

## Cardiovascular disease

Health is in the news. It is a matter of intense public concern and fills much newspaper space and air time. What passes for public debate in Britain about health policy has, however, been limited largely to discussion about funding and organisation of the National Health Service. These are crucially important issues and it is right that they be debated widely. They should not hide or be confused with debates about health. At least since Mckeown,<sup>1</sup> we have to recognise that the major determinants of the health of populations lie outside the health services. The publication of *The health of the nation*,<sup>2</sup> the British Government's health strategy for England, is therefore greatly to be welcomed. It lays out quantitative targets for reduction of disease in five key areas, and makes explicit that achievement of these targets will involve much more than action on the part of health services.

As with any official pronouncement there is room for criticism, but the publication of the document is potentially of great importance and is to be applauded. It provides an opportunity to address the fundamental determinants of health. Targets for the key diseases will not be met simply by changed activity within the health service. There will need to be multisectoral activity.

There are two issues worth taking up, one because it features strongly in the *The health of the nation* and one because it is conspicuous by its virtual absence. The first is the strategy of prevention: should it involve the whole population or should it be targeted at groups at special risk? The second concerns the substantial variations in health status that occur among social and ethnic groups and among geographical localities. A good case can be made that priority should have been given to reduction of inequalities in health, because it is a socially desirable goal. Quite apart from that, not to attempt to reduce differences in health among subgroups of the population is a serious lack that may make it harder to achieve the targets for the whole population.

Geoffrey Rose's new book, *The strategy of preventive medicine*,<sup>3</sup> is particularly relevant to both of these important issues. Rose deals with strategy, rather than tactics. He does not give a practitioner's guide to specific actions, but rather a coherent case for the general thesis that advances in public health will require changes not only in people at special risk, but in the whole population.

### Preventive medicine or public health?

Given this concern with changes to the whole population, the title "Preventive medicine" is, perhaps, an odd choice. It reflects Rose's firmly held view that epidemiology should be part of medicine. While this undoubtedly has been good for the status of epidemiology within medicine (and Geoffrey Rose himself is as highly regarded as any), it is less consistent with the rediscovery of public health as requiring a set of disciplines, of which those contained within medicine are but some. It can be useful to make a distinction between preventive medicine and public health. The former implies approaching prevention within the practice of medicine. Public health has a lot to do with preventing diseases but involves much more than medicine.

Rose emphasises that to improve the public's health "a population strategy of prevention is necessary wherever risk is widely diffused through the whole population". Rose tells us that, among other things, this population strategy includes concern with social interactions and support (p110), and with social deprivation in education, housing, and unemployment. This is very much the stuff of the new public health.<sup>4</sup> It would not easily fit under the rubric of preventive medicine. Doctors should be concerned with it, but it is not prevention within the practice of medicine, as usually understood.

### Epidemiology as a guide to public health action

Rose's book is deceptively radical. Rose discusses three ideas that are usually confined to discussions in epidemiologists' tea rooms, and shows their profound importance for public health. The three are the shape of the dose-response curve linking exposure to disease, relative versus absolute measures of risk, and ecological versus individual studies.

#### THE DOSE-RESPONSE CURVE

The shape of the dose-response curve linking exposure to disease should lead us to ask two questions: how much of the burden of ill health is concentrated within a high risk group?, and is there a level below which risk is negligible? Within the cardiovascular field we have come to accept that for many factors the dose-response curve is continuous and graded. The data from the more than 350 000 men in the MRFIT screening study show this clearly. The lower the plasma cholesterol level, the lower the coronary heart disease risk.<sup>5</sup> Data from China, where the whole distribution of plasma cholesterol is shifted to the left compared with the USA, show that the continuous relation between plasma cholesterol and coronary heart disease extends to lower levels of cholesterol than are likely to be achieved by any substantial numbers of the British population.<sup>6</sup> Interestingly, the Chinese data show the pattern that has excited so much comment in western data: at the lowest levels of cholesterol there is an increased risk of mortality from other diseases. That this is not the result of the low cholesterol is suggested by the fact that it occurs at much lower levels of cholesterol than this effect in western data and is related to a different set of diseases. It adds to the speculation that the low cholesterol is not a cause of the increased risk.<sup>7</sup> The implication of the dose-response curve is that for plasma cholesterol there is no threshold; ie, within the usual range in Britain there is no level below which there ceases to be a relation between level of plasma cholesterol and coronary heart disease risk. Therefore, if we choose to define a certain level of plasma cholesterol as high, and ignore levels below that, we do so in the knowledge that we are choosing to ignore a certain level of risk. The degree to which this risk associated with "normal" cholesterol levels is acceptable will depend on the absolute as well as the relative risk, which will depend on the level of other risk factors. It will also depend on whether there is an acceptable means of lowering risk for the whole population.

