The vulnerable child

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SUMMARY. There is enough evidence from epidemiological studies of respiratory disease in children and young adults to justify testing various strategies for the identification of those children who are particularly vulnerable to respiratory disease. Such studies should be coupled with anti-smoking programmes carried out by those involved in the health education of schoolchildren and adults. The effects of this selective approach to the prevention or control of respiratory disease would require rigorous evaluation.

Introduction

Increasing interest is being shown by epidemiologists in the underlying causes of respiratory disease in children. This interest stems not only from the importance this group of illnesses occupies among the diseases of childhood, but also from the apparent longer-term consequences of such exposure on the development of respiratory disability in later life.

Smoking, as an aetiological factor, occupies a central point in any discussion of respiratory disease in adults. Among children, however, other factors both familial and environmental exercise major influences on respiratory disease. Smoking does, however, become important, as recent studies confirm, among older children in whom it may become a well established habit (Bewley, Day, and Ide, 1973). To mitigate the harmful effects of smoking, one approach would be to identify those children who, if they take up smoking, are at particular risk of developing chronic respiratory disease, and then to persuade them not to smoke. In this paper the identification of such children is discussed and various suggestions are made for the control or prevention of respiratory disability in older children.

Identification of the vulnerable child

Two main questions arise in discussing the identification of vulnerable children. First, where in the population should we seek them? In other words, do we have reason to believe that they may be concentrated in particular subgroups of the population? Secondly, what particular features of the individual child points towards him being vulnerable?

Sources of vulnerable children

In trying to answer the first of these questions one can draw on epidemiological studies that suggest potential sources of vulnerable children.

There is now a large body of evidence implicating various social and environmental factors in the aetiology of respiratory disease in children (Colley, 1971). It is worth re-emphasising some of these general factors as they point towards potential sources of vulnerable children.

In the United Kingdom, social factors have for long been recognised as having an important influence in children on mortality and morbidity from respiratory disease.

Figure 1 summarises the findings from a national survey of respiratory disease in 6–10 year-old primary schoolchildren. Children have been classified according to their father's social class (General Register Office, 1966). Thus fathers in professional and managerial occupations are placed in social class 1, those in non-manual, or intermediate occupations in social class 2, skilled workers in social class 3, semi-skilled in social class 4, and finally unskilled in social class 5. In the figure, social classes 1 and 2 and 4 and 5 have been combined.

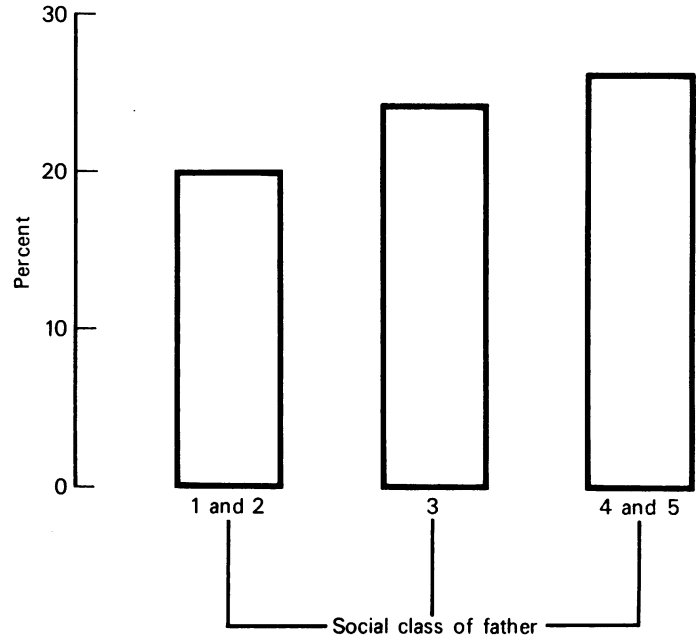

Figure 1
Per cent of children with history of chest illness in early childhood by social class.

