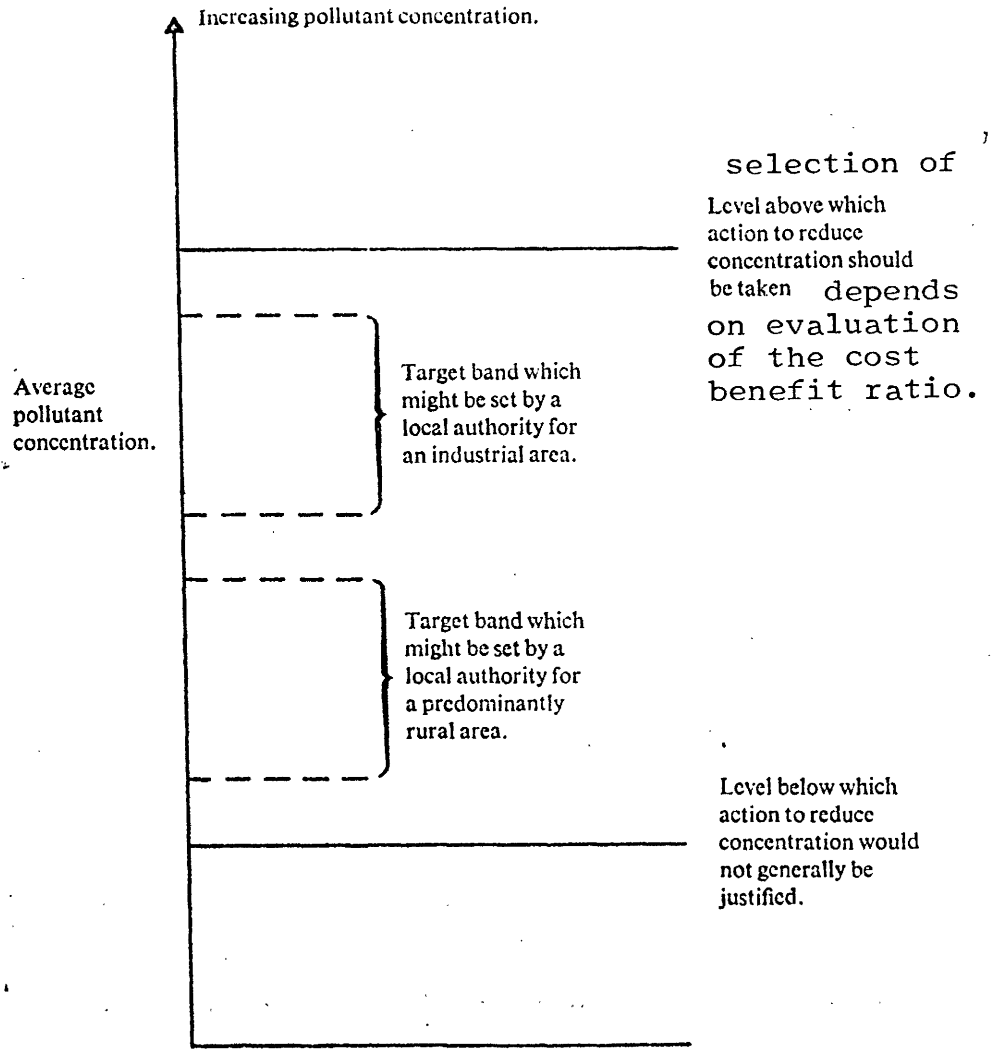

Diagram illustrating use of proposed air quality guidelines.

Conclusion

This study is largely based on information systems available in the United Kingdom and Ireland. Similar calculations can be undertaken in the other countries of the European Community based on (a) the mortality statistics by place of residence, (b) hospital statistics where they are available (hospital statistics at a national level require further development in some European countries), (c) the national health insurance schemes and other schemes for payment to the house doctor which are dependent on reporting the type of illness from which the patient suffers, and (d) the cost of drugs estimated from the consumption of various categories of drugs in different areas subject to different atmospheric environmental conditions.

The analysis of discharges, bed occupancy, and deaths from the hospital in-patient enquiry scheme of England and Wales shows that there is great variation from area to area and that in rural areas of clean air admissions to hospital for respiratory infection, heart disease, and lung cancer are lower than they are in areas of pollution. Of course, this is an over-simplification and many other factors have to be brought into account, in particular bed availability, cigarette smoking, which is greater in urban than in rural areas and has been so for many years, social class, occupation, and even such factors as hardness or softness of the water, which may be relevant as far as ischaemic heart attacks are concerned. Nevertheless, it is possible to calculate very roughly the expected number of beds occupied if all areas of the country had the same admission rates as those in a better area. The theoretical number of bed days that would be saved can be calculated and no doubt the actuaries could calculate from this the number of millions of pounds saved for the Exchequer.

It is also possible in many countries to calculate the cost in time off work, both for care at home and care in hospital. The cost in loss of earning capacity from premature retirement and early death can also be estimated by the actuaries for areas with different degrees of air pollution.

The cost that cannot be calculated is the distress and suffering of the men and women whose health is affected by air pollution and the sorrow of those they leave behind as a result of premature death.

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CHAPTER 7: SUGGESTIONS FOR FURTHER STUDY.

This report has been in the main based on the mortality and morbidity statistics of the United Kingdom and Ireland. Because the United Kingdom has a state medical service and keeps records of all hospital admissions though the Hospital Activity Analysis scheme it is possible to compare the admissions to hospitals of various population groups living in different environments.

It is suggested that a working group representing the Member States should consider how this study should be extended to the other Member States.

Air pollution causes much sickness which never reaches hospital and it is suggested that studies should be undertaken on the effect of air pollution on health using as a basis the consultations by general practitioners recorded in the state and private insurance schemes.

The national payment schemes for unemployment and time off work due to sickness resulting from the effects of air pollution should be utilised to study the populations most at risk from basic air pollution.

In the countries where national hospital and general practice statistics of morbidity are not available it may be possible to use for study the national and private health insurance schemes.

The financial cost of air pollution to the community has not yet been ascertained but it must be immense. Some of this cost could be ascertained by actuarial studies based on time off work and premature death and the cost to the community of loss of working capacity and of medical treatment.

CHAPTER 8: RECOMMENDATIONS.

1. It is recommended that a workshop should meet to consider extending this pilot study in order to determine the critical groups and the size of the populations affected by pollution in the countries of the Community which do not yet have national morbidity statistics.

2. Morbidity information systems should be developed which will make further analysis of the effects of air pollution possible. An E.E.C. workshop is being undertaken on hospital statistics in Edinburgh from 2nd to 4th November,1976 in order to consider the extension of the Hospital Activity Analysis Scheme to the other countries of the Community and the minimum basic data that will be required.

3. National and private insurance schemes should be utilised to ascertain the time off work which results from illnesses caused by air pollution.

