

PREVENTING BRONCHITIS



Smoking

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Glossary

Acute bronchiolitis Acute bronchiolitis is a term used to describe lower airways inflammation usually during the first 18 months of life. Initial upper respiratory tract symptoms, irritability and difficulty in feeding are followed by cough, wheezing and occasional respiratory failure. The duration of the illness is usually short.

Acute (tracheo) bronchitis An acute attack of bronchitis is an infective condition of the chest of no specific duration. Cough is the principal symptom. The latter is repetitive and unproductive in the early stages.

Bronchiectasis Bronchiectasis is a disorder characterised by widening and distortion of bronchi, leading to impaired drainage of bronchial secretions and increased liability to infection. Most cases arise in childhood but due to the effectiveness of antibiotics its prevalence is falling. The majority of cases follow severe bronchial and pneumonic infection in childhood.

Chronic bronchitis Chronic bronchitis entails persistent cough with the production of sputum for at least three months in the year for at least two years. It is often a progressive condition in which, in advanced cases, breathlessness due to airways obstruction occurs.

Emphysema Emphysema is a condition which may complicate chronic bronchitis but often exists autonomously. It involves destruction of the lung tissue, airways obstruction, disability and eventually can cause death.

FEV Forced Expiratory Volume is the volume of air expelled by a maximal forced expiration from a position of full inspiration. In lung function tests the measure used is normally FEV₁, the volume exhaled in one second.

PEFR Peak Expiratory Flow Rate is measured with a peak flow meter or gauge. It is the maximum rate of airflow which can be achieved during a sudden forced expiration from a position of full inspiration. This is mainly determined by the calibre of the airways. (In normal subjects forced expiration is completed in less than six seconds, any longer being a sign of airways obstruction.)

Introduction

In 1808 Charles Badham adopted the term 'bronchitis' to define collectively 'chronic pectoral (chest) complaints, especially those of people advanced in life . . .' This definition is of relevance today in that it serves to illustrate the wide range of morbid states that bronchitis may encompass and hence the likelihood that most people will experience, at one time or another, some of the symptoms of a bronchitic ailment. Such illnesses may occur either in the form of acute, usually periodic attacks or as chronic afflictions which often become progressively more serious over time. Chronic bronchitis, which is widely known as the English disease, is the main concern of this paper.

The effects of the condition on individual sufferers range from minor and transient inconvenience, through varying levels of handicap in every-day life to severe distress which in some cases ultimately leads to death. In fact it causes around 30,000 fatalities a year in the UK, a number which although significant in itself is relatively small compared to the million or more people in the population who have chronic bronchitis. One person in every 20 consults a family doctor about a bronchitic complaint of some kind during the course of each year whilst one day in every 10 of sickness absence from work is classified as being due to bronchitis. In 1974 the treatment of bronchitic conditions cost the NHS approximately £100 million whilst the economic burden they placed on the community in terms of lost production was probably of the order of £250 million.

The occurrence of bronchitis is associated with the exposure of individuals to a variety of factors. The most significant of these appears to be cigarette smoking, with smaller but important contributions from dusty occupations, the climate and air pollution. In the context of the latter causes the incidence of bronchitis has often been regarded as an unfortunate but inevitable consequence of economic development and industrial advance. Further, its importance has often been over-shadowed by that of other, more dramatically destructive complaints. Throughout much of this century, for example, respiratory tuberculosis occupied a large part of the effort and attention of the health services whilst today lung cancer holds a similarly dominant position. Even now some people tend to underestimate the impact of bronchitic illness on the community and to regard it as a natural consequence of ageing.

This paper, however, emphasises the extent to which such conditions, particularly chronic bronchitis, may be prevented by the control of factors associated with respiratory disorder, in particular cigarette smoking. It also describes the progressive nature of bronchitis, its causes and its social and economic costs and reviews the techniques employed in its treatment.

The nature of bronchitis

Much confusion has arisen over the precise definition of the term chronic bronchitis. Fundamentally it refers to the state of those individuals who experience a chronic or excess mucus secretion in the bronchial tree, which in most cases is accompanied by a persistent cough,¹ where such abnormal excess secretion of mucus is not brought about by other disorders such as bronchiectasis or tuberculosis. But although there is broad agreement that the above application of the term is the most acceptable one, chronic bronchitis is often used loosely to describe a wide range of conditions which may involve airflow obstruction or various forms of obstructive lung disease regardless of whether chronic sputum production is present or not (Thurlbeck 1976).

The progressive nature of the complaint has also been a subject of dispute and there is still disagreement regarding the actual manner of its development. Classifications such as that proposed by the Medical Research Council's Committee on research into chronic bronchitis in 1965, which divided the disorder into three main types – simple, recurrent mucopurulent, and obstructive (Table 1) – are useful as an indication of the different stages that individual sufferers may experience although they may sometimes create a misleading impression concerning the true relationship between the categories.² It has been widely assumed that individuals naturally progress from the simple to the mucopurulent and eventually the obstructive disorder. However, despite the fact that the available data show that subjects with persistent cough and sputum have, on average, a higher frequency of chest illness and lower ventilatory capacity than those without these symptoms (Fletcher *et al* 1959, Sharp *et al* 1965, Van der Lende 1969, Monto *et al* 1975) it need not necessarily be that a direct aetiological link exists between any of these separate stages. Their observed coincidence may be due to an independent common cause or causes.

Recent epidemiological studies, particularly that of Fletcher *et al* (1976), suggest that mucus hypersecretion, bronchial infection and airflow obstruction, which have been widely regarded as components of a single condition, may in fact be associated with two largely distinct processes (Figure 1). These are, first, one of lung obstruction which may lead to progressive

1 Chronicity is defined as occurring on most days for at least three months in the year for at least two successive years.

2 Thurlbeck (1976) has suggested that the MRC classification has little practical use in that a differentiation between simple and mucopurulent bronchitis is often difficult because the bronchi of patients with simple chronic bronchitis are frequently not sterile. More significantly the prognosis does not differ between patients with mucoid sputum and those with purulent sputum. The concept of chronic obstructive bronchitis is important but the method of recognising airways obstruction was never defined by the MRC group that coined the term and questions relating to the site, mechanism, and nature of the obstruction were left unanswered by the definition.

Table 1 *Types of chronic bronchitis (After the MRC 1965)*

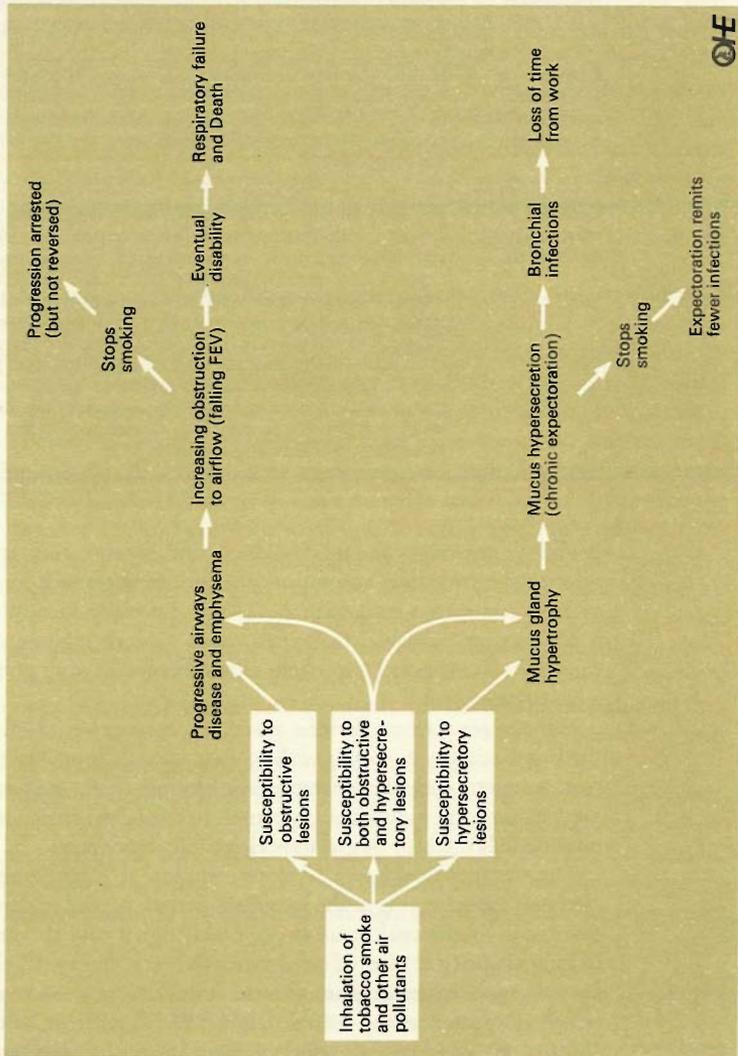
Simple chronic bronchitis	There is a recurrent increase in the volume of mucoid bronchial secretion sufficient to cause expectoration (productive cough). The subject is otherwise unimpaired although he or she is likely to be more susceptible to respiratory infection than most people.
Chronic or recurrent mucopurulent bronchitis	In mucopurulent bronchitis the sputum is infected by bacteria in the lung. Although the latter may cause occasionally distress to the individual concerned there appears to be little reason to believe that respiratory infection will by itself speed the rate of degeneration of the lung tissue.
Chronic obstructive bronchitis	In obstructive bronchitis there is narrowing of the intrapulmonary airways with consequent increased resistance to airflow. Thus in addition to persistent cough and excess sputum production sufferers experience abnormal breathlessness which becomes progressively worse. A widely held view in the past was that obstructive bronchitis was a direct result of the mucus hypersecretion and lung infection experienced in the types of bronchitis described above and thus that simple, mucopurulent and obstructive bronchitis were stages of the same condition. This is now questioned (see Figure 1). It is probable, for example, that some cigarette smokers may develop small airways disease and lung obstruction without experiencing an initial hypersecretory condition.

disability, respiratory failure, and death, and, second, a hypersecretory one which may sometimes accompany the former but which by itself is likely to have less severe consequences. This is especially so now that modern antibiotics are available. In Britain today both conditions are apparently caused predominantly by smoking with other forms of air pollution playing a contributory role.

In the hypersecretory disorder excess mucus secretion (chiefly generated in the larger airways as a result of the enlargement of bronchial mucus glands) may interfere with the clearance mechanisms of the respiratory tract so predisposing the individual concerned to bronchial infection. This is the only disability which mucus hypersecretion alone causes.

The obstructive disorder is more complex. It is predominantly due to airways collapse owing to the increased pressure needed to drive air through diseased (dysfunctional) small airways, although it may also be due to a lack of lung elasticity in cases of emphysema. Thus in the model of Fletcher and his colleagues hypersecretory chronic bronchitis may be seen as a process which is initiated in the central, larger airways whereas obstructive bronchitis is one which mainly works inwards from the peripheral airways. In certain individuals the separate existence of one or other of these conditions may be clearly observed, particularly in the initial stages. But because both hypersecretory and obstructive bronchitis have common causes and because their incidence is probably linked to the constitutional susceptibilities of subjects to respiratory illness in general they often develop simultaneously.