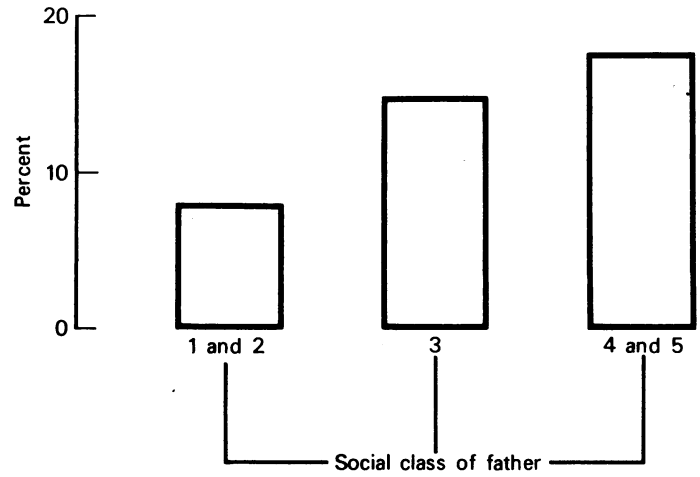

Figure 2
Prevalence of chronic winter cough by social class.

The prevalence rates for chest illnesses in the children show a gradient, with the lowest levels in children from social class 1 and 2 and highest in 4 and 5, 3 being intermediate between these two. Children with chest symptoms which were current at the time of the study (figure 2), show chronic winter cough has a similar pattern to that for chest illnesses.

Social class gradients for various indices of respiratory disease have been a consistent finding in studies of children of pre-school and school age in the United Kingdom, and indicate that children with respiratory disability tend to be concentrated in families of low social class. It is also worth noting that children with a history of pneumonia or bronchitis are more likely than children without this history, also to have a chronic cough in later childhood.

In recent years emphasis has been placed upon the role of air pollution in the evolution of chronic respiratory disease in adults. There is suggestive evidence that it may also be a factor in respiratory disease in children. Comparison of the prevalence of respiratory disease in children living in rural and urban areas has demonstrated gradients that could be ascribed to exposure of urban children to air pollution.

In figure 3 the prevalence of chronic cough is shown for children in rural areas, urban areas with moderate air pollution, and in urban areas with high pollution. The index of air pollution is the mean winter sulphur dioxide ($\mu g/m^3$). In social class 1 and 2 there is a gradient for chronic cough between rural and urban areas, but not between the two urban areas. In contrast, a gradient between the urban areas is present among children in social class 3, and is most striking in social class 4 and 5. This suggests that we should seek the vulnerable child among urban children, in towns where they are exposed to high air pollution, and from families of low social class. These are very general sources of vulnerable children and it would clearly be an advantage if specific groups of children containing a higher proportion of vulnerable children could be identified. Here some of the more recent epidemiological studies can help.