4. The financial cost in time off work and medical treatment caused by air pollution should be ascertained.

5. The E.E.C.has already undertaken a study on the effects of air pollution on the health of schoolchildren and this study should be continued and will make international comparisons possible.

6. The Community should continue to develop its policy of studying the standardisation of air pollution monitoring.

7. The Community should continue its monitoring of certain dangerous pollutants, for instance lead, asbestos and arsenic.

8. The effectiveness of different countries' systems of air pollution control should be studied.

9. Agreed enforcible pollution emission standards should be developed.
10. Suitable publicity should be undertaken to increase general awareness in the public of the dangers of air pollution.
11. Comprehensive legislation to cover all aspects of industrial air pollution should be a major objective.
12. The necessary inspectorate will be required to make sure that the air pollution requirements are being kept and they will require the support of the necessary fiscal policy.
13. Monitoring and research work into air pollution should continue to be a major function of the European Community.

ENGLAND AND WALES

ANNEX 1 TABLE 11: 1963-1972 Enquiries - Estimated total discharges by diagnostic group.
1972 Enquiry - Numbers in sample by diagnostic group with estimated discharge rates per 10,000 population.

Diagnostic Group	Estimated Total Discharges 1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	Number in Sample 1972	Discharge Rate 1972
RESPIRATORY INFECTION												
Acute respiratory infections and influenza	48,900	45,400	49,000	53,200	56,400	77,930	78,500	80,290	74,810	82,780	7,710	16.9
Pneumonia	83,300	68,400	65,400	69,800	57,700	68,270	68,860	73,560	63,460	70,570	6,573	14.4
Bronchitis and emphysema	77,100	69,300	70,100	73,800	67,100	60,780	67,810	66,580	59,670	58,420	5,441	11.9
Asthma	23,300	26,300	30,000	30,800	35,800	37,740	36,940	32,650	34,390	33,400	3,111	6.8
Hypertrophy of tonsils and adenoids	186,900	194,600	191,900	175,500	157,800	139,900	133,510	115,910	117,520	114,820	10,694	23.4
Other respiratory diseases	73,300	71,900	77,600	76,300	86,600	88,760	95,180	94,410	95,970	98,440	9,168	20.1
Diseases of respiratory system	492,800	475,900	484,000	479,400	461,400	482,380	480,800	463,400	445,820	458,440	42,697	93.5
HEART DISEASE												
Rheumatic fever and rheumatic heart disease	23,000	22,700	23,200	20,900	22,300	20,350	20,260	18,010	19,890	19,350	1,802	3.9
Hypertensive disease	27,900	26,700	26,600	25,700	26,900	26,890	27,110	25,770	25,250	26,140	2,435	5.3
Acute myocardial infarction	57,300	59,600	65,600	68,100	71,600	74,860	79,990	82,220	87,060	93,800	8,736	19.1
Other ischaemic heart disease	24,900	25,900	28,500	29,600	31,100	31,970	32,660	35,230	39,720	41,780	3,891	8.5
Other forms of heart disease	51,500	52,200	57,200	59,100	61,700	74,120	78,510	77,930	86,670	93,120	8,673	19.0
Rheumatic fever, hypertensive disease and heart disease	184,600	187,100	201,100	203,400	213,600	228,190	238,530	239,170	258,580	274,190	25,537	55.9
LUNG CANCER												
Trachea, bronchus and lung	37,600	39,400	40,900	41,700	44,100	41,530	41,410	42,740	43,420	45,260	4,215	9.2

ENGLAND AND WALES

ANNEX 2 TABLE 12: Discharge rates per 10,000 population (DR) and mean waiting times in weeks (MWT) by hospital region of residence for all discharges from hospitals included in the Enquiry by diagnostic group for 1972.

Diagnostic Group		Hospital Region in which Resident																	
		Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Welsh	Birmingham	Manchester	Liverpool	All Regions (England & Wales)	Residents outside England & Wales	England
RESPIRATORY INFECTION																			
Diseases of respiratory system	DR	94.0	100.7	74.9	78.1	99.5	107.5	99.1	101.2	88.8	94.7	87.4	104.8	74.8	102.0	100.3	93.3	-	92.6
	MWT	16.7	15.4	28.2	14.0	20.0	17.0	15.5	16.5	22.4	19.5	19.9	23.7	27.4	24.9	26.0	21.0	12.6	20.8
Bronchitis and emphysema	DR	14.5	17.8	9.5	7.6	11.7	15.0	10.8	10.6	6.9	9.5	10.0	19.6	7.8	11.6	15.5	11.9	-	11.4
	MWT	14.4	2.4	2.7	4.7	3.9	3.9	2.6	1.3	9.4	0.6	2.9	3.9	6.4	3.1	2.1	4.3	-	4.5
Hypertrophy of tonsils & adenoids	DR	20.4	26.1	12.7	17.3	23.3	23.1	25.1	26.4	37.9	32.7	23.2	28.1	21.6	29.0	12.2	23.4	-	23.1
	MWT	17.7	15.9	31.4	14.4	21.6	17.5	16.7	17.2	24.7	21.2	20.8	27.2	29.9	28.1	25.1	22.6	8.3	22.2
HEART ∪ISEASE																			
Rheumatic fever, hypertensive disease and heart disease	DR	62.6	68.6	45.4	45.4	61.3	65.6	62.1	57.4	48.3	42.4	46.7	64.6	44.8	58.0	58.4	55.7	-	55.2
	MWT	5.1	4.3	9.3	9.8	4.9	5.3	4.4	5.9	7.6	3.6	4.4	5.0	8.0	5.0	11.8	6.1	7.6	6.2
Hypertensive disease	DR	5.2	4.7	4.8	4.7	6.4	6.9	5.7	5.4	4.4	4.3	4.8	7.8	3.7	5.0	6.5	5.3	-	5.2
	MWT	2.6	3.4	2.5	6.1	3.8	2.8	2.7	4.2	5.6	1.8	2.9	4.1	3.9	3.6	4.8	3.6	-	3.6
Acute myocardial infarction	DR	24.7	23.9	15.2	16.8	19.1	21.1	22.0	18.3	16.1	14.9	16.9	21.4	16.2	19.1	19.7	19.1	-	18.9
	MWT	-	0.3	2.3	0.1	0.8	1.1	0.5	0.3	0.3	-	0.7	0.3	0.9	0.6	0.4	0.9	-	1.0
LUNG CANCER																			
Malignant neoplasm of trachea, bronchus, lung	DR	8.2	9.0	7.5	7.8	11.0	10.4	12.2	10.3	6.9	9.7	8.6	11.0	7.2	8.7	10.2	9.2	-	9.1
	MWT	1.4	2.0	1.7	1.8	1.5	1.8	1.7	1.5	2.0	1.0	2.3	1.3	1.5	3.1	4.3	1.9	1.6	2.0