Figure 1 *The natural histories of obstructive and hypersecretory bronchitis*



Source Fletcher *et al* 1976

It is this conjunction of occurrence which gives the impression of a single progressive disease entity.

However, although the above hypothesis is a highly plausible one which should help to promote a realistic attitude to the treatment and prevention of chronic bronchitis its possible limitations should also be observed. For example, it is still uncertain as to the extent to which lung obstruction may itself promote mucus hypersecretion and subsequent respiratory infection. It may also be pointed out that in cases where both hypersecretory and obstructive forms are present the course of the latter may in some ways be influenced by exacerbations associated with the former. Furthermore, although it is unlikely that infection is a significant factor in initiating chronic obstructive bronchitis in adults it is quite possible that acute respiratory disorders in children, whether or not associated with bronchial hypersecretion, may make certain individuals susceptible to developing either form of bronchitis in the future.

Emphysema

Advanced chronic obstructive bronchitis has often been confused with cases of emphysema. However, the two are anatomically quite distinct in that emphysema is characterised by abnormal, permanent enlargement of the air spaces (the alveoli) attached to the terminal bronchioles accompanied by the destruction of their walls.³ Such changes, which are usually due to very fine penetrations of smoke, dust or other noxious substances, lead to a loss of elasticity which results in the lungs tending to be permanently inflated.

Emphysema can exist quite independently of other respiratory complaints but frequently coincides with obstructive bronchitis. This may either be because it is caused by factors directly associated with the effects of the latter or because of a shared aetiology involving external agents, particularly smoking which almost certainly causes both small airways disease and emphysema.

Both processes may appear to converge in their advanced stages towards a common pattern of lung disorder although new techniques have now made it possible to distinguish the type of obstruction due to disease of the airways from that due to emphysema (Leaver *et al* 1974). The predominance of one process or the other in a particular patient can often be recognised by his or her appearance, and the terms 'pink puffer' and 'blue bloater' have been coined to describe the two extremes of a spectrum of illness within which a considerable amount of overlap occurs. At one extreme are the pink puffers whose respiratory impairment is usually largely due to emphysema. In these individuals symptoms such as cough and excessive

3 Destruction of respiratory tissue is now regarded as a definitional requirement of emphysema, making it more easily recognisable by the pathologist and separating emphysema from the term 'over-inflation' which describes enlargement of air spaces unaccompanied by destruction. The term 'abnormal' also differentiates emphysema from changes that normally occur in the lung with age.

sputum production are often relatively trivial and their history is mainly characterised by progressive breathlessness. By breathing vigorously they manage to keep their blood well oxygenated – hence the term ‘pink puffer’. At the other extreme are the ‘blue bloaters’ who suffer from large sputum volume and frequent infective exacerbations of their condition. Their blood is under-oxygenated due to their poor respiratory drive and they are ultimately liable to lapse into congestive heart failure. In these individuals emphysema is not normally present.

The causes of bronchitis

The occurrence of any form of bronchitis may be related to a variety of factors acting either singly or in conjunction with one another. In many cases bronchitic conditions probably develop as a result of individuals being subjected to a succession of ‘insults’ over their lifetimes, such as frequent respiratory infection in childhood followed by exposure to cigarette smoking and/or dusty working conditions in maturity. This may help to explain the strong correlation between bronchitis mortality and social class which, as Table 2 indicates, has existed in Britain throughout the twentieth century.

However, the social and environmental changes of the last few decades have almost certainly altered the relative importance of the various known or suspected causes of bronchitis. For instance, the threat presented by most forms of atmospheric pollution in Britain has decreased as has that stemming from infections susceptible to modern medicines. But that associated with smoking has probably increased in both absolute and relative terms. This section discusses the current significance of the factors most commonly believed to play an aetiological role in bronchitic disease.

Cigarette smoking

Numerous studies have indicated that the frequency of bronchitic symptoms,

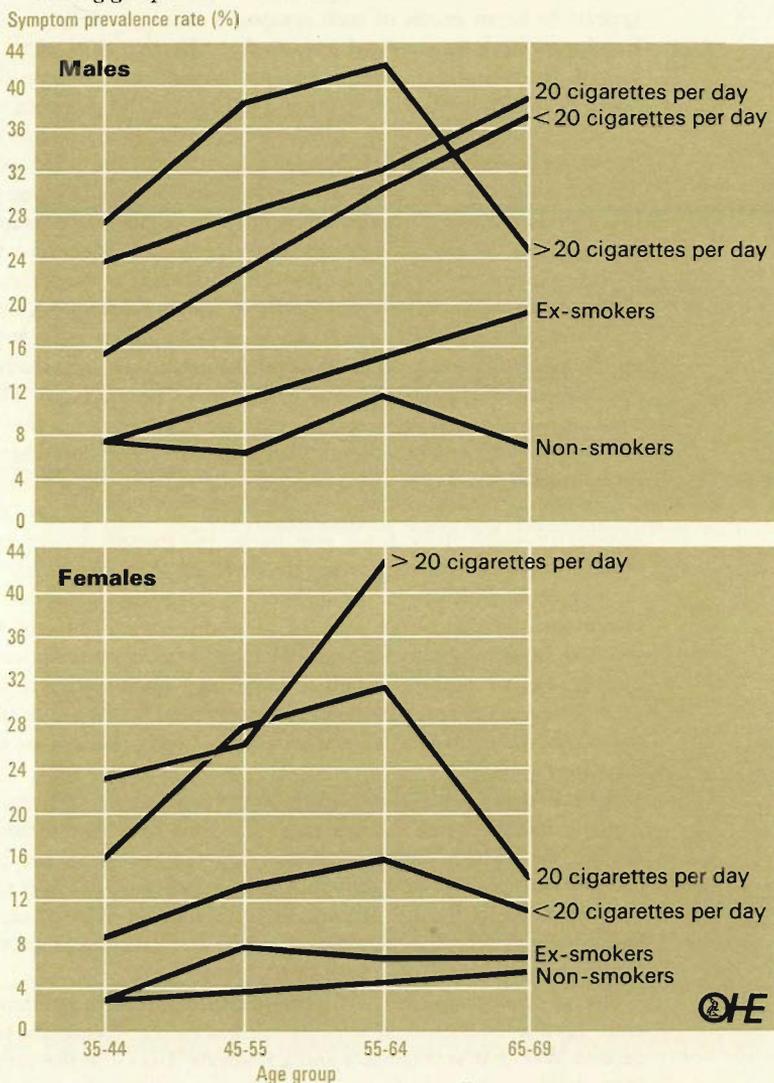
Table 2 *Bronchitis mortality by social class*

Social Class	SMRs (Males 20–64)		
	(1921–23)	(1949–53)	(1959–63)
I	26	34	28
II	55	53	50
III	94	98	97
IV	121	101	116
V	177	171	194

Note Full occupational tables for 1971 are as yet unpublished. See Figure 8a for latest available data

Source Registrar General’s Decennial Supplement for 1961

Figure 2 Prevalence of persistent cough and phlegm production in various smoking groups



Note The drops in symptom prevalence rate in both men and women aged over 65 who are the heaviest smokers of their generation (i.e. > 20 a day for men and 20 a day for women) are related to a number of factors. One of the most significant may be that those particularly vulnerable to the ill effects of smoking tend to die or to reduce consumption in middle life. Hence the high rate smokers in old age are a selected sample of more resistant individuals.

Source Lambert and Reid 1970

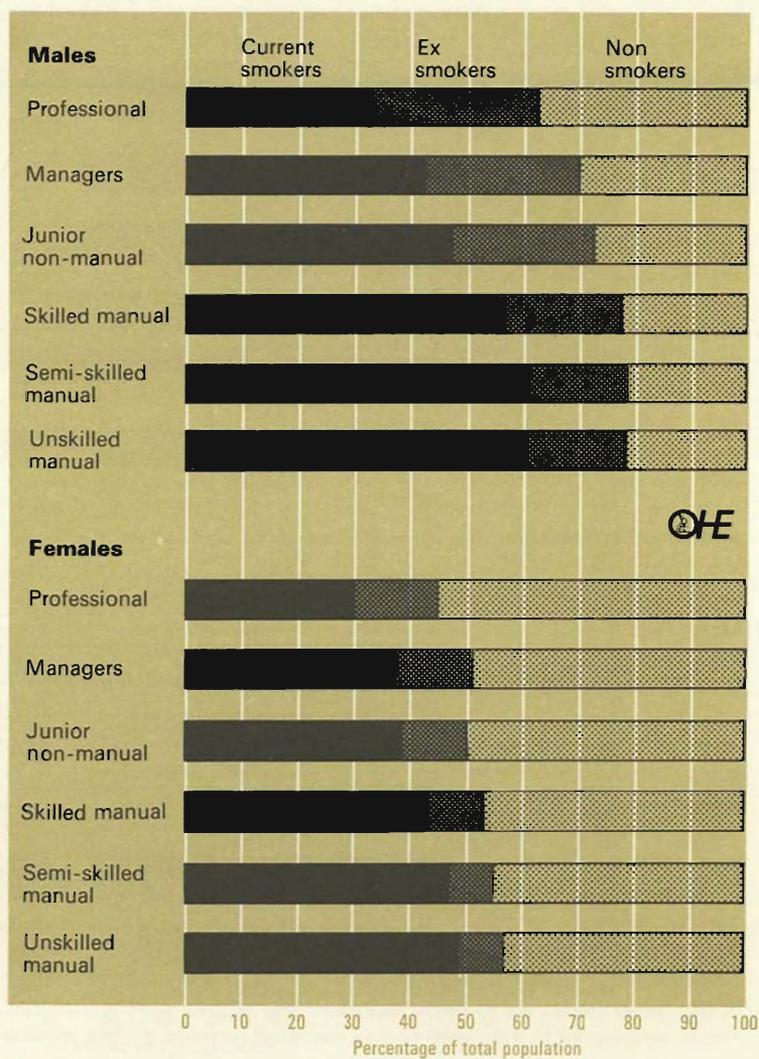
such as persistent cough and phlegm production, is closely related to the smoking habits of affected subjects, although as Figure 2 illustrates there appears to be an excess of such symptoms amongst males as opposed to females for both smokers and non-smokers. Fletcher *et al* (1976) have also argued that cigarette smoking is a major cause of small airways disease and hence of chronic airflow obstruction. However, it had also been noted that smoking leads to lung damage of a degree that is likely to have any functional or clinical significance only in a small proportion of the at risk population. The latter therefore probably have some special susceptibility to the effects of tobacco smoke on the lungs, although a subject's method of smoking may be important. It has been observed that chronic bronchitis is more frequently experienced by those individuals who smoke without removing the cigarette from their mouth and by those who habitually extinguish their cigarettes and relight them at a later time (Rimington 1973, 1974). It has also been suggested that the depth of inhalation corresponds closely with the consumption of cigarettes (Tobacco Research Council 1972). Thus heavy smokers not only expose their bronchi to more irritation but they also tend to inhale smoke to a deeper level which could be significant where damage to the smaller airways is concerned.