For blood pressure and stroke the implication is slightly different. The relation between blood pressure and stroke is more curvilinear. It is steeper at higher levels of pressure than at lower. This suggests a greater concentration of the burden of risk at the upper part of the range of blood pressure. Even here, there is still an association between level of pressure and subsequent disease below the level of blood pressure usually considered "hypertensive".

#### RELATIVE AND ABSOLUTE MEASURES OF RISK

In epidemiological studies, associations are usually expressed as relative differences in those with and without a given level of exposure: relative risks, odds, or rates. Much of the argument in favour of relative risks was worked out in relation to the original debate over the association between smoking and lung cancer. The relative measure of risk has some properties that make it useful as a guide in sorting out whether an association is causal.

Rose lays great emphasis on the absolute level of risk as giving a better guide to public health decisions than relative risk. By shifting attention away from relative risk (how many times more likely is this exposed person to succumb than someone not exposed?) to absolute risk (what is this exposed person's increase in absolute level of risk?), and even further to some measure of population attributable risk (how much of the disease in the population can be attributed to this level of

exposure?), the notion of what constitutes an important risk can change dramatically.

Such considerations of absolute levels of risk lead Rose to a fundamental axiom: a large number of people at slightly increased risk may make a more important contribution to the population burden of disease than a small number of people at greatly increased risk. This insight throws new light on the question of acceptable risk. It may be reasonable for an individual to ignore a real but low level of increased risk at lower levels of a risk factor such as plasma cholesterol or blood pressure. It is less reasonable for a society to ignore it if there is a goal of reducing the community burden of disease.

This leads Rose to elaborate what he calls the prevention paradox: “a preventive measure that brings large benefits to the community affords little to each participating individual” (p12). This raises an important question about the justification and practicality of persuading individuals to change behaviour. The question is not answered satisfactorily by right wing propaganda that tells the government that it has no business producing a health strategy document, or that labels those concerned with the less healthy parts of the nation’s diet as “food Leninists”. Nor is it solved by ignoring it.

Let us consider first the question of little benefit. Life expectancy in Hungary is five years shorter than in Britain, and has been declining.<sup>8</sup> This is largely a result of the great and growing burden of cardiovascular and other chronic diseases. The whole population is at high risk. An “average risk” person in Hungary is a high risk person in England and Wales. An average risk person in England is a high risk person in Japan, where cardiovascular mortality rates are low and life expectancy about 3-5 years longer than in England and Wales.<sup>9</sup> The benefit may not be so small to each participating person. Much depends, however, on the nature of the action that must be taken.

An environmental measure affects everyone regardless of their risk status. The clean air act provided less benefit, as absolute reduction of risk, to wealthy non-smokers living in the suburbs than it did to poor smokers living in crowded inner city houses. We have little difficulty in justifying this environmental measure that included low and high risk people.

Interventions that apply to individuals are different. Were it possible to divide the population into two groups, those who would definitely succumb to cardiovascular disease and those who would definitely not, prevention would be appropriately targeted at the subgroup at risk. As indicated from the dose-response curves, such binary classification is not possible. Hence the conclusion quoted above: “a population strategy of prevention is necessary wherever risk is widely diffused through the whole population”. Provided the intervention is likely to be beneficial, on balance, to all who follow it, the case can be made for a population strategy.

Alcohol is an example where the situation is more complex. There is an undoubted relation between the mean level of alcohol consumption of a population and the level of heavy drinking.<sup>10</sup> Therefore the most appropriate way to reduce the number of heavy drinkers is to shift the mean downwards. There is a “but . . .”. If, as the evidence on coronary heart disease suggests,<sup>11</sup> there may actually be some benefit from consuming one or two drinks per day, then the great mass of people in that range may not derive benefit from reducing their consumption. This poses a challenge to public health policy that has yet to be worked out satisfactorily.