ANNEX 3 TABLE 13: 1972 Enquiry - Numbers in sample by sex, age-group region of residence, and diagnostic group. Number of deaths and hospital fatality ratios (per cent) for "all regions" totals

Region in which Resident	Males Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	Females Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
PNEUMONIA														
Newcastle	28	12	20	49	79	73	261	21	9	11	33	51	97	222
Leeds	30	12	7	48	61	71	229	21	7	9	33	42	98	210
Sheffield	40	9	28	74	89	145	385	20	9	18	45	70	118	280
East Anglian	6	5	7	21	29	40	108	3	-	4	13	12	36	68
North West Metropolitan	29	21	31	77	100	109	367	25	13	36	52	59	146	331
North East Metropolitan	21	9	16	51	93	115	305	13	7	18	33	52	135	258
South East Metropolitan	34	9	17	54	64	129	307	23	12	11	37	50	144	277
South West Metropolitan	27	11	31	47	59	79	254	16	6	20	26	43	103	214
Wessex	8	6	12	21	26	45	118	9	4	3	16	12	35	79
Oxford	14	3	16	25	18	49	125	9	2	7	17	15	35	85
South Western	25	16	11	41	55	48	196	13	9	9	27	23	74	155
Wales	19	10	19	41	38	34	161	16	2	6	14	31	47	116
Birmingham	56	16	26	80	81	83	342	34	9	16	41	45	91	236
Manchester	46	13	15	53	78	80	285	33	5	10	45	56	117	266
Liverpool	28	4	16	32	48	48	176	14	5	6	27	29	49	130
Residents outside England and Wales	2	2	2	9	2	3	20	-	-	2	2	-	3	7
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	413	158	274	723	920	1,151	3,639	270	99	186	461	590	1,328	2,934
Deaths in hospital	20	4	23	216	508	771	1,542	17	4	12	138	282	877	1,330
Hospital Fatality Ratio	4.8	2.5	8.4	29.9	55.2	67.0	42.4	6.3	4.0	6.5	29.9	47.8	66.0	45.3
England (discharges & deaths)	392	146	253	673	880	1,114	3,458	254	97	178	445	559	1,278	2,811
BRONCHITIS AND EMPHYSEMA														
Newcastle	20	6	8	114	95	49	292	7	5	10	39	42	39	142
Leeds	32	5	16	113	116	84	366	17	3	15	54	46	55	190
Sheffield	34	4	7	108	98	57	308	21	4	9	37	32	38	141

over/..

TABLE 13 contd...   ANNEX 3 contd...

Region in which Resident	Males: Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	Females: Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
East Anglian	6	1	4	22	22	22	77	2	-	-	6	7	9	24
North West Metropolitan	37	7	10	86	106	66	312	19	10	12	38	33	40	152
North East Metropolitan	19	8	3	93	113	75	311	24	2	7	30	35	50	148
South East Metropolitan	28	3	2	55	94	60	242	16	3	6	19	26	33	105
South West Metropolitan	26	4	6	65	73	47	221	17	2	3	17	18	47	104
Wessex	13	-	-	16	26	33	88	6	-	3	5	8	16	38
Oxford	19	4	1	29	47	23	123	6	2	4	5	8	21	46
South Western	19	2	6	57	77	43	204	13	2	10	15	20	24	84
Wales	28	5	10	137	139	64	383	15	1	7	49	36	38	146
Birmingham	47	8	14	67	77	39	252	32	5	3	29	21	27	117
Manchester	37	6	18	97	105	54	317	21	2	20	51	48	26	168
Liverpool	24	3	8	73	59	42	209	12	2	8	29	32	33	116
Residents outside England and Wales	3	1	3	3	3	2	15	-	-	-	1	1	-	2
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	392	67	116	1,135	1,250	760	3,720	228	43	117	424	413	496	1,721
Deaths in Hospital	-	-	3	81	167	195	446	-	1	2	25	33	64	125
Hospital Fatality Ratio	-	-	2.6	7.1	13.4	25.7	12.0	-	2.3	1.7	5.9	8.0	12.9	7.3
England (discharges & deaths)	361	61	103	995	1,108	694	3,322	213	42	110	374	376	458	1,573
ASTHMA														
Newcastle	9	25	18	22	6	3	83	10	10	32	33	16	4	105
Leeds	24	39	25	22	9	2	121	6	24	27	30	13	5	105
Sheffield	24	34	13	38	17	3	129	17	31	52	53	20	2	175
East Anglian	5	6	11	2	8	1	33	2	3	14	15	8	4	46
North West Metropolitan	21	37	37	39	8	3	145	11	27	63	41	14	7	163
North East Metropolitan	20	34	34	34	11	2	135	10	16	37	31	14	5	113
South East Metropolitan	16	21	25	16	12	3	93	14	20	35	37	8	13	127
South West Metropolitan	27	31	19	29	3	5	114	7	22	32	27	8	6	102
Wessex	16	14	8	14	4	1	57	5	4	11	12	9	2	43
Oxford	7	20	7	14	3	-	51	6	5	29	15	3	2	60
South Western	23	24	12	19	2	8	88	11	20	32	27	5	14	109

over/...

TABLE 13 contd... ANNEX 3 contd...

Region in which Resident	Males Age-group (in years)							Females Age-group (in years)						
	0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
Wales	15	25	25	31	11	1	108	4	14	40	30	15	3	106
Birmingham	25	25	38	27	9	2	126	13	23	46	47	18	4	151
Manchester	26	35	26	39	5	3	134	15	20	51	46	14	3	149
Liverpool	5	25	15	15	5	3	68	5	6	25	22	6	3	67
Residents outside England and Wales	-	-	1	1	-	-	2	-	-	1	2	-	-	3
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	263	395	314	362	113	40	1,487	136	245	527	468	171	77	1,624
Deaths in hospital	-	1	2	10	9	7	29	-	-	-	14	10	10	34
Hospital Fatality Ratio	-	0.3	0.6	2.8	8.0	17.5	2.0	-	-	-	3.0	5.8	13.0	2.1
England (discharges & deaths)	248	370	288	330	102	39	1,377	132	231	486	436	156	74	1,515
DISEASES OF RESPIRATORY SYSTEM														
Newcastle	260	360	218	321	225	162	1,546	188	353	246	175	145	168	1,275
Leeds	325	426	258	311	252	189	1,761	221	400	239	188	140	196	1,384
Sheffield	335	463	306	390	265	246	2,005	206	421	295	226	160	209	1,517
East Anglian	77	42	107	129	165	82	602	44	35	82	110	97	64	432
North West Metropolitan	349	498	416	385	303	224	2,175	212	502	430	223	149	246	1,762
North East Metropolitan	321	440	273	317	267	225	1,843	240	388	305	170	130	218	1,451
South East Metropolitan	307	409	290	258	248	236	1,748	211	395	316	158	120	230	1,430
South West Metropolitan	336	393	323	288	205	163	1,708	212	385	343	158	113	194	1,405
Wessex	171	303	150	123	85	95	927	98	249	155	72	53	67	694
Oxford	158	295	154	141	95	88	931	113	262	171	83	50	71	750
South Western	248	353	222	217	179	156	1,375	181	345	253	129	75	171	1,154
Wales	287	372	248	385	282	127	1,701	174	309	242	163	108	126	1,122
Birmingham	390	491	362	342	257	155	1,997	260	455	335	197	120	153	1,520
Manchester	498	685	379	392	261	168	2,383	309	600	363	256	171	194	1,893
Liverpool	273	296	168	207	156	119	1,219	154	251	148	125	88	113	879
Residents outside England and Wales	12	6	21	21	9	6	75	2	6	11	7	4	3	33

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TABLE 13 contd..   ANNEX 3 contd..