The prevalence of cigarette smoking in the community affects the respiratory health of the entire population. For instance Colley *et al* (1974) found that passive smoking during the first year of an infant's life influences the degree to which he or she is likely to experience acute bronchitis or pneumonia. The incidence rates of these diseases are directly related to parental smoking rates although after the age of one this relationship between passive smoking and infant respiratory illness appears to fade. Even so, there appears to be good reason to actively bring to the notice of smoking parents the dangers of the habit as far as their young children are concerned (Leeder *et al* 1976).

A study that examined the health of individuals born in Britain in 1946 from birth to the age of 20 found that at the latter age cigarette smoking was already the most significant influence on the prevalence of bronchitic coughs. The second most significant factor was a history of lower respiratory tract illness under the age of two years. Correlation of social class and air pollution with symptom prevalence, at least up to the age of 20, was found to be relatively low (Colley *et al* 1973).

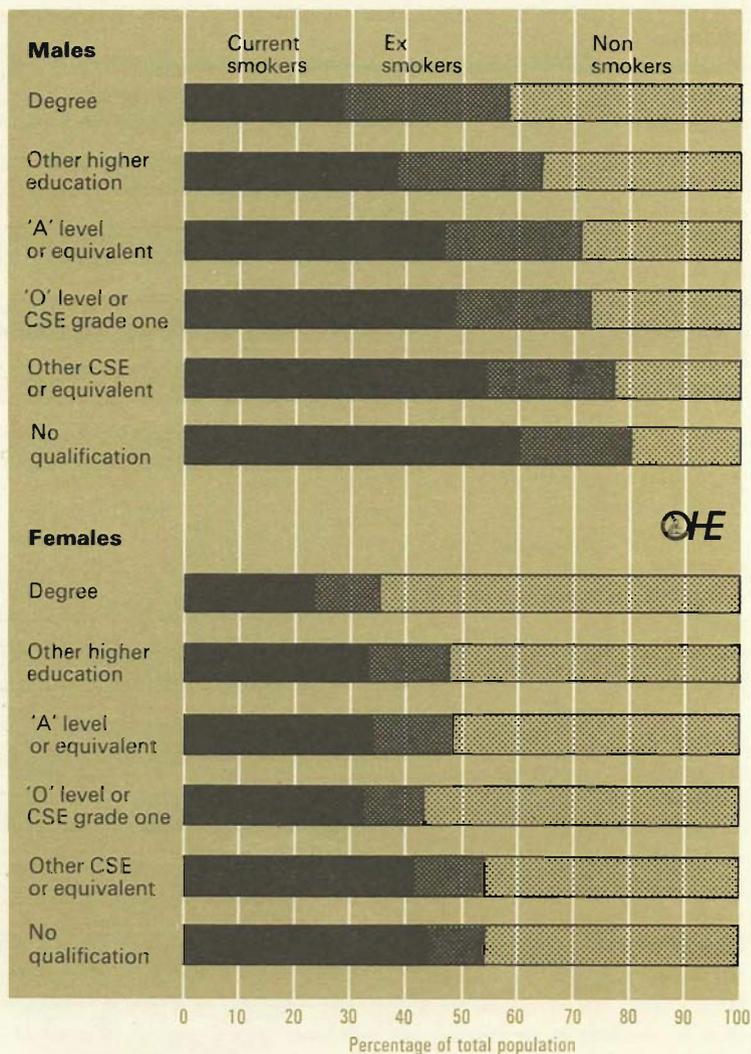
Recent studies indicate that a close relationship between smoking and social class and educational achievement has emerged since the end of the Second World War. Figures 3 and 4 illustrate data from the 1973 General Household Survey which show that the proportion of professional men who have never or only occasionally smoked is approximately double that amongst unskilled male manual workers. The latter also appear to be less able or motivated to give up the habit than members of the professional classes. A similar trend is shown in the comparison of smoking habits by educational groupings, where striking variations in the incidence of smoking

Figure 3 Cigarette smoking by sex and socio-economic group. Age standardised percentages, Great Britain 1973



Source General Household Survey 1976

Figure 4 Cigarette smoking by sex and highest level of qualification attained. Age standardised percentages, Great Britain 1973



Source General Household Survey 1976

are found to be directly related to educational achievement for both males and females.

All available studies indicate that it is beneficial from the viewpoint of relieving bronchitic symptoms to give up smoking at any stage in the condition's development. However, where airflow obstruction is involved there is some disagreement as to the effect that a break with tobacco addiction may have on its subsequent progression. Some authorities have argued that an improvement in the prognosis is likely to result⁴ (Doll and Hill 1964, Best 1966, Kahn 1966, Hammond 1966) but others believe that once the lung has been damaged the underlying progression of the disorder is unaffected by a cessation of smoking (Macklem *et al* 1974).

Air pollution

Air pollution may be both a primary cause of bronchitis and a factor responsible for exacerbating the condition in cases where it is already well established. This was dramatically illustrated by the high bronchitis death rates witnessed during the 'smog' episodes of 1952 and 1962. The experience of these events emphasised the value of anti-pollution controls in countries like Britain where temperature inversions may cause atmospheric contaminants to be trapped at low levels.

There can be little doubt that interventions such as the 1956 and 1968 Clean Air Acts have helped significantly to reduce the levels of air pollution. Between 1952 and 1965 smoke emission in the UK fell from 2.39 to 0.39 million metric tons per annum. Whilst a similar drop in sulphur dioxide emission has not occurred (the level has remained at about 5 million metric tons per annum) the overall contamination caused by it has also decreased due to controls placed on where, when and under what circumstances it may be released (National Survey of Air Pollution 1975). This improvement is shown on a regional basis in Table 3 for the period 1968-69 to 1974-75.

The same period was also one of falling bronchitis mortality in many parts of the country, especially the South East region, although a causal relationship between these two trends should not necessarily be presumed. One of the relatively few pieces of research conducted on this topic took place in Sheffield where the effect of a substantial decline in atmospheric pollution was studied in relation to patients with obstructive lung disorders. Comparisons were made between them and individuals of similar ages and smoking habits who had taken part in a prior survey. It was found that they had less productive cough, fewer winter illnesses, less severe breathlessness, and only one-third of the rate of decline of FEV of the people in the earlier sample, a result taken to be in part at least indicative of the positive effects of environmental improvement (Howard 1974).

In studies where pollution variations have been measured in conjunction

⁴ Pathological studies have clearly shown that there is a reduced level of lung damage from emphysema in those patients who stop smoking as opposed to those who continue the habit (Auerbach *et al* 1963).

Table 3 Air pollution: by regions in the UK

Standard regions	Smoke		Sulphur dioxide (SO ₂)	
	1974-75 level*	% change since 1968-69	1974-75 level*	% change since 1968-69
North	37	-66%	59	-39%
Yorkshire & Humberside	38	-61%	88	-37%
North West	39	-64%	90	-39%
East Midlands	35	-55%	62	-39%
West Midlands	37	-41%	76	-36%
East Anglia	25	-51%	52	-40%
South East (excl GLA)	19	-51%	57	-27%
Greater London Area	28	-39%	98	-35%
South West	19	-42%	44	-35%
Wales	23	-41%	60	-3%
Scotland	32	-64%	63	-28%
Northern Ireland	38	-52%	63	-34%

*Micrograms per cubic metre

Source National Survey of Air Pollution, Warren Springs Laboratory

with other factors (particularly smoking) bronchitis symptom prevalence has been shown to be greater than expected on the basis of the sum of their likely separate effects. It has been found, for example, that in non-smokers the effects of atmospheric pollution are relatively small but in established smokers its adverse influence becomes increasingly marked in direct proportion to the level of smoking (Lambert and Reid 1970). However, more detailed analyses of the nature of inhaled pollutants, particularly those occurring in workplaces, and of possible allergenic components in those pollutants might show greater specific correlation with symptom occurrence.

Bacterial infection

There is still uncertainty as to the precise role of bacterial lower respiratory infections in the initiation and subsequent progression of chronic bronchitis despite the fact that this area has been widely studied. Until recently it was generally believed that such illnesses were a direct cause of the type of damage characteristic of chronic obstructive bronchitis. But it now seems that much deterioration in respiratory function occurs before there is any clinical evidence that infection is producing serious ill effects. Hence the presence of the latter may be more coincidental than causal in nature.

A study by Fletcher (1968) found the significance of bacterial infection associated with chest illness in otherwise healthy working men to be minimal in that the rate of regression of respiratory function (as measured by FEV) between patients with differing levels of sputum purulence was not

statistically significant. Similar research conducted by the Medical Research Council on early chronic bronchitics found that male adults who had a history of purulent sputum had a rate of decline of FEV that was not significantly different from those whose sputum specimens were uninfected (MRC 1966). The same study did not discover over a period of five years any difference in the decline of FEV between those early bronchitics who had received continuous prophylactic chemotherapy for acute exacerbations and those who had received a placebo.⁵ In patients with severe airflow obstruction, a slight reduction of FEV is often seen when an exacerbative infection occurs (Howard 1967) but such losses are usually only temporary.

Fletcher *et al* (1976) argued that it is not possible to say that 'no clinical infection ever causes an appreciable degree of irreversible airflow obstruction' but asserted 'that this must be a rare event in adult life'.

Little is known, however, of the extent of damage or its relevance to future bronchitis caused by lung infections in childhood. In these cases the effects of early bronchitis and episodes of infection could have a lasting significance. Bronchiectasis, for example, is a childhood condition which could be a possible cause of airflow obstruction in later life. Furthermore, the organism that is the usual cause of persistently purulent sputum, the Haemophilus Influenzae, may not always be entirely eliminated by antibiotic treatment and may remain established in the bronchi of chronic bronchitic patients, making them more susceptible than normal subjects to reappearance of the infection. It is conceivable, therefore, that persistent but undetected low-grade bacterial infection may cause progressive erosion of ventilatory function although there is no evidence as yet that such sub-clinical infections actually occur.

Viral infection

Although intermittent viral infections may affect the course of chronic bronchitis at any stage of its development there is little evidence to suggest that they play a causal role at the start of its development in adults. Some bronchitic patients may associate the onset of their complaint with an acute viral infection but it is likely that in most cases such episodes only bring to the attention of the individual a pre-existing respiratory impairment.

Yet in some instances secondary bacterial infections of the lung develop following an initial viral infection and the onset of purulent sputum may date from such circumstances. Also viruses such as those shown in Table 4 can themselves cause acute exacerbations of chronic bronchitis which may accelerate the rate of a subject's deterioration. It is a common observation that people with chronic bronchitis fare badly during epidemics of influenza during which periods bronchitis mortality rates usually show marked peaks.

Several virological investigations have also shown that para-influenza viruses, respiratory syncytial viruses and rhinoviruses can be isolated more

⁵ However, the second report on this investigation was never published.

Table 4 *Viruses associated with chronic bronchitis*

Rhinoviruses	May precipitate acute exacerbations of chronic bronchitis, and may occasionally cause pneumonia in infancy.
Adenoviruses	May cause severe bronchitis in childhood and very occasional pneumonia in infancy.
Respiratory syncytial viruses	Principal cause of bronchiolitis in infancy and possible cause of infantile pneumonia.
Influenza viruses	In epidemics patients with persistent chronic respiratory disorders are at risk, especially the elderly.
Parainfluenza viruses	May cause lower respiratory tract infections and occasional cases of bronchiolitis.
Measles virus	A passive relationship. Pneumonia and tracheo-bronchitis may complicate severe measles.