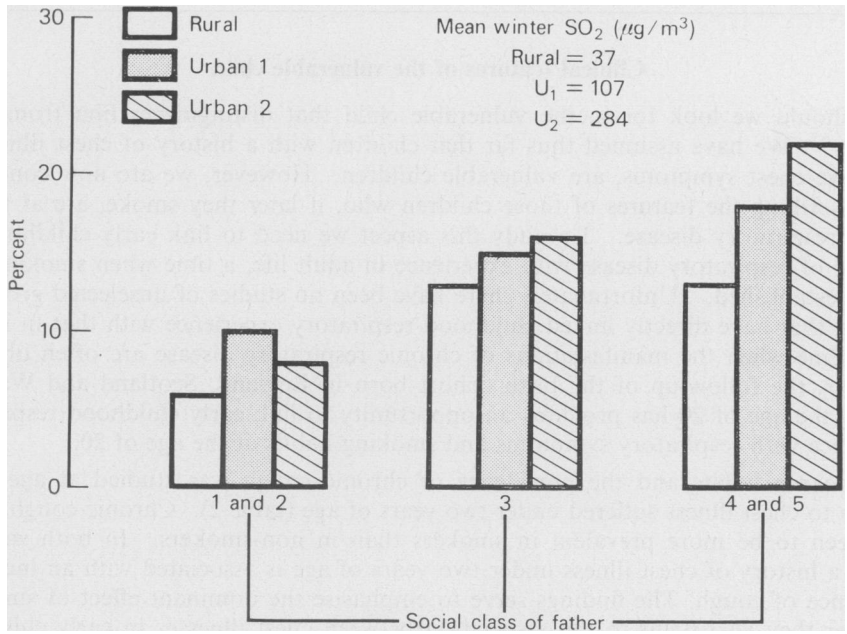

Figure 3
Prevalence of chronic winter cough by social class and urbanisation.

Investigation of aetiological factors in childhood respiratory disease is incomplete without at the same time considering the influences of home environment and in particular the health of other members of the family. The general practitioner may well be familiar with certain families in his practice where most members suffer unduly from respiratory disease. The reasons for this association between family members in their experience of respiratory disease are not usually clear. An estimate of the strength of association between parents and child in their respiratory disease experience will greatly assist in deciding whether family experience of respiratory disease can be used to identify susceptible children.

In a recent family study, respiratory symptoms were sought in parents and in their school-aged children. Table 1, from this study, contrasts the prevalence of chronic cough in children where neither parent has morning phlegm, where one, and finally both parents have this symptom. There are striking differences in cough prevalence in the children according to the presence of symptoms in the parents. Thus chronic cough prevalence is at its lowest in families where both parents do not have morning phlegm, and highest where both have this symptom. This finding suggests a strong association between parent and child in respiratory disease experience and seems to suggest that the vulnerable child should be sought for particularly in families where parents have chest symptoms.

TABLE 1

PREVALENCE (%) OF CHRONIC WINTER COUGH IN CHILDREN WITH WINTER MORNING PHLEGM IN PARENTS

	Winter morning phlegm in parents		
	Absent in both	*Present in one*	*Present in both*
Children with chronic winter cough	*14*	*25*	*44*

Clinical features of the vulnerable child

What should we look for in the vulnerable child that distinguishes him from other children? We have assumed thus far that children with a history of chest illness, or who have chest symptoms, are vulnerable children. However, we are now concerned with describing the features of those children who, if later they smoke, are at risk of serious respiratory disease. To study this aspect we need to link early childhood experience of respiratory disease with experience in adult life, a time when smoking may be well established. Unfortunately there have been no studies of unselected groups of children that have directly linked childhood respiratory experience with that in middle age, a time when the manifestations of chronic respiratory disease are often obvious. However, the follow-up of the birth cohort born in England, Scotland and Wales in 1946 to the age of 20 has provided an opportunity to link early childhood respiratory experience with respiratory symptoms and smoking habits at the age of 20.

Smoking habits and the prevalence of chronic cough was studied at age 20 in relation to chest illness suffered under two years of age (table 2). Chronic cough at age 20 is seen to be more prevalent in smokers than in non-smokers. In both smoking groups a history of chest illness under two years of age is associated with an increased prevalence of cough. The findings serve to emphasise the dominant effect of smoking. However they also point to the association between chest illnesses in early childhood and respiratory disability in early adult life. This confirms that children with a poor respiratory history are at greater risk of developing early manifestations of chronic

respiratory disease, particularly if they smoke, than children without such a history. It therefore appears that children with a history of bronchitis and pneumonia in early childhood or chronic cough in late childhood are indeed vulnerable children.