Region in which Resident	Males Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	Females Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	4,347	5,832	3,895	4,227	3,254	2,441	23,996	2,825	5,356	3,934	2,440	1,723	2,423	18,701
Deaths in hospital	24	7	36	373	785	1,080	2,305	24	6	22	211	374	1,049	1,686
Hospital Fatality Ratio	0.6	0.1	0.9	8.8	24.1	44.2	9.6	0.8	0.1	0.6	8.6	21.7	43.3	9.0
England (discharges and deaths)	4,048	5,454	3,626	3,821	2,963	2,308	22,220	2,649	5,041	3,681	2,270	1,611	2,294	17,546
ACUTE MYOCARDIAL INFARCTION														
Newcastle	-	-	33	257	126	51	467	-	-	6	90	98	79	273
Leeds	-	-	39	273	135	50	497	-	-	6	71	94	78	249
Sheffield	-	-	37	319	120	51	527	-	-	4	72	65	49	190
East Anglian	-	-	7	78	58	22	165	-	-	-	15	22	21	58
North West Metropolitan	-	-	39	315	119	58	531	-	-	3	62	82	79	226
North East Metropolitan	-	-	24	259	121	50	454	-	-	3	58	72	59	192
South East Metropolitan	-	-	34	236	145	63	478	-	-	3	54	89	82	228
South West Metropolitan	-	-	26	201	114	44	385	-	-	3	44	65	67	179
Wessex	-	-	12	124	52	27	215	-	-	2	23	29	25	79
Oxford	-	-	14	89	53	26	182	-	-	-	27	29	27	83
South Western	-	-	22	170	92	57	341	-	-	1	43	53	51	148
Wales	-	-	30	244	114	27	415	-	-	8	66	53	35	162
Birmingham	-	-	36	300	151	54	541	-	-	8	93	77	45	223
Manchester	-	-	52	326	136	52	566	-	-	6	96	76	56	234
Liverpool	-	-	29	152	73	29	283	-	-	6	53	39	32	130
Residents outside England and Wales	-	-	7	15	4	2	28	-	-	1	1	5	-	7
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	-	-	441	3,358	1,613	663	6,075	-	-	60	868	948	785	2,661
Deaths in hospital	-	-	30	537	552	349	1,468	-	-	3	161	315	419	898
Hospital Fatality Ratio	-	-	6.8	16.0	34.2	52.6	24.2	-	-	5.0	18.5	33.2	53.4	33.7
England (discharges & deaths)	-	-	404	3,099	1,495	634	5,632	-	-	51	801	890	750	2,492

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TABLE 15 contd... ANNEX 3 contd..

Region in which Resident	Males Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	Females Age-group (in years) 0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
OTHER ISCHAEMIC HEART DISEASE														
Newcastle	-	-	14	88	40	19	161	-	-	3	53	46	52	154
Leeds	-	-	20	107	52	35	214	-	-	5	60	48	63	176
Sheffield	-	-	14	76	52	34	176	-	-	5	41	30	46	122
East Anglian	-	-	1	15	16	10	42	-	-	1	5	13	17	36
North West Metropolitan	-	-	23	156	64	32	275	-	-	7	57	49	49	162
North East Metropolitan	-	-	15	119	37	32	203	-	-	4	34	38	63	139
South East Metropolitan	-	-	14	90	31	19	154	-	-	6	27	25	53	111
South West Metropolitan	-	-	9	89	49	21	168	-	-	6	27	33	38	104
Wessex	-	-	3	25	15	16	59	-	-	1	10	21	22	54
Oxford	-	-	6	28	7	16	57	-	-	1	13	12	13	39
South Western	-	-	8	47	25	16	96	-	-	3	15	20	26	64
Wales	-	-	18	85	63	24	190	-	-	4	39	38	27	108
Birmingham	-	-	15	100	26	25	166	-	-	7	36	29	26	98
Manchester	-	-	19	132	66	41	258	-	-	4	61	52	47	164
Liverpool	-	-	5	41	18	5	69	-	-	1	22	12	25	60
Residents outside England and Wales	-	-	4	6	-	-	10	-	-	-	-	2	-	2
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	-	-	188	1,204	561	345	2,298	-	-	58	500	468	567	1,593
Deaths in hospital	-	-	3	49	98	142	292	-	-	-	24	52	179	255
Hospital Fatality Ratio	-	-	1.6	4.1	17.5	41.2	12.7	-	-	-	4.8	11.1	31.6	16.0
England (discharges & deaths)	-	-	166	1,113	498	321	2,098	-	-	54	461	428	540	1,483
MALIGNANT NEOPLASM OF TRACHEA, BRONCHUS AND LUNG														
Newcastle	-	-	7	89	71	19	186	-	-	3	34	15	7	59
Leeds	-	-	12	102	91	27	232	-	-	1	26	18	5	50
Sheffield	-	-	11	164	99	22	296	-	-	1	29	17	9	56
East Anglian	-	-	1	30	35	12	78	-	-	2	11	9	3	25
North West Metropolitan	-	-	10	172	130	42	354	-	-	3	39	29	9	80
North East Metropolitan	-	-	10	123	102	19	254	-	-	4	29	22	10	65
South East Metropolitan	-	-	8	138	116	37	299	-	1	4	41	37	9	92

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TABLE 13 contd.. ANNEX 3 contd..