Source Brewis 1975

frequently in samples from chronic bronchitics when they are suffering an acute exacerbation of symptoms than at times of remission. Rhinoviruses particularly have been highlighted as causing infections that 'go down to the chest' and that have a significant association with exacerbations of bronchitis (Stenhouse 1967, Eadie *et al* 1966). Stark (1975) found in a Glasgow study that rhinoviruses were recoverable from 48 per cent of bronchitic patients who had a cold together with an exacerbation of bronchitis but from only 4 per cent of those with an exacerbation without symptoms of a cold and from 5 per cent of those with uncomplicated colds. It has also been found that exacerbations in susceptible subjects are more likely to be related to viral infections when their families contain children than when they do not (Lambert and Stern 1972).

Recent evidence has drawn attention to the fact that abnormalities of lung function following a viral infection may be more prolonged in smokers compared with non-smokers. A report by Fridy *et al* (1974) found that rhinoviral infection occurring in smokers was associated with abnormalities of pulmonary function which were strongly suggestive of pathological changes in the smaller airways even though there were no symptoms of lower respiratory infection.

Childhood experience

The bronchitic complaints of childhood are generally of a different nature to those of later life. However, it is now widely recognised that the two are basically related in as much as respiratory disease in the first years of life may predispose individuals to developing chronic bronchitis subsequently. Yet there is no conclusive data to support this hypothesis, partly because this is an area which has tended to be overlooked in the past. Reliable research findings have only begun to emerge within the last two decades.

Colley and Reid (1970) found that children aged 6 to 10 years who gave a history of previous bronchitis or pneumonia had lower PEF rates than children with no such history. Gregg (1974) also discovered a clear variation in

Table 5 Respiratory disease mortality in children and adult males, and male/female death ratios

Death rates per 100,000 per annum from influenza, bronchitis, pneumonia - in 1957-61, WHO (World Health Organisation 1964)

Country	Age-specific rates		Male/female ratios	
	45-64	0-14	45-64	0-14
England & Wales	160	35	3.3	1.2
Scotland	152	37	3.3	1.2
Northern Ireland	129	40	2.4	1.3
Netherlands	39	14	2.6	1.2
France	30	23	2.2	1.2
Norway	20	20	1.4	1.2
Denmark	20	18	1.5	1.3

Source Reid 1969

PER rates between young adults of 15 to 30 years who gave a history of recurrent bronchitis in childhood and individuals of the same age without such experience. Although his findings were not indicative of any excess of serious lung impairment in the former group this may well have been because they were relatively young and would not in any case be expected to show major pathological changes until later life.

Reid (1969) pointed out that in Britain the excess in respiratory disease mortality for adults as compared to the rates in countries like Norway and Denmark is reflected by a similar although less marked excess in the 0-14 age group, as is shown in Table 5. This not only implies that special bronchitogenic factors may be at work in Britain but leaves open the possibility that childhood exposure to them is reflected in the adult rates.

A follow up study to the age of 25 years of a nationally drawn sample of children born in 1946 found that those who suffered an attack of pneumonia or bronchitis in the first two years of life had nearly double the risk of chest symptoms at the age of 25 years compared with those who escaped such illness (Kiernan *et al* 1976). While the major variation in symptom prevalence was due to smoking (a difference in prevalence between 'non' and 'present' smokers of 13.8 per cent) a 4.7 per cent difference in prevalence was found between those who had and had not had a chest illness under the age of two years. It is possible, therefore, that attacks of pneumonia and bronchitis in the first two years of life have long-term consequences, at least up to the age of 25 years. After this it is not improbable that such chest symptoms could persist or become more severe with increasing age. However, an alternative explanation of this association could be that it is due to the fact that people who have a poor resistance to infection in childhood continue with this poor resistance in adult life.

Douglas and Waller (1966) described the relationship between air pollution, social class and the incidence of lower respiratory tract illness experi-

enced under the age of two years in a group of young adults. They found that air pollution had a major effect on the incidence of multiple (two or more) lower respiratory tract infections. A three-fold difference in the incidence of the latter existed between children exposed to the lowest air pollution levels and those exposed to the highest. A social class effect was also found although this was less significant. Yet Colley and Reid (1970) in a study of 6-10 year olds living in various urban and rural areas of England and Wales found stronger evidence regarding the importance of a social class gradient in the frequency of chronic cough, history of bronchitis, and disease of the ear and nose. A consistent rise in the frequency of chest conditions with increasing local levels of air pollution was clearly seen only among the children of semi-skilled and unskilled workers. Thus the social class gradient which is characteristic of bronchitis mortality in adults was found to appear in children even before they began to smoke or to be exposed to different occupational environments.

A study that examined school-children from four contrasting areas in Kent found that area of residence, social class, family size and a past history of pneumonia, bronchitis or asthma were all associated with differing PEF rates (Holland *et al* 1969). These four factors apparently acted independently and their adverse effects were believed to be additive. Such findings are a reasonable indication that experience in the early years of life may produce respiratory system changes in individuals which persist throughout later life and which possibly contribute to the subsequent development of chronic bronchitis.

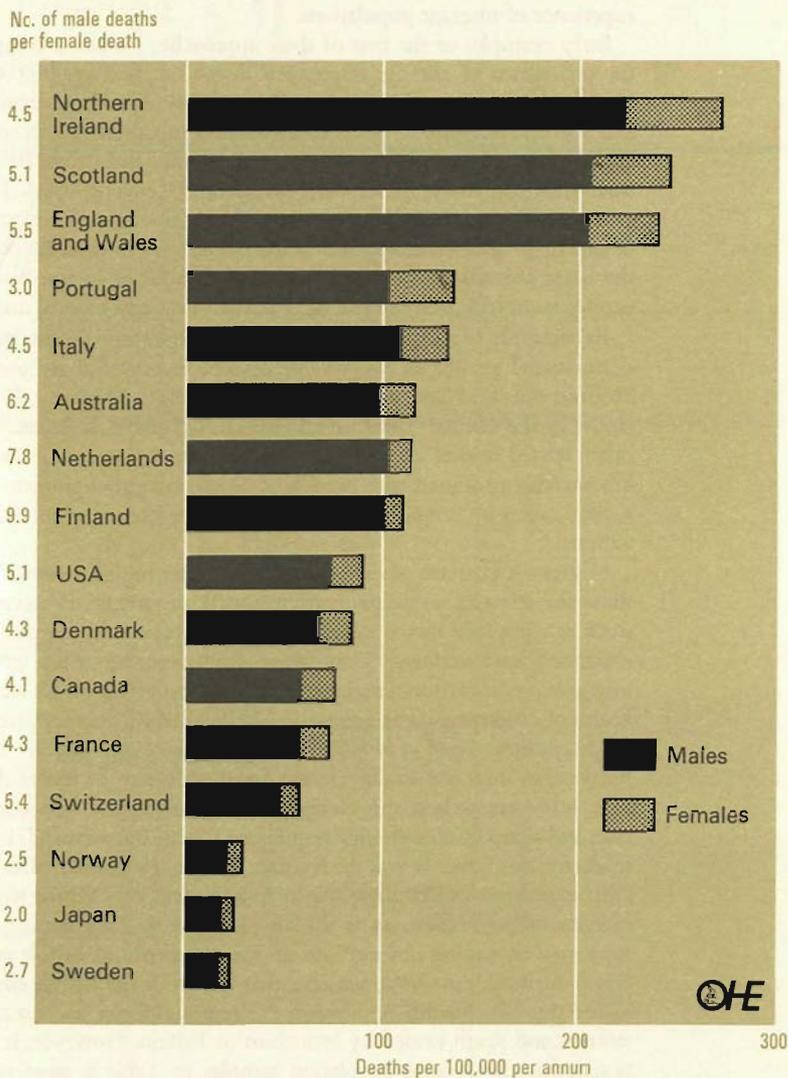
The occurrence of bronchitis

International comparisons of rates of mortality from bronchitis clearly indicate that the disorder affects the British population to a greater extent than that of any other country in the world. Although variations in diagnostic practice mean that simple comparisons of specified causes of death such as chronic bronchitis or emphysema are virtually meaningless if considered in isolation from one another, aggregates of the conditions which together make up the chronic lung diseases can usefully be extracted from available data.

Figure 5 compares death rates in the 55-64 age group from all chronic lung disease diagnosis (not specifically from bronchitis). It shows that mortality in the UK from these conditions during the mid-1960s was probably in the order of 10 times that experienced in Japan, Sweden and Norway and several times that which occurred in most other industrialised countries.

Awareness of such variations coupled with the observation that the male/female ratio of death rates also differs widely between nations has led to considerable epidemiological research in the last two decades aimed mainly

Figure 5 Death rates from 'chronic lung disease' at ages 55-64 for males and females in various countries 1965-67



Note For a discussion of the significance of ICD classification changes see TRC occasional paper 2, 1976.

Source WHO data
Presentation after Reid and Fletcher 1971

at identifying the causal factors involved. This has been conducted in a number of ways, including general population surveys, comparisons of specific occupational groups and analyses of the morbidity and mortality experience of migrant populations.

Early examples of the first of these approaches include a comparison of the prevalence of chronic respiratory disease in men aged 55-64 on the Danish island of Bornholm and similar males living in rural areas of Wales and Scotland (Olsen and Gilson 1960), and a comparison of men and women aged between 40 and 64 in various parts of rural and urban Britain and a small American town, Berlin, New Hampshire (Reid *et al* 1964). The former related the higher British experience of bronchitic complaints to the habit of smoking cigarettes as opposed to the Danish pipe or cigar smoking whilst the latter pointed to the possibility that some factor in the British urban environment increased the risk of bronchitis amongst elderly males.

An example of a comparison of rates of respiratory disease in a specific occupational group, service vehicle drivers, is provided by the work of Holland and Reid (1965) in England, Mork (1962) in Norway, Holland *et al* (1965) in the United States, and Matsuya *et al* (1971) in Japan. These and other related studies all confirmed that within countries smoking was the key variable associated with bronchitic symptoms although there was again a clear excess in Britain even after the tobacco consumption variable was adjusted.⁶

Migrant studies are of special value for a number of reasons. They may show the effect of a change in environment on people of a given genetic stock as compared to the experience of their peers who remained in their childhood surroundings. They may also overcome some problems of intergroup comparison associated with diagnostic fashion by allowing the health of different genetic groups to be recorded by doctors practising in a single country. Reid *et al* (1966) compared the experience of British and Norwegian migrants to the United States with that of native Americans. Like other researchers they found a close correlation between smoking rates and symptoms of chronic respiratory illness. But when adjustment was made for this factor it was shown that the bronchitis morbidity and mortality experience of British people in America was very similar to that of the indigenous population, as is shown in Table 6. This finding, which is supported by similar observations on the experience of British migrants to South Africa (Dean 1965), suggests that factors in the British environment rather than the British population are responsible for the excess rates of sickness and death caused by bronchitis in Britain. However, it should be noted that the general population samples in Table 6 were taken from national studies; hence the problem of differing medical fashions in diagnosis may not have been entirely overcome. It is also of interest that the

6 By contrast the Japanese figures were remarkably low despite relatively high current smoking levels. This may have been due to a reluctance based on cultural grounds to report bronchitic symptoms, particularly sputum production.