TABLE 2

PREVALENCE (%) OF CHRONIC WINTER COUGH AND SMOKING HABITS AT AGE 20 YEARS BY HISTORY OF CHEST ILLNESS UNDER THE AGE OF 2 YEARS

		Prevalence (%) of chronic winter cough at age 20	
		Never smoked	*Present smoker*
Chest illness under 2 years of age	*No chest illness*	*5*	*14*
	One or more chest illnesses	*9*	*17*

So far the identification of these children has only relied upon obtaining a history of past chest illnesses and current respiratory symptoms. A further method for their identification could involve the measurement of ventilatory function. As a group, children with a past history of bronchitis or pneumonia, and chronic cough have lower ventilatory function than children without this history. The usual interpretation placed upon these differences is that they indicate a degree of lung damage in those children with a poor respiratory history. The selection of those children with a poor respiratory history, who, in addition, have their ventilatory function in, say, the bottom five to ten per cent of the normal distribution of ventilatory function, would identify a particularly vulnerable group.

Prevention and control of respiratory disease

At least two strategies for prevention or control of respiratory disease suggest themselves as a result of these investigations.

The first of these would involve the identification of children with a history of bronchitis or pneumonia, or who have chronic respiratory-tract symptoms and also have a low lung function. The objective would then be to persuade these children not to smoke. As a group these children might be more amenable to anti-smoking programmes than children without a poor respiratory history.

Such a study could be done by general practitioners. Their practice records would act as the source for identification of children with a poor respiratory history. In addition the smoking habits of their parents might also have been recorded.

Alternatively a study could be carried out on children who had started attending school. The identification of these vulnerable children would not be too difficult and might, for example, employ the existing school health service.

As these particular selective approaches to persuading children against smoking are unlikely to have been used before, their effectiveness will need to be rigorously assessed, for example, by means of controlled trials. Such studies could be done in urban areas with high air pollution, and among children of low social class, as this would yield a high proportion of children with respiratory disability. On the other hand, from past experience, this particular group of children may be the least amenable to suggestions about not smoking.

In the second strategy the parents as well would be directly involved. The objective here would be to identify parents with respiratory symptoms, in particularly those who

smoke, and attempt to persuade them to give up smoking. At the same time their children and especially those with poor respiratory history, would be persuaded against smoking. Hopefully, the parents who give up smoking may lose their respiratory symptoms, thereby lessening the opportunity for passing on infections to their children. An added bonus might be the example to the child of parents giving up smoking. As with the first strategy, this particular approach has not yet been used and there appear to be good reasons for also testing its effectiveness.

Looked at purely from the view point of identifying vulnerable children, these two strategies would not involve extensive resources if carried out on a large scale. The populations for study, being schoolchildren, are easily defined and are also accessible. The primary source of data on respiratory disability in the child would be the parent. These data can be acquired using self-administered questionnaires.

The techniques for this approach have already been validated and extensively used in a number of research projects. Ventilatory function can also be easily measured using, for example, the Wright peak flow meter. The major problems are likely to be in selecting and applying the techniques for persuading children and their parents from smoking, not in identifying the vulnerable child. It remains to be seen whether, by selecting those children and parents with a poor respiratory history, the effects of anti-smoking programmes are any more effective than when used in the general population.

REFERENCES

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SELF-POISONING—WHAT IS THE FUTURE?

Cohort analysis has been used to examine the situation and admission-rates plotted for cohorts of individuals born ten years apart. Owing to the limited period for which hospital out-patient enquiry material is available (1953–72), only three points for ages ten years apart can be plotted for each cohort.

These show an alarming trend, with no age-peak in the curves for any of the cohorts and higher rates for each succeeding birth group. These curves are based on national data, involving large numbers of individual events; despite the qualifications already mentioned in the interpretation of this material, the curves indicate a horrifying picture.

They are compatible with a rising frequency of admissions throughout life, including the cohort of women who are now already showing such high rates by the time they are aged 15-24. The curves also show a striking increase in admission-rates in each succeeding cohort, and it is thus possible that the rates for the children now aged 0-5 may be even higher.

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