Region in which resident	Males Age-group (in years)							Females Age-group (in years)						
	0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages	0-4	5-14	15-44	45-64	65-74	75 & Over	All Ages
South West Metropolitan	-	-	6	114	97	32	249	-	-	6	30	20	11	67
Wessex	-	-	3	46	43	9	101	-	-	-	8	14	3	25
Oxford	-	-	2	72	50	13	137	-	-	-	21	10	4	35
South Western	1	-	3	100	66	31	201	-	-	3	16	20	9	48
Wales	-	-	6	129	98	22	255	-	-	3	20	10	9	42
Birmingham	-	-	7	162	91	18	278	-	-	4	38	11	8	61
Manchester	-	-	9	165	109	19	302	-	-	4	34	20	3	61
Liverpool	-	-	5	94	58	16	173	-	-	2	23	12	3	40
Residents outside England and Wales	-	-	-	5	4	-	9	-	-	-	4	1	-	5
ALL REGIONS (ENGLAND AND WALES)														
All discharges and deaths	1	-	100	1,705	1,260	338	3,404	-	1	40	403	265	102	811
Deaths in hospital	-	-	23	422	445	181	1,071	-	1	14	115	76	66	272
Hospital Fatality Ratio	-	-	23.0	24.8	35.3	53.6	31.5	-	100.0	35.0	28.5	28.7	64.7	33.5
England (discharges & deaths)	1	-	94	1,571	1,158	316	3,140	-	1	37	379	254	93	764

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ENGLAND AND WALES ANNEX 4 TABLE 14: 1972 Enquiry - Numbers in sample, estimated total discharges, mean and median waiting time (weeks), mean and median duration of stay (days) of sample cases, with estimated average number of beds used daily, estimated average number of beds used daily per million population and estimated discharge rates per 10,000 population. Analysed by hospital region in which resident and diagnostic group.

	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outside England & Wales	England
	Hospital region in which resident																	
	ACUTE RESPIRATORY INFECTIONS AND INFLUENZA																	
Number in sample	565	548	703	206	755	616	573	629	179	224	463	366	517	764	575	7,683	27	7,3
Estimates total discharges	5,730	5,680	6,990	2,790	8,100	6,610	6,150	6,750	2,050	2,560	5,140	3,710	5,660	8,350	6,090	82,490	290	78,8
Mean waiting time (weeks)	22.1	18.2	30.0	15.7	20.8	19.7	16.3	16.3	16.5	21.7	20.8	11.2	29.9	30.9	31.9	23.3	17.5	23
Median waiting time (weeks)	22.1	14.8	22.0	11.4	16.2	14.5	12.2	9.4	11.9	20.9	15.3	4.9	30.1	19.7	24.9	17.2	12.9	17.
Mean duration of stay (days)	5.6	6.8	5.9	7.5	7.2	6.0	7.6	6.6	6.6	4.9	6.0	8.9	7.2	6.0	7.1	6.6	7.9	6.
Median duration of stay (days)	4.1	4.2	4.0	4.1	4.7	4.3	5.0	4.4	4.1	3.5	3.9	4.6	4.4	4.0	4.3	4.3	4.5	4.
Average beds used daily	87	105	113	57	159	108	128	122	37	34	84	90	111	136	118	1,492	6	1,40
Beds per million	28.7	32.5	24.2	31.8	37.4	32.8	37.1	37.1	17.7	17.0	26.3	33.1	21.6	29.7	53.2	30.4		30.
Discharge rate	18.8	17.5	15.0	15.6	19.1	20.1	17.9	20.5	9.8	12.6	16.0	13.6	11.0	18.2	27.5	16.8		17.
	PNEUMONIA																	
Number in sample	483	439	665	176	698	563	584	468	197	210	351	277	578	551	306	6,546	27	6,26
Estimated total discharges	4,900	4,550	6,610	2,380	7,490	6,040	6,270	5,020	2,250	2,400	3,890	2,810	6,330	6,020	3,240	70,280	290	67,56
Mean waiting time (weeks)	1.0	0.7	1.0	0.9	1.5	0.8	0.7	2.1	0.4	0.4	1.2	0.7	0.6	1.3	0.5	0.9	-	0.
Median waiting time (weeks)	1.1	0.9	1.0	1.1	1.1	0.7	0.7	2.9	0.6	0.7	1.4	0.7	0.7	1.2	0.6	0.8	-	0.

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TABLE 14 contd..   ANNEX 4 contd..

Hospital region in which resident

	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outside England & Wales	England
Mean duration of stay (days)	15.6	19.8	18.1	18.5	18.3	17.7	20.8	24.2	16.5	16.3	13.8	17.3	13.7	18.8	16.7	17.9	13.C	18.0
Median duration of stay (days)	9.7	10.8	10.1	10.3	11.8	12.1	12.3	12.0	10.5	11.1	9.4	12.4	8.9	10.5	10.9	10.8	10.5	10.8
Average beds used daily	208	246	327	120	374	293	356	332	102	107	147	133	237	310	148	3,446	10	3,318
Beds per million	68.4	75.8	70.0	67.2	88.1	89.1	103.5	100.7	48.7	52.9	45.9	48.7	46.0	67.6	66.7	70.3		71.7
Discharge rate	16.1	14.1	14.1	13.3	17.6	18.4	18.2	15.2	10.8	11.8	12.1	10.3	12.3	13.1	14.6	14.3		14.6
								BRONCHITIS AND EMPHYSEMA										
Number in sample	434	556	449	101	464	459	345	325	126	169	288	529	369	485	325	5,424	17	4,895
Estimated total discharges	4,400	5,770	4,460	1,370	4,980	4,930	3,700	3,490	1,440	1,930	3,190	5,370	4,040	5,300	3,440	58,240	180	52,750
Mean waiting time (weeks)	14.4	2.4	2.7	4.7	3.9	3.9	2.6	1.3	9.4	0.6	2.9	3.9	6.4	3.1	2.1	4.3	-	4.5
Median waiting time (weeks)	2.6	1.0	1.9	4.9	1.3	1.9	2.9	1.1	0.9	0.7	1.4	1.5	2.9	2.4	1.1	1.6	-	1.6
Mean duration of stay (days)	20.8	26.6	23.3	25.2	19.5	23.6	26.8	22.8	24.2	17.2	21.5	25.2	18.5	25.5	24.6	23.2	14.4	23.0
Median duration of stay (days)	12.5	13.1	11.9	13.4	12.3	14.2	13.9	11.9	10.8	12.3	11.3	14.4	9.7	11.9	14.4	12.7	15.5	12.5
Average beds used daily	251	419	284	94	265	317	271	217	95	91	188	369	205	370	231	3,696	7	3,318
Beds per million	82.3	129.2	60.7	52.5	62.4	96.5	78.8	65.7	45.7	44.7	58.5	135.2	39.7	80.6	104.3	75.4		71.7
Discharge rate	14.5	17.8	9.5	7.6	11.7	15.0	10.8	10.6	6.9	9.5	10.0	19.6	7.8	11.6	15.5	11.9		11.4
										ASTHMA								
Number in sample	188	226	304	79	308	248	220	216	100	111	197	214	277	283	135	3,106	5	2,892
Estimated total discharges	1,910	2,340	3,020	1,070	3,300	2,660	2,360	2,320	1,140	1,270	2,190	2,170	3,030	3,090	1,430	33,350	50	31,170
Mean waiting time (weeks)	3.6	2.4	1.7	2.2	3.8	1.1	0.6	2.7	5.4	1.6	14.7	2.1	2.7	5.2	6.4	3.8	-	4.1
Median waiting time (weeks)	3.9	1.9	1.9	1.9	1.7	1.9	1.1	2.9	1.4	1.1	1.9	2.4	1.4	1.9	1.1	1.7	-	1.7

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TABLE .. contd.. ..NE.. . contd..