Table 6 Age-adjusted death rates and morbidity prevalence rates for chronic lung disease in migrant and general population samples aged 35-74

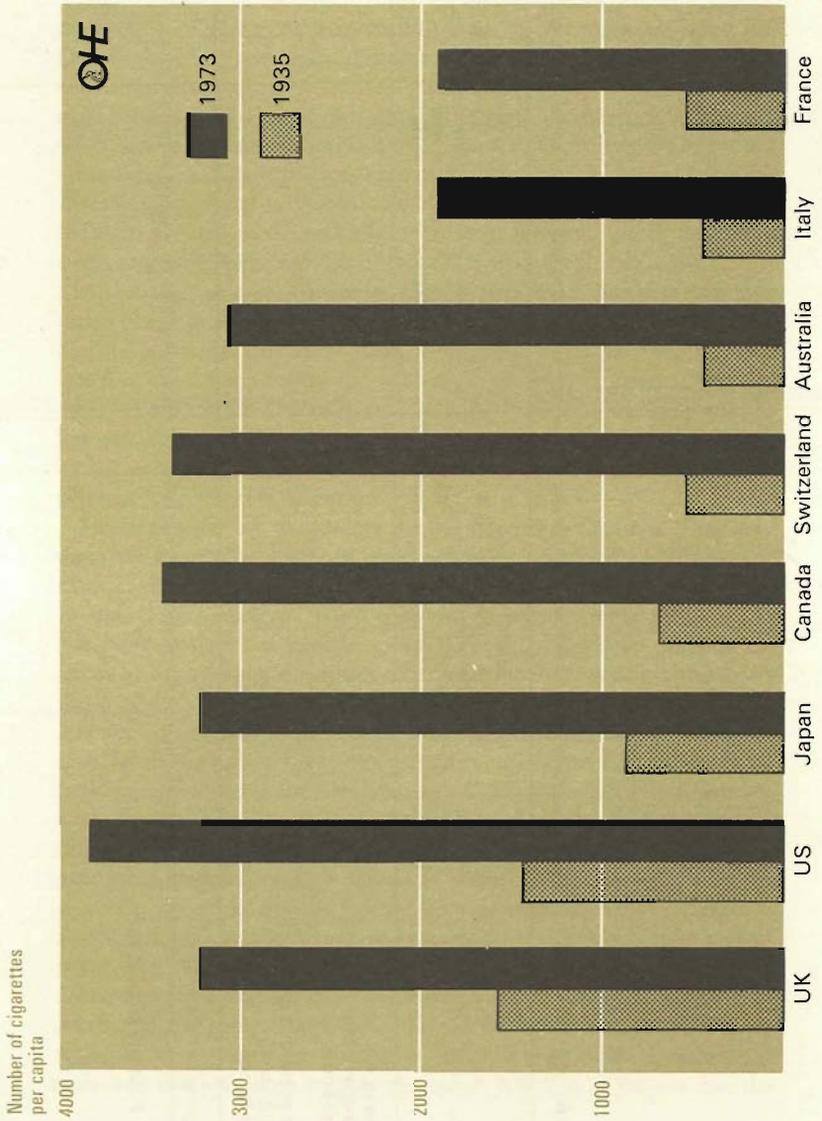
	Males		Females	
	Death rate/100,000	Prevalence (%)*	Death rate/100,000	Prevalence (%)*
		Persistent phlegm production	Persistent phlegm production	'Chronic bronchitis'†
Migrants in USA				
Norwegian-born	9	6	2	1
British-born	23	8	4	1
General population samples				
USA (12 States)	24	11	4	1
Great Britain	125	20	24	4

*Age-group in Britain, 35-69

†'Chronic bronchitis' = persistent phlegm production + exacerbation(s) in the last three years + dyspnoea on walking at normal pace

Source Reid and Fletcher 1971

Figure 6 *Manufactured cigarette consumption per adult per annum in 1935 and 1973*



Source Tobacco Research Council

death rate from bronchitis amongst British immigrants to the United States was still relatively high compared to that of the Norwegians.

Bronchitis in Britain

Overall the weight of epidemiological evidence is that although smoking habits play a dominant intra-national role in determining the occurrence of bronchitis current smoking levels do not appear to explain why Britain suffers from such a particularly high prevalence of the condition. In this context it is interesting to note that although female cigarette smoking has increased in Britain in recent decades and that female lung cancer deaths rose by about a half between 1961 and 1973, female bronchitis death rates fell by over a third in the same period.

However, this apparent conflict may probably be explained by the long period of time it takes an individual to develop and eventually to die of chronic bronchitis. In the light of this point Britain's large (mainly male) cigarette consumption in the 1930s, shown in Figure 6, may go some way to explaining our comparatively high current mortality from the disease. Regarding the female figures it may well be that the consequences of recently increased smoking have yet to fully show themselves (despite increases in bronchitis mortality in women who reached their 20s during or after the decade 1920-30, TRC 1976a) whilst the present favourable overall trends in female bronchitis death rates are associated with earlier environmental improvements.

Information from the prevalence studies quoted above indicates that over a million people in Britain may be said to suffer from chronic bronchitis, that is persistent phlegm production characterised by a history of exacerbations and some degree of breathlessness on walking at normal pace. Amongst the population aged 35 around one man in five and one woman in ten suffers from persistent phlegm production (Lambert and Reid 1970) and even in Britain children aged between 6 and 10 one in ten in rural areas and one in seven in polluted cities have chronic cough (Colley and Reid 1970).⁷

One indicator of the extent of the burden such morbidity imposes on the community are the findings of the Second National Morbidity Survey (1971) which show that at the start of the 1970s nearly 600,000 individuals in Britain consulted a general practitioner at least once a year for chronic bronchitis and over 2,800,000 did so for conditions described under the category of acute bronchitis. In the former category males outnumbered females by 2:1 but in the latter there was no significant sex variation. The

7 It should be noted that in children, especially those in the first four years of life, acute bronchitis and bronchiolitis account for a high proportion of morbidity and mortality. Approximately a quarter of the total deaths suffered from these conditions occur in the first year of life, and they account for about one-twentieth of the total mortality in that group.

rate of GP consultation for bronchitis appears to have risen during the past two decades.

By contrast, however, hospital discharges and deaths for chronic bronchitis and emphysema are falling. In England and Wales they dropped by almost a third between 1963 and 1973, from 77,000 to about 54,000. Much of this reduction is probably accounted for by improvements in treatment of the condition, including the more widespread and efficient use of antibiotics. The mortality rates shown in Figure 7 indicate a significant decline in female bronchitis mortality since the end of the Second World War, even though overall male rates have remained more stable. The trends in age specific mortality rates, which reflect an increase in the ratio of male to female deaths with rising age, are illustrated in Table 7.

Regional and occupational comparisons

Within the UK there is a clear pattern of regional disparity in the rates of bronchitis mortality, as shown in Table 8. It is high in the industrial Midlands, the North of England, South Wales and the Forth-Clyde Valley and low within Eastern England and the South West. The regional figures for lung cancer and heart disease correlate fairly closely with those for bronchitis which again suggests external social and environmental causality for the disorder rather than the existence of intrinsic predisposing factors within the population.

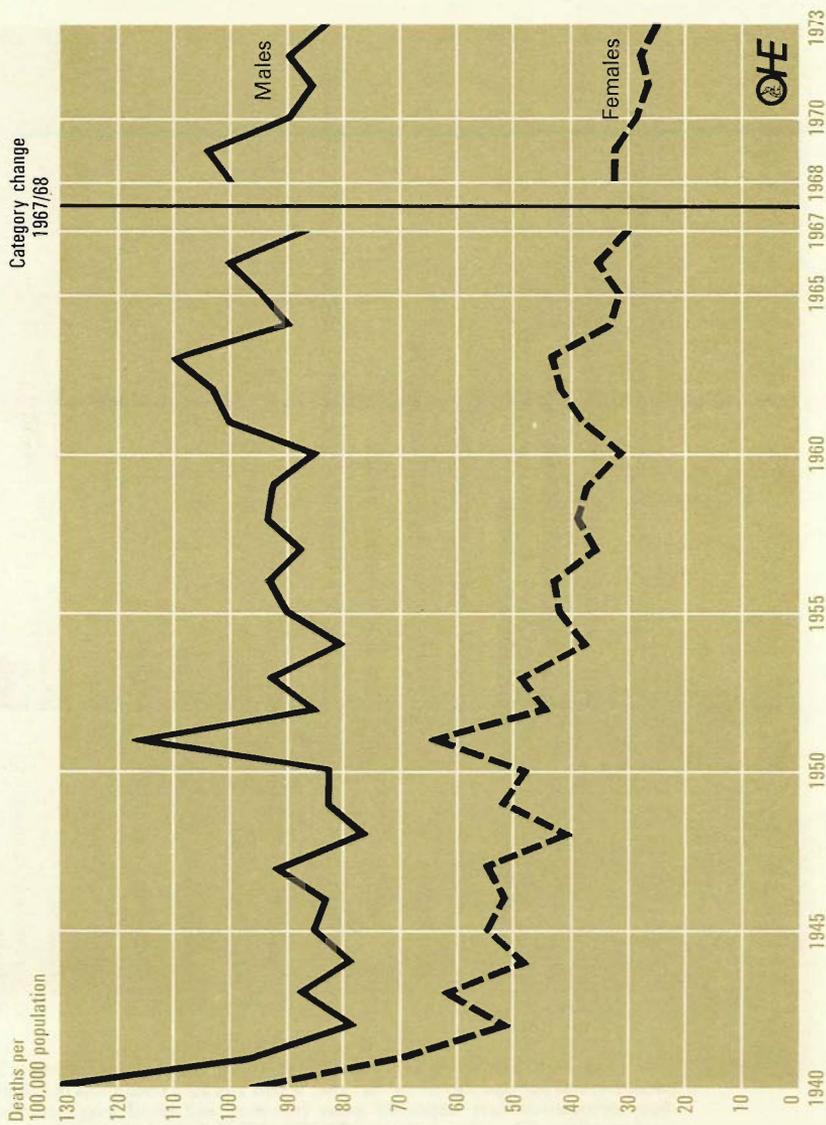
Variations in temperature and rainfall may explain some of the regional disparities in bronchitis incidence but the connection is not well established. Of the two, low average temperature appears to be the most significant. However, factors such as the quality of housing and the pattern of industrial

Table 7 Annual death rates per 100,000 for the periods 1951-53, 1961-63 and 1971-73 for chronic and unqualified bronchitis

	Age group	Males	Females	Male/Female Ratio
1951-53	25-44	4.0	2.0	(2:1)
	45-64	113.8	30.4	(3.7:1)
	65-74	446.8	137.5	(3.2:1)
	75+	903.3	456.0	(2:1)
1961-63	25-44	2.9	1.7	(1.7:1)
	45-64	114.3	21.0	(5.4:1)
	65-74	550.2	108.0	(5.1:1)
	75+	1071.0	334.0	(3.2:1)
1971-73	25-44	1.5	0.9	(1.6:1)
	45-64	72.4	19.0	(3.8:1)
	65-74	416.2	70.0	(5.9:1)
	75+	1017.0	209.6	(4.8:1)

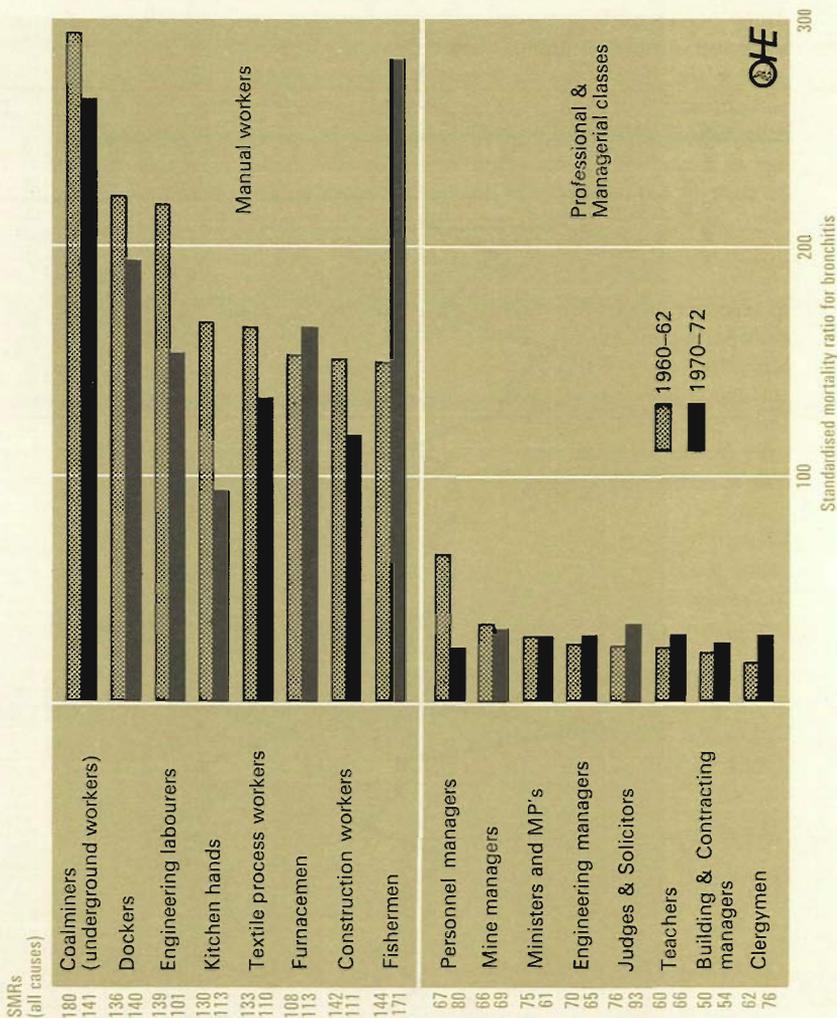
Source Registrar General

Figure 7 Trends in male and female mortality, England and Wales, 1940-73



Source Annual Abstract of Statistics, various years

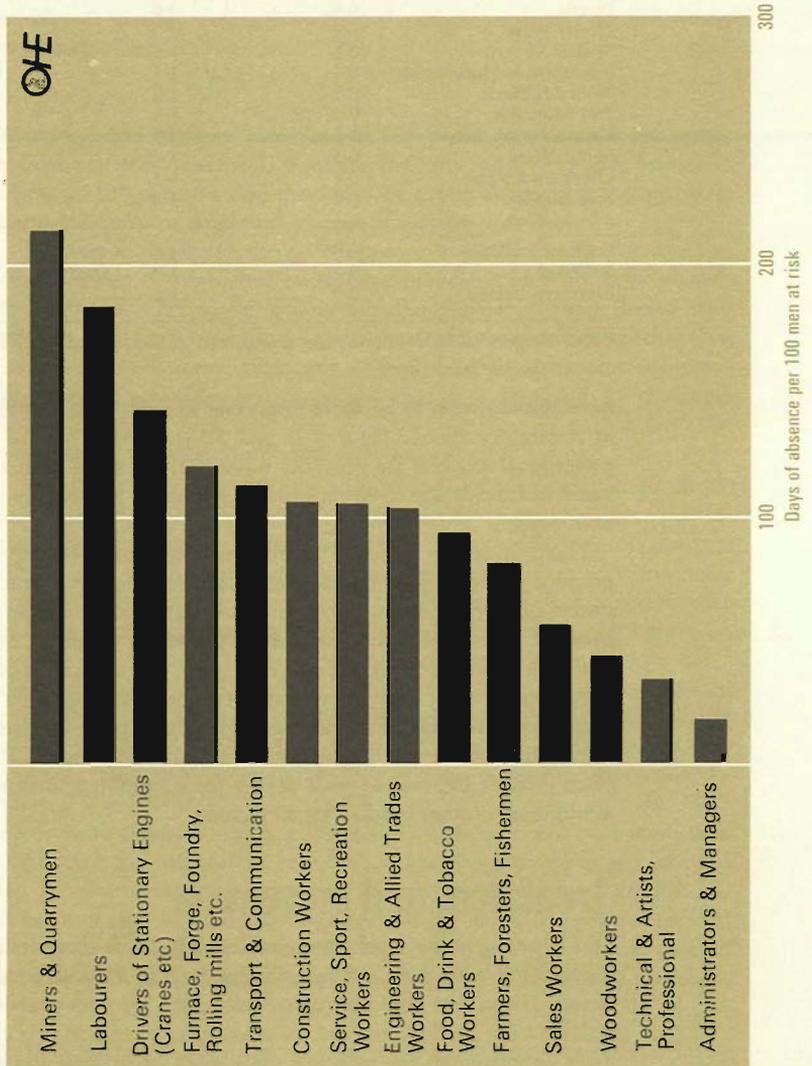
Figure 8a The ratio (percentages) of observed bronchitis deaths in selected occupational groups relative to the number expected on the basis of national age standardised rates



Note The high 1970-72 SMRs for fishermen are related to improvements in data collection and perhaps also to the fact that whilst working conditions in traditionally dusty occupations have improved many fishermen still spend long hours in often smokey cabins. Thus the change in the bronchitis SMRs may be a reflection of the increased causal significance of cigarette smoking in chronic bronchitis.

Source Registrar General (1970-72 figures from *Hansard* 12 January 1977)

Figure 8b Days of absence from work per 100 men at risk due to bronchitis. Selected occupations, UK 1962



Source Ministry of Pensions 1965

Table 8 Deaths per 1,000 males (aged 45-64) from selected causes 1975

Standard regions	Bronchitis*	Lung cancer	Heart disease
North	0.8	2.0	6.2
North West	0.8	2.0	6.4
Wales	0.8	1.6	6.6
Yorkshire & Humberside	0.7	1.7	6.1
West Midlands	0.7	1.8	5.4
East Midlands	0.6	1.5	5.2
Great London Area	0.6	1.7	5.2
South West	0.5	1.4	5.0
Other South East	0.4	1.3	4.7
East Anglia	0.4	1.4	4.4
England & Wales	0.6	1.6	5.5
Scotland	0.6	1.9	6.5
Northern Ireland	0.9	1.2	7.0

*This category includes chronic and unqualified bronchitis and emphysema
 Source Social Trends 1976

development seem to be more important in explaining regional variations in respiratory illness. Figures 8a and 8b show that manual rather than professional workers are generally more likely to suffer both absence from work and death due to bronchitis. Miners show particularly high rates in both cases.

There is much evidence to suggest that dusty working conditions produce adverse effects on individual lung function. For example, several studies of workers exposed to cotton dust have shown a strong correlation between that and the development of bronchitis (Schilling 1956, Elwood *et al* 1965, Pemberton 1968, Berry *et al* 1974). The assessment of evidence of association of other dusty occupations with bronchitis has been reviewed by Gilson (1970). He stated that all the available data point consistently to high bronchitis rates in dust exposed groups, although in individual cases it is often difficult to assess to what degree the condition is attributable to this as opposed to other possible causal factors.

Treatment and prevention

To a large extent the development of disabling or life-threatening bronchitis is associated with the exposure of individuals to avoidable environmental factors. Given that once obstructive bronchitis becomes established there is little that can be done to cure the underlying condition it is clear that the main opportunities for reducing the burden of sickness and death which bronchitis imposes on the community lie in the field of prevention rather than direct medical intervention.

Yet the latter can be of great value in certain circumstances. For example, much distress can be averted through the control of the frequency and

severity of infection suffered by chronic bronchitics. This section therefore examines the techniques available for both the treatment and prevention of bronchitis on the assumption that they are not alternatives to be judged one against the other but complementary approaches which will generate the maximum possible returns for society if used pragmatically in conjunction with each other.

Treatment

Many episodes of acute bronchitis are self-limiting and do not necessarily require antibiotic treatment. Similarly, the early stages of chronic bronchitis often do not demand that medicines be given although broad spectrum antibiotics may be employed in cases of sputum purulence.

By contrast, however, the use of appropriate antibiotics to treat infective exacerbations of established obstructive bronchitis may not only provide symptomatic relief to the patient but also prevent to some degree their physical and/or psychological decline. And many authorities feel that once bronchitis has become sufficiently advanced to be a cause of significant handicap to the individual concerned then it is beneficial to administer antibiotics prophylactically; that is, over a prolonged period with the intention of warding off infective episodes.

Despite some doubts as to the advisability of this practice, based on the fear that bacterial resistance may be encouraged,⁸ research indicates that for the sufferers immediately involved it is of definite value. For example, a recent trial which investigated the use of the medicines co-trimoxazole and amoxycillin in this context found that both were effective and that the patients concerned reported greater wellbeing than during the previous, comparable, winter (Cooper 1975). An earlier study (Johnson *et al* 1969) also found that chemoprophylaxis reduced the number of exacerbations experienced by chronic bronchitics although its authors did not find any indication that it altered the rate of deterioration of their respiratory function. However, it is possible that in some cases the latter could be affected if other prophylactic measures, such as stopping an individual's exposure to cigarette smoke, are employed in conjunction with medicines.

Additional treatments for bronchitis, particularly during or as a preventive measure against exacerbations, include techniques used to clear the bronchi of excess secretions. Vigorous postural drainage is sometimes used to improve pulmonary ventilation and may accelerate the response of bronchopulmonary infection to antibacterial drugs. The value of mucolytic

8 Resistant strains of pneumococcus and H-influenzae have been reported in the recent past (Percival *et al* 1969, Holt *et al* 1969, May and Davies 1972) but the level of risk this implies should be seen in perspective. Since the start of the 1960s the sensitivity of the organisms commonly associated with bronchitis to the standard antibiotics has remained substantially unchanged (May 1975). It would thus appear that the relief given to bronchitics by long-term chemotherapy outweighs any hazards created by such procedures.

agents in the liquefaction of tenacious sputum is still unproved but they may be useful in patients who complain of excessive difficulty in producing viscid sputum. Hot drinks can also provide some additional benefit in easing expectoration, as may vapour inhalations.