	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outside England & Wales	England
	Hospital region in which resident																	
Mean duration of stay (days)	10.6	9.5	15.9	10.3	9.8	9.5	10.5	10.1	10.8	8.4	10.6	13.8	12.9	10.2	15.7	11.4	1.8	11.2
Median duration of stay (days)	6.9	7.0	6.4	7.9	6.7	6.6	6.3	6.7	6.3	5.4	6.9	8.6	6.4	6.9	9.3	6.8	1.5	6.7
Average beds used daily	55	61	132	30	89	69	68	64	34	29	63	82	107	87	61	1,036	0	953
Beds per million	18.1	18.8	28.2	16.9	20.9	21.0	19.7	19.4	16.1	14.3	19.7	29.9	20.8	18.9	27.7	21.1		20.6
Discharge rate	6.3	7.2	6.5	6.0	7.8	8.1	6.9	7.0	5.5	6.3	6.8	7.9	5.9	6.7	6.5	6.8		6.7
HYPERTROPHY OF TONSILS AND ADENOIDS																		
Number in sample	611	814	599	229	921	707	806	812	691	580	670	756	1,016	1,217	256	10,685	9	9,929
Estimated total discharges	6,200	8,440	5,950	3,100	9,880	7,590	8,650	8,710	7,900	6,640	7,430	7,670	11,120	13,300	2,710	114,720	100	107,000
Mean waiting time (weeks)	17.7	15.9	31.4	14.4	21.6	17.5	16.7	17.2	24.7	21.2	20.8	27.2	29.9	28.1	25.1	22.6	8.3	22.2
Median waiting time (weeks)	12.8	13.7	19.1	7.7	14.8	11.6	12.1	12.3	18.8	19.1	14.6	16.0	21.8	19.9	20.4	15.9	3.9	15.9
Mean duration of stay (days)	3.4	3.0	3.9	3.1	4.6	4.4	4.6	4.7	4.4	3.2	4.4	4.2	3.8	3.4	3.8	4.0	5.1	4.0
Median duration of stay (days)	3.1	2.6	3.4	3.1	4.5	4.2	4.3	4.7	4.2	2.8	4.2	3.6	3.6	2.8	3.5	3.5	4.5	3.5
Average beds used daily	58	68	63	26	125	91	110	112	95	58	90	87	116	123	28	1,245	1	1,156
Beds per million	19.0	21.1	13.4	14.8	29.4	27.6	31.8	33.9	45.5	28.7	28.0	32.0	22.5	26.9	12.8	25.4		25.0
Discharge rate	20.4	26.1	12.7	17.3	23.3	23.1	25.1	26.4	37.9	32.7	23.2	28.1	21.6	29.0	12.2	23.4		23.1
OTHER RESPIRATORY DISEASES																		
Number in sample	540	562	802	243	791	701	650	663	328	387	560	681	760	976	501	9,145	23	8,464
Estimated total discharges	5,480	5,830	7,970	3,290	8,490	7,520	6,970	7,110	3,750	4,430	6,210	6,910	8,320	10,670	5,310	98,190	250	91,220
Mean waiting time (weeks)	11.7	14.0	25.7	13.4	17.8	16.7	13.7	15.5	17.5	15.9	19.1	21.3	23.6	18.5	22.6	18.3	14.4	18.1
Median waiting time (weeks)	7.7	9.7	11.1	6.7	8.8	8.5	8.4	8.4	8.1	9.7	10.4	9.1	13.6	10.2	11.2	9.4	2.9	9.4

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TABLE 14 contd..   ANNEX 4 contd..

	Hospital region in which resident					
	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan
Mean duration of stay (days)	12.4	10.8	17.5	33.6	9.4	8.8
Median duration of stay (days)	4.3	4.6	3.9	4.3	5.5	5.0
Average beds used daily	185	171	382	302	219	182
Beds per million	60.8	52.9	81.8	168.7	51.5	55.2
Discharge rate	18.0	18.0	17.1	18.4	20.0	22.9
DISEASES OF RESPIRATORY SYSTEM						
Number in sample	2,821	3,145	3,522	1,034	3,937	3,294
Estimated total discharges	28,610	32,630	35,010	13,980	42,240	35,340
Mean waiting time (weeks)	16.7	15.4	28.2	14.0	20.0	17.0
Median waiting time (weeks)	11.2	12.4	15.9	7.6	12.6	10.8
Mean duration of stay (days)	10.8	12.0	13.6	16.5	10.7	11.0
Median duration of stay (days)	4.7	4.7	4.8	4.4	5.8	5.6
Average beds used daily	844	1,071	1,301	630	1,230	1,059
Beds per million	277.4	330.4	278.3	351.9	289.8	322.2
Discharge rate	94.0	100.7	74.9	78.1	99.5	107.5
ACUTE MYOCARDIAL INFARCTION						
Number in sample	740	746	717	223	757	646
Estimated total discharges	7,510	7,740	7,130	3,010	8,120	6,930
Mean waiting time (weeks)	-	0.3	2.3	0.1	0.8	1.1
Median waiting time (weeks)	-	1.1	0.8	1.1	1.1	1.1

	Hospital region in which resident					
	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales
Mean duration of stay (days)	9.5	8.7	8.8	6.9	10.0	11.2
Median duration of stay (days)	5.2	5.0	5.3	3.4	5.2	6.4
Average beds used daily	180	169	90	84	170	212
Beds per million	52.4	51.1	43.0	41.4	53.1	77.7
Discharge rate	20.3	21.6	18.0	21.8	19.4	25.3
DISEASES OF RESPIRATORY SYSTEM						
Number in sample	3,178	3,113	1,621	1,681	2,529	2,823
Estimated total discharges	34,100	33,400	18,540	19,240	28,050	28,640
Mean waiting time (weeks)	15.5	16.5	22.4	19.5	19.9	23.7
Median waiting time (weeks)	10.6	10.6	16.0	17.2	13.0	11.9
Mean duration of stay (days)	11.9	11.1	8.9	7.7	9.7	12.4
Median duration of stay (days)	5.7	5.6	4.7	3.4	5.0	5.9
Average beds used daily	1,113	1,016	452	404	743	974
Beds per million	323.2	307.9	216.7	199.0	231.5	356.6
Discharge rate	99.1	101.2	88.8	94.7	87.4	104.8
ACUTE MYOCARDIAL INFARCTION						
Number in sample	706	564	294	265	489	577
Estimated total discharges	7,580	6,050	3,360	3,030	5,420	5,850
Mean waiting time (weeks)	0.5	0.3	0.3	-	0.7	0.3
Median waiting time (weeks)	1.1	1.1	1.1	-	0.8	0.5