Exacerbations of bronchitis may be associated with reversible airways obstruction especially where an allergic or asthmatic component is present. In such circumstances a bronchodilator aerosol or a short course of an oral corticosteroid may be of value. Bronchodilator therapy is also used by some patients with severe obstructive bronchitis or emphysema.

Where emphysema is the main, though not the sole, cause of disability some physicians believe that breathing exercises may be of value.⁹ During attacks of urgent breathlessness anti-spasmodic remedies may be given, while inhalation of oxygen will often afford relief.¹⁰ It is also of note that some 'pink puffers' may actually benefit from a moderation of their vigorous attempts to keep their blood well oxygenated and do better if helped to adjust to maintaining rather lower levels. Both surgical and medical techniques for achieving this goal have been, and are being, investigated although their range of application is limited.

Prevention

Preventive approaches to illness and its consequences may be adopted before, during and after a condition's inception and subsequent development. Measures taken at these three separate stages may be respectively referred to as primary, secondary and tertiary prevention. In chronic bronchitis the first of these involves attempts to eliminate the factors believed to be the initial causes of pulmonary irritation and damage, like workplace pollution and addiction to cigarette smoking. The second includes those procedures designed to check the development of the condition in its early stages and the third those employed to reduce the suffering bronchitis causes, such as social interventions which may improve the quality of life of people with respiratory handicap.

However, chronic bronchitis (whether hypersecretory or obstructive) is a progressive disorder which is often established before a sufferer begins to be aware of its symptomatic effects.¹¹ Thus the scope for secondary prevention is small although it is possible that in the future the regular monitoring of lung functioning could be conducted amongst high risk although still

9 Proper muscle co-ordination may reduce the amount of work required in the breathing process and hence the amount of oxygen consumed. The more expiration is forced in an emphysematous patient the greater will be the degree of airways obstruction.

10 However, the latter should be used carefully where the patient is of the 'blue bloater' type.

11 For example, individuals with obstructive bronchitis usually do not report significant breathlessness until their lung capacity has dropped to about a third below that of a healthy person.

healthy sections of the population, particularly if the people involved could be trained to test their own ventilatory performance. This could lead to the recognition of impairment at an early stage when some form of intervention, such as a change of working environment might still be effective. Macklem (1972) has suggested that individuals revealed to have relatively minor small airways disease due to smoking might be persuaded to give up the habit and so perhaps avoid the onset of severe illness.

Even so, it is clear that the greatest benefits are likely to be gained in the area of primary prevention. And it is also clear that today the main area in which current effort of this type needs to be concentrated is the control of cigarette smoking. For although problems like environmental pollution and the hazards of the workplace are still significant there is fairly sound reason to suppose that their dangers and the need to control them is recognised by the community as a whole. This is reflected, for example, by the 1974 revision of anti-pollution legislation and the 1974 Health and Safety at Work Act. However, society appears to have been less successful in attempting to resolve important issues relating to smoking, a point apparently emphasised in much of the evidence submitted during the recent investigation on the prevention of ill health conducted by a sub-committee of the House of Commons Select Committee on Expenditure.

The previous emphasis on a relatively passive educational approach to this issue is now being called into serious question. Cigarette smoking in Britain has increased considerably since the end of the Second World War, particularly amongst younger women. Although in recent years overall numbers of smokers have fallen (and the proportion in the higher social classes has dropped particularly significantly) the number consumed per individual has remained relatively stable, a finding which may bode ill for the future respiratory health of the population. Another observation which calls into some doubt the usefulness of health education about the risks of smoking is that people in the lowest social class, who already incur a seven times greater risk of dying from bronchitis than those in the highest, are the least likely to be influenced by it.

Government restrictions on cigarette advertising¹² and the marketing of high tar cigarettes may be seen as more positive interventions (as may current moves to restrict smoking in public places) although even their value can also be questioned. For instance, smoking in countries like the Soviet Union and the People's Republic of China is apparently prevalent despite the absence of the advertising techniques employed in the West.

It may be therefore that the smoking habit is more persistent than some commentators appear to believe and that further public debate is needed on

12 In 1975 the tobacco industry spent over £83 million on advertising (press £13.3 million, cinema £1.5 million, sponsorship £6 million, posters £5 million, coupons £50 million, television £4.4 million, other £3 million) as opposed to the £1 million spent by the government on direct anti-smoking campaigns. In 1976 expenditure on coupons was reduced but that in some other areas increased. For example, the amount spent by the tobacco industry on press advertising more than doubled (ASH 1977).

how governments' and individuals' interests in this area may best be served. At present increased emphasis is being placed on encouraging people who smoke to use low tar yield cigarettes (which should perhaps have a relatively high nicotine content – Russell 1976 – or contain one of the new synthetic smoking materials – Freedman and Fletcher 1976). But there is as yet no guarantee that this will reduce the health dangers of smoking to an acceptable level.

There would thus seem to be strong arguments in favour of cutting cigarette consumption by more vigorous means than are at present being applied. The further increase of taxes on tobacco products is probably the most effective policy immediately available (Russell 1973, Peto 1974, ASH 1977).¹³ Despite the fact that concerted action along such lines could raise some questions as to personal liberty because tobacco smoking, unlike the taking of addictive or potentially fatal medicines, has traditionally been regarded as a matter purely for personal choice, it would probably be workable in the long term. On close examination many objections to the use of market mechanisms to control cigarette consumption appear invalid. For instance, it is sometimes argued that the poor in the community would be unfairly penalised by such measures but in balance to this it may be pointed out that people in the lower social classes are at the most risk from the diseases of smoking and are the group least likely to be helped to break the habit by less direct methods. Similarly it has been suggested that pricing cigarettes out of the reach of most elderly people would unnecessarily deprive them of a source of pleasure. However, objections to this view may be based not only on the grounds that some older people would themselves probably benefit physically from stopping smoking but also that until the addiction is largely eradicated throughout the community it will probably be impossible to discourage many young people from experimenting with and becoming addicted by cigarette smoking.

Economic and social aspects of bronchitis

The estimates presented in Table 9 indicate that in 1974 the treatment of bronchitis and emphysema cost the NHS approximately £95 million. Hospital services accounted for over 60 per cent of this sum and Family Practitioner Committee pharmaceutical services for nearly 25 per cent. The latter proportion may appear relatively high although the 30 per cent fall in the discharge rate between 1963 and 1973 for chronic bronchitis from hospitals (which may be taken to show a similar fall in admissions) is

13 In the long term it is possible that alternatives to the active ingredients of tobacco could be developed for use as psycho-active 'social' drugs. Advocacy of this approach at least has the advantage of stimulating discussion on the role of mood-changing substances in human societies.

Table 9 *The cost of bronchitis and emphysema to the NHS. UK 1974, £million*

	<i>Bronchitis and emphysema</i>	<i>Total</i>	<i>% of total identified NHS expenditure in sector</i>
Hospital services	59.9	2,630	2.3
General medical service	13.0	253	5.1
Pharmaceutical services	21.7	353	6.1
	94.6		

Notes

1 The hospital service figure includes capital costs but excludes outpatient services.

2 The cost of pharmaceutical service is calculated using the average cost for all prescriptions of £1.01 in 1974.

Source OHE Estimates

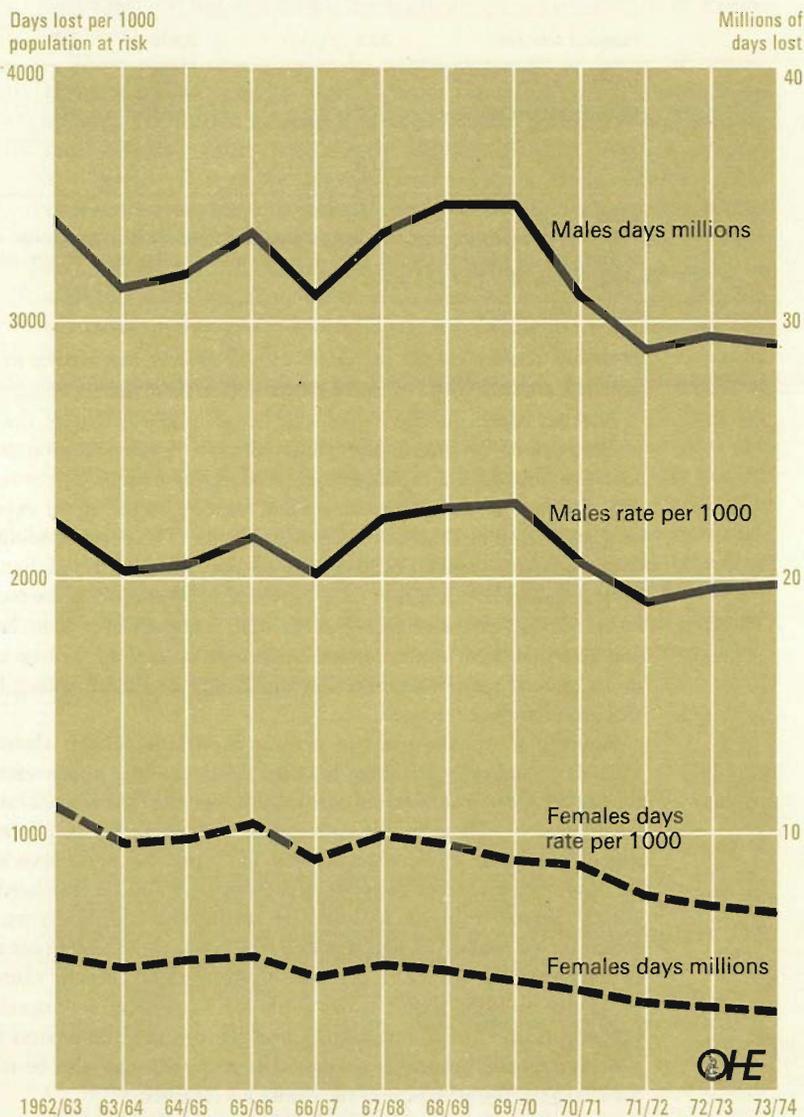
probably related to the increased use of modern antibiotics in general practice, a factor which to some extent offsets their costs.

Another economic cost which can be quantified is that of the sickness absence caused by chronic bronchitis. In 1973-74 the condition accounted for 31 million days of certified absence which represented 9.7 per cent of all recorded lost working days in Britain, thereby incurring an expenditure of £56 million in State sickness benefit grants. (The corresponding figures for emphysema were 1.3 million days, 0.4 per cent and £2.3 million.) However, it should be noted that these figures tend to understate the true extent of bronchitis sickness absence. For example, many spells of acute bronchitis and some transient exacerbations of chronic conditions will be classified under general respiratory infection and in any case those lasting less than three days are not recorded.

Figure 9 shows the trend in chronic bronchitis sickness absence since 1962-63. It indicates that there has been relatively little improvement over the last decade in male sickness absence although the figures for females have fallen steadily. These trends correspond with those for deaths and thus probably reflect real differences between the experience of the sexes although the low female absence rates for bronchitis may also be associated with a greater female readiness to leave the workforce completely once their condition has reached a stage in which they are likely to experience frequent or long absences. (In all 14 per cent of all invalidity benefit claimants in 1974, that is those absent from work for more than six months, were suffering from chronic bronchitis.) And the observed differences between male and female bronchitis sickness absence trends may also be related to the changing age structure of the insured workforce.

The value of production which is lost through sickness absence can be derived approximately from estimates of earnings forgone and on this

Figure 9 Days of certified incapacity attributable to bronchitis (chronic and unqualified) and emphysema, for males and females, 1962-63 to 1973-74, in Great Britain. Expressed in millions of days and as a rate per thousand of the average population at risk in the relevant sex group



Source DHSS

basis bronchitis cost £250 million in 1974.¹⁴ Yet it is extremely difficult to evaluate accurately the financial significance of sickness absence in this area: many factors, such as the level and adaptability of economic activity and inflationary pressures should, in theory, be taken into account.

The social nature of bronchitis

Despite the fact that around 30,000 deaths from chronic bronchitis are recorded in the UK each year the ratio of mortality to morbidity caused by the condition is relatively low. It is rarely fatal in middle life, around four-fifths of all deaths from it occurring in people aged over 65. Hence, even the limited proportion of sufferers who eventually die of the condition do so usually only after years of progressively worsening disability.

At first sight the available official statistics on handicap caused by bronchitis and related conditions are not particularly disturbing. Harris and her colleagues in their study of handicap and impairment in Britain (1971) estimated that 130,000 people were impaired by chronic bronchitis and 30,000 by emphysema. Of the combined total only a little over 20 per cent were sufficiently affected to be classified as severely or appreciably handicapped. However, two main points should be taken into consideration in the context of those figures. First, they do not include people living in institutions or hospitals, where perhaps the majority of badly disabled, elderly people suffering from respiratory handicap are to be found. Second, the Harris survey was aimed at assessing the potential uptake of new allowances for disabled people being planned in the late 1960s and early 1970s. Its emphasis was to identify people who could not care for themselves in the home and thus the defining criteria of handicap adopted were both strict and narrow. Occupational handicaps, for instance, which are often experienced by people with respiratory impairments sufficient to sap their endurance even though they retain the ability to do physically undemanding domestic tasks, were not recorded.

In fact the insidious and often not immediately visible nature of handicap stemming from chronic bronchitis often makes it an extremely difficult state to live with. Interruption of normal activities by infectious exacerbations tends to break up patterns of supportive contact whilst its progressive nature is often mistaken for a general personal deterioration with age rather than an aspect of the sufferer's specific condition. The fact that chronic bronchitics who are still mobile are not obviously disabled in the sense that someone who has, say, suffered an amputation is and that they may also have rather unpleasant symptoms of cough and sputum production often leads other people to have relatively little sympathy for them. Also it is most likely to affect non-professional people, who may be particularly vulnerable to the social and economic effects of any impairment.

14 Based on average yearly earnings (1974) for workers in manufacturing and certain other industries of £2,530 males and £1,400 for females.

Factors such as this can contribute special difficulties to the handicap caused by chronic bronchitis as it is experienced by sufferers and their families. Rubeck (1971) reported that the wives of bronchitic male patients frequently reported symptoms such as exhaustion, insomnia, recurring migraine and 'nerves'. During the same study it was found that many family doctors thought advanced chronic bronchitics depressing to treat. Limited ability to help medically, difficulty in obtaining hospital beds for long-term cases and inability to stop patients smoking were the main reasons cited for this response. More home helps, health visitors and facilities like meals-on-wheels were regarded as especially desirable by the doctors questioned.

Conclusions

Despite the heavy burden of morbidity and mortality still inflicted by bronchitis upon the British population it seems likely that the distress caused by the condition has declined in recent decades. The reasons for this include advances in medicine coupled with improvements in the living and working conditions of the population.

However, it now appears that the scope for developments in these areas to contribute further to the control of chronic bronchitis is relatively limited. This is because as the causal significance of factors such as occupational and environmental pollution has declined so that of cigarette smoking has increased. Also it is now realised that although the control of respiratory infection relieves some of the suffering of chronic bronchitics it is likely that in most cases medicines do little to slow or halt the process of progressive lung obstruction which underlies the most serious form of the condition.

The available evidence indicates that cigarette smoking is today the prime cause of small airways dysfunction and that the most effective way to control such pulmonary illness would be to reduce the prevalence of the smoking habit in the community. It is apparent that amongst the more educated or privileged sections of the population awareness of the benefits of ceasing to smoke or not adopting the habit is growing and that smoking is increasingly being regarded as socially unacceptable. But in the social classes who are most likely to encounter other possible causes of bronchitis, such as recurrent respiratory infection in childhood associated with poor housing and diet followed by exposure to dusty working conditions in adult life, cigarette smoking is still very widespread.

A question of growing urgency, therefore, is whether or not stronger measures aimed at reducing cigarette consumption should be introduced, over and above current health education efforts and promotion restrictions. Available information suggests that further taxes employed to increase tobacco prices (and hence awareness of the high absolute price of tobacco products) would be a viable approach which would be innovative

in the sense that it would more explicitly introduce health related issues into the sphere of economic policy. Although in recent years the Chancellor of the Exchequer has in the budget speeches made reference to the health implications of fiscal measures related to tobacco products Britain as yet lacks a long-term, publicly announced tax strategy for control of the cigarette habit. Such a programme, perhaps based on progressively increased taxation loaded to favour 'safer', low tar, brands, could do much to lessen the prevalence of the addiction in this country and might provide a model for other Common Market countries. Britain's tobacco taxes are due to be brought into line with those of the EEC by 1978, a move which at present would give a price advantage to 'king size' cigarettes at a consequent possible cost to the nation's health.

However, progress towards this goal is likely to prove highly controversial. This is not only because the use of price mechanisms in such a manner might be thought socially divisive but because it could also be regarded as an unwarranted intrusion into personal freedom in the way that some people believe water fluoridation trespasses on individual rights of choice.¹⁵

Further public debate on this topic is therefore necessary. But what is already beyond dispute is that medical and social advances have cut considerably the burden of premature mortality in most developed countries and so the main challenges now facing their health services are the degenerative diseases of later life typified by chronic bronchitis. Success in this area depends to a large degree on the population adopting ways of life which minimise their exposure to factors hazardous to health. In the case of bronchitis it is an ironic possibility that to some degree the stresses which the population has borne during the efforts necessary to provide the wealth needed to improve physical living and working conditions have led many people to take up the habit of smoking. This trend has in turn caused them to forgo in health terms the benefits which social progress would otherwise have brought them.

In this light one of the most important points to underline with regard to chronic bronchitis is that although its symptoms are not so dramatically unpleasant as those of lung cancer, which is unfortunately often seen as the only major danger from smoking, it is in fact more likely to occur than cancer. Indeed, few habitual smokers avoid all bronchitic symptoms although many of these are relatively mild. Yet because bronchitis is not immediately thought of as a life-threatening condition (and hence is not so frightening as cancer) it may be that it is easier for many people emotionally to accept that they may develop it as a consequence of their own actions. Thus in some ways it is appropriate to bring bronchitis into the centre of public concern about the ill-effects of cigarette smoking rather than to allow it to be an undefined hazard peripheral to carcinoma of the lung and the suffering and death that that disease causes.

15. Others might regard the regulation of arsenic sales in the 1850s, heroin in the 1920s or barbiturates in the 1930s as better analogies.

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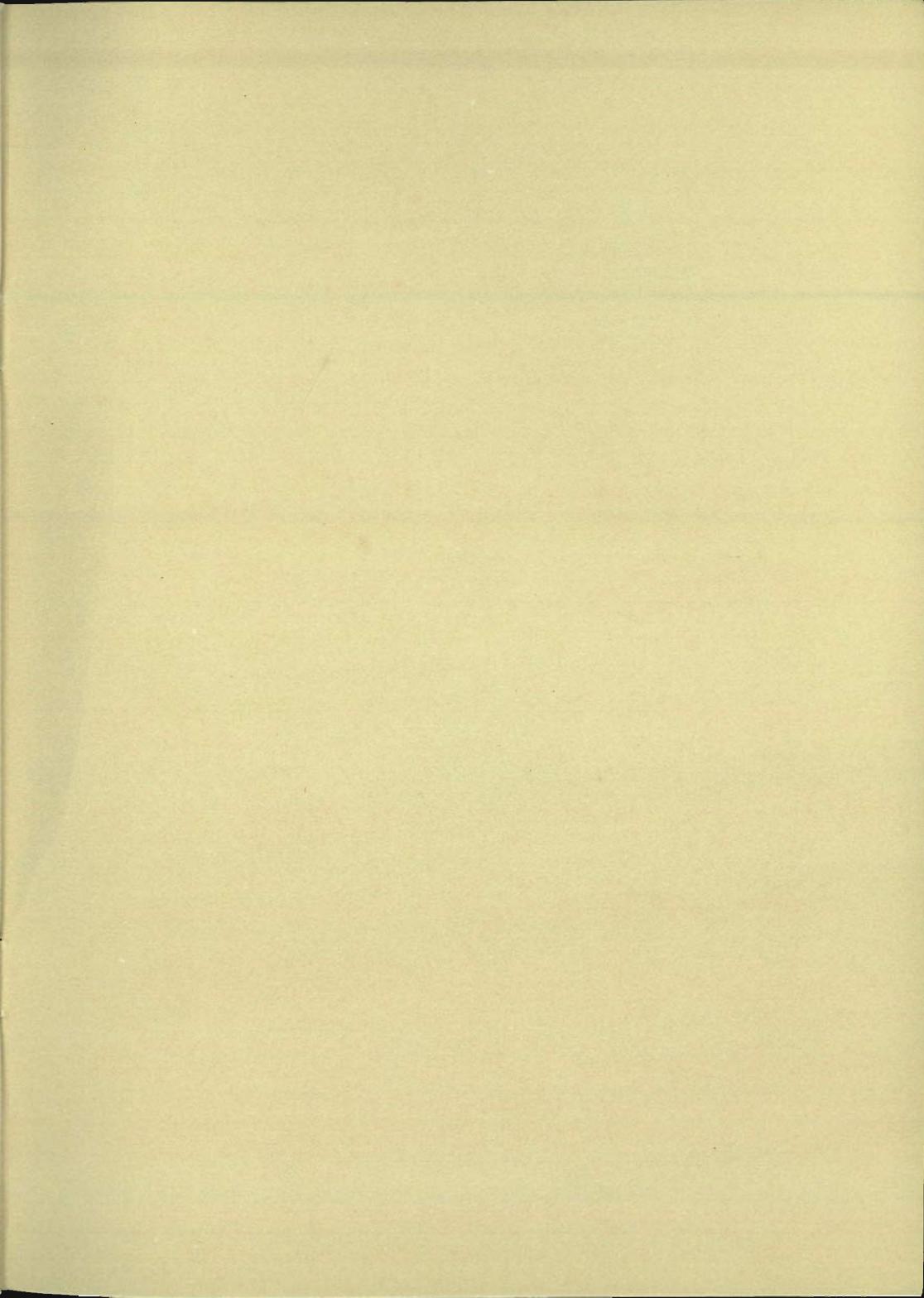
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