	Hospital region in which resident				
	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outs England & Wales	England
Mean duration of stay (days)	8.9	8.7	11.9	11.0	8.4	11.
Median duration of stay (days)	4.7	4.6	4.9	4.9	7.5	4.
Average beds used daily	201	254	173	2,950	6	2,73
Beds per million	39.1	55.5	78.0	60.2		59.
Discharge rate	16.2	23.3	24.0	20.0		19.
DISEASES OF RESPIRATORY SYSTEM						
Number in sample	3,517	4,276	2,098	42,589	108	39,76
Estimated total discharges	38,490	46,740	22,220	457,280	1,160	428,56
Mean waiting time (weeks)	27.4	24.9	26.0	21.0	12.6	20.
Median waiting time (weeks)	18.6	16.8	17.7	13.5	6.9	13.
Mean duration of stay (days)	9.3	10.0	12.5	11.1	9.8	11.
Median duration of stay (days)	4.6	4.4	5.6	5.1	6.6	5.
Average beds used daily	976	1,280	759	13,866	31	12,88
Beds per million	189.6	279.1	342.7	282.8		278.
Discharge rate	74.8	102.0	100.3	93.3		92.
ACUTE MYOCARDIAL INFARCTION						
Number in sample	764	800	413	8,701	35	8,12
Estimated total discharges	8,360	8,740	4,370	93,420	380	87,55
Mean waiting time (weeks)	0.9	0.6	0.4	0.9	-	1.
Median waiting time (weeks)	1.1	0.6	1.1	0.7	-	0.

over/....

TABLE 14 contd..   ANNEX 4 contd..

Hospital region in which resident

	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outside England & Wales	England
Mean duration of stay (days)	17.9	16.9	15.0	20.8	19.8	18.5	21.0	23.7	16.7	23.3	18.7	20.1	15.1	16.7	21.4	18.6	18.0	18.5
Median duration of stay (days)	13.8	14.7	12.6	16.3	17.6	17.0	16.2	16.6	15.9	13.9	14.9	15.9	13.7	15.5	17.2	15.1	15.8	15.0
Average beds used daily	367	357	293	171	439	351	435	392	153	193	277	321	344	398	255	4,749	18	4,425
Beds per million	120.5	110.2	62.7	95.6	103.4	106.7	126.4	118.8	73.3	94.9	86.4	117.6	66.8	86.9	115.3	96.9		95.6
Discharge rate	24.7	23.9	15.2	16.8	19.1	21.1	22.0	18.3	16.1	14.9	16.9	21.4	16.2	19.1	19.7	19.1		18.9
OTHER ISCHAEMIC HEART DISEASE																		
Number in sample	315	390	298	78	437	342	265	272	113	96	160	298	264	422	129	3,879	12	3,581
Estimated total discharges	3,200	4,050	2,960	1,050	4,690	3,670	2,840	2,920	1,290	1,100	1,770	3,020	2,890	4,610	1,370	41,650	130	38,590
Mean waiting time (weeks)	4.7	1.9	3.8	26.4	4.4	5.3	8.2	6.3	3.6	3.5	4.2	2.1	7.6	3.4	-	5.0	2.7	5.3
Median waiting time (weeks)	2.9	1.9	1.9	3.9	2.8	2.5	2.9	3.9	1.9	1.7	1.9	1.4	2.9	2.1	-	2.3	2.9	2.4
Mean duration of stay (days)	13.4	25.7	20.1	76.4	18.3	24.9	39.0	17.0	14.9	37.8	59.1	14.6	15.6	35.5	31.1	25.8	13.6	26.7
Median duration of stay (days)	10.5	11.7	10.8	13.7	11.4	13.4	13.9	10.0	11.5	10.5	12.8	10.9	10.0	11.9	13.8	11.6	9.5	11.6
Average beds used daily	117	284	163	220	234	250	303	136	52	114	287	121	123	448	116	2,932	5	2,814
Beds per million	38.3	87.7	34.9	123.1	55.2	76.0	88.1	41.1	25.1	55.9	89.3	44.3	23.9	97.7	52.4	59.8		60.8
Discharge rate	10.5	12.5	6.3	5.9	11.0	11.2	8.3	8.8	6.2	5.4	5.5	11.1	5.6	10.1	6.2	8.5		8.3
MALIGNANT NEOPLASM OF TRACHEA, BRONCHUS AND LUNG																		
Number in sample	245	282	352	103	434	319	391	316	126	172	249	297	339	363	213	4,201	14	3,904
Estimated total discharges	2,490	2,930	3,500	1,390	4,660	3,420	4,200	3,390	1,440	1,970	2,760	3,010	3,710	3,970	2,260	45,110	150	42,070
Mean waiting time (weeks)	1.4	2.0	1.7	1.8	1.5	1.8	1.7	1.5	2.0	1.0	2.3	1.3	1.5	3.1	4.3	1.9	1.6	2.0
Median waiting time (weeks)	1.2	1.8	1.2	1.4	1.2	1.5	1.2	1.2	1.7	0.8	1.9	1.1	1.0	1.5	1.1	1.3	1.4	1.3

over/...

TABLE 14 contd.. ANNEX 4 contd..

	Hospital region in which resident																	
	Newcastle	Leeds	Sheffield	East Anglian	North West Metropolitan	North East Metropolitan	South East Metropolitan	South West Metropolitan	Wessex	Oxford	South Western	Wales	Birmingham	Manchester	Liverpool	All regions (England and Wales)	Residents outsid England & Wales	England
Mean duration of stay (days)	17.1	20.2	16.1	15.9	18.9	20.5	20.3	20.4	14.2	15.3	14.4	21.1	16.9	28.0	22.0	19.3	18.0	19.2
Median duration of stay (days)	12.7	15.4	11.9	11.9	14.4	13.5	14.7	15.3	10.5	10.9	9.9	14.6	13.0	12.3	13.2	13.5	13.5	13.3
Average beds used daily	116	161	154	61	241	192	233	189	56	82	109	173	171	303	135	2,380	7	2,205
Beds per million	38.1	49.7	32.9	33.8	56.7	58.4	67.6	57.3	26.8	40.5	33.9	63.5	33.2	66.2	61.1	48.5		47.6
Discharge rate	8.2	9.0	7.5	7.8	11.0	10.4	12.2	10.3	6.9	9.7	8.6	11.0	7.2	8.7	10.2	9.2		9.1

ENGLAND AND WALES

ANNEX 5 TABLE 15: 1972 Enquiry. Numbers in sample, number of deaths in hospital in sample and mean duration of stay (days) of sample cases with estimated discharge rates per 10,000 population and estimated average number of beds used daily. Analysed by sex and age for each diagnostic group.

	Males Age-group (in years)										Females Age-group (in years)									
	0-4	5-14	15-19	20-24	25-34	35-44	45-64	65-74	75 and Over	All Ages	0-4	5-14	15-19	20-24	25-34	35-44	45-64	65-74	75 and Over	All Ages
ACUTE RESPIRATORY INFECTIONS AND INFLUENZA																				
N.	2,134	942	109	78	112	95	339	285	179	4,273	1,453	847	226	145	136	79	230	152	169	3,437
N.D.	3	1	-	-	-	1	22	33	35	95	3	1	-	-	-	2	5	13	21	45
M.D.S.	5.3	3.9	5.1	5.0	5.6	6.6	12.0	14.8	18.7	6.7	5.2	4.0	5.2	4.6	5.4	7.2	10.6	12.9	22.3	6.5
D.R.	116.5	25.1	6.7	4.7	3.7	3.6	6.4	17.2	26.8	19.2	83.4	23.7	14.6	8.8	4.6	3.0	4.1	6.7	11.6	14.6
A.B.D.	330	109	16	11	18	18	119	124	98	845	222	100	35	20	21	17	71	58	110	654
PNEUMONIA																				
N.	413	158	36	37	86	115	723	920	1,151	3,639	270	99	20	20	66	80	461	590	1,328	2,934
N.D.	20	4	4	2	3	14	216	508	771	1,542	17	4	-	2	2	8	138	282	877	1,330
M.D.S.	8.9	7.6	9.6	11.3	12.2	12.9	15.0	17.3	20.7	16.1	7.9	8.4	8.3	10.5	11.5	13.4	16.9	20.4	25.7	20.1
D.R.	22.5	4.2	2.2	2.2	2.8	4.3	13.6	55.6	172.1	16.4	15.5	2.8	1.3	1.2	2.2	3.0	8.2	25.9	91.2	12.5
A.B.D.	107	35	10	12	31	43	318	468	698	1,723	62	24	5	6	22	31	229	353	1,000	1,733
BRONCHITIS AND EMPHYSEMA																				
N.	392	67	7	12	27	70	1,135	1,250	760	3,720	228	43	8	16	36	57	424	413	496	1,721
N.D.	-	-	-	-	-	3	81	167	195	446	-	1	-	-	-	2	25	33	64	125
M.D.S.	6.9	4.7	4.9	7.9	9.5	12.6	18.8	24.3	38.9	23.0	6.2	5.1	7.9	11.1	9.6	17.8	17.8	21.9	42.1	23.6
D.R.	21.4	1.8	0.4	0.7	0.9	2.6	21.4	75.5	113.7	16.8	13.1	1.2	0.5	1.0	1.2	2.2	7.5	18.1	34.1	7.3
A.B.D.	79	9	1	3	8	26	627	891	866	2,510	41	6	2	5	10	30	221	265	612	1,193
ASTHMA																				
N.	263	395	49	55	102	108	362	113	40	1,487	136	245	88	125	142	172	468	171	77	1,624
N.D.	-	1	1	-	-	1	10	9	7	29	-	-	-	-	-	-	14	10	10	34
M.D.S.	5.5	7.8	6.8	7.7	9.1	9.2	14.3	13.2	66.8	11.1	7.5	6.8	7.2	7.4	10.4	11.2	13.6	17.7	23.0	11.6
D.R.	14.4	10.5	3.0	3.3	3.4	4.0	6.8	6.8	6.0	6.7	7.8	6.9	5.7	7.6	4.8	6.5	8.3	7.5	5.3	6.9
A.B.D.	42	90	10	12	27	29	152	44	78	485	30	49	19	27	43	57	187	89	52	552
ACUTE MYOCARDIAL INFARCTION																				
N.	-	-	-	2	51	388	3,358	1,613	663	6,075	-	-	2	-	4	54	868	948	785	2,661
N.D.	-	-	-	1	1	28	537	552	349	1,468	-	-	-	-	2	1	161	315	419	898
M.D.S.	-	-	-	8.5	15.6	15.8	16.6	16.0	21.3	16.9	-	-	21.0	-	12.5	18.9	17.8	20.7	30.0	22.4
D.R.	-	-	-	0.1	1.7	14.5	63.4	97.5	99.1	27.4	-	-	0.1	-	0.1	2.1	15.4	41.6	53.9	11.3
A.B.D.	-	-	-	0	23	180	1,639	759	414	3,017	-	-	1	-	1	30	452	575	691	1,750

over/...

TABLE 15 contd..   ANNEX 5 contd..

	0-4	5-14	15-19	20-24	25-34	35-44	45-64	65-74	75 and Over	All Ages	0-4	5-14	15-19	20-24	25-34	35-44	45-64	65-74	75 an Over	ges
										OTHER ISCHAEMIC HEART DISEASE										
N.	-	-	-	1	29	158	1,204	561	345	2,298	-	-	-	1	9	48	500	468	567	1,593
N.D.	-	-	-	-	1	2	49	98	142	292	-	-	-	-	-	-	24	52	179	255
M.D.S.	-	-	-	2.0	11.2	12.0	13.1	15.7	49.0	19.0	-	-	-	13.0	8.3	10.8	14.3	30.2	60.8	35.4
D.R.	-	-	-	0.1	1.0	5.9	22.7	33.9	51.6	10.4	-	-	-	0.1	0.3	1.8	8.9	20.5	38.9	6.8
A.B.D.	-	-	-	0	10	55	464	259	496	1,283	-	-	-	0	2	15	209	414	1,012	1,653
								MALIGNANT NEOPLASM OF TRACHEA, BRONCHUS AND LUNG												
N.	1	-	1	5	14	80	1,705	1,260	338	3,404	-	1	-	1	7	32	403	265	102	811
N.D.	-	-	-	-	1	22	422	445	181	1,071	-	1	-	-	6	8	115	76	66	272
M.D.S.	23.0	-	15.0	15.2	15.1	17.6	17.8	17.5	19.8	17.9	-	1.0	-	13.0	18.6	17.8	18.8	26.8	50.1	25.3
D.R.	0.1	-	0.1	0.3	0.5	3.0	32.2	76.1	50.5	15.3	-	0.0	-	0.1	0.2	1.2	7.1	11.6	7.0	3.5
A.B.D.	1	-	0	2	6	41	890	649	197	1,786	-	0	-	0	4	17	222	208	150	601

N: Numbers
ND: Numbers of Deaths
MDS: Mean Duration of Stay
DR: Discharge Rate
ABD: Average Beds Daily