#### INDIVIDUAL *v* ECOLOGICAL STUDIES

Comparisons between populations or groups, as a way of detecting associations between disease and exposures, have come in for a bad academic press. They are subject to the ecological fallacy, the fallacy of assuming that correlations between factor x and disease y at the group level will apply to individuals. Rose has turned the ecological fallacy on its head,

and argues for an individual level fallacy. His argument is that the determinants of why one population has a higher rate of disease than another may be different from the determinants of individual differences in risk within a population.

Rose shows a number of examples, among them blood pressure, plasma cholesterol, and body mass index, where differences between populations are characterised by a shift in the whole distribution of the biological variable involved. Where distribution is a constant, studying individuals who are high compared to those who are low, within a single population, will not illuminate the causes of population differences in the position of the distribution.

This would argue for two sets of causes related to the strategy of prevention. Knowledge of the causes of the position of the distribution of a population leads to strategies aimed at the whole population. If Britain’s coronary heart disease rates are high because of high plasma cholesterol distribution related to high intake of saturated fat, the appropriate intervention is to reduce average saturated fat intake for the whole population. Knowledge of why some individuals within a population are at higher risk than others leads to a strategy directed at high risk individuals.

This clear division between strategies aimed at causes of individual and population differences rests on the constancy of the distribution of the important variable. There is no necessary reason why it should be a constant. The shape of the distribution represents a balance between forces favouring and retarding diversity. These will be social and biological. Rose cites blood pressure as an example where the shape of the distribution seems to change little; but the distribution of body mass index does change—a higher mean appears to be associated with a greater spread. Similarly, we have found that shifts in the mean of fat intake are related to changes in skewing of the distribution.<sup>12</sup> Not everyone changes their diet to the same degree—a conclusion that accords with common observation.

This question of the constancy or otherwise of the distribution is crucial to the study of social variations. It has been put to me that the aim of public health should be to change the position of the distribution of factors related to ill health; there is therefore no reason to worry about the variation between social classes. The argument runs: if we are successful in shifting the distribution, everyone will benefit. Social variations in health are not a constant. They vary between countries<sup>13</sup> and within countries over time.<sup>14</sup> One of the conclusions of the comparison between two Whitehall studies of civil servants is that even though smoking prevalence declined markedly in the 20 years separating the two studies, the inverse social gradient in smoking had, if anything, got steeper.<sup>15</sup> We must pay attention to the shape as well as the position of the distribution and how the distribution varies among subgroups of the population.

#### Strategy of prevention and the new public health

Rose’s conclusion is of profound importance. The major diseases that affect public health are determined by the nature of society as a whole, not by the eccentricities of some risky individuals within it. This echoes Durkheim from a previous century who argued that society was a collectivity, not only a collection of individuals. One might have thought, naively as it turned out, that such an argument would be easily accepted by anyone who had ever looked at national statistics of any kind. Regrettably even the idea of society became politicised by those who wanted to deny social causes and hence social responsibility. *The health of the nation* is based on the premise that there is such a thing as society and governments, and others have responsibility to address the causes of ill health that are related to the nature of society.



If this is true of diet and smoking it is even more true of the social environment: housing, the nature of work, education, social relationships. The research agenda for public health now should not only ask how best to achieve change in unhealthy behaviours but how to identify the social and economic causes of ill health, whether they act by affecting behaviours or by other means related to the environment; whether they act in adulthood or whether they act early in life.<sup>16-18</sup>

Rose's insight on blood pressure and cholesterol applies also to social differences in ill health. People at the lower end of the social distribution, the poor, the homeless and the unemployed, have worse health than those better off. But although these individuals are at high risk and require attention, they are a minority within the population, and hence account for a minority of the burden of ill health attributable to social causes. The principal lesson from the study of social variations in ill health is that there is a gradient that runs right across society.<sup>15</sup> A strategy for public health must deal with this important fact.

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## Chronic respiratory diseases

It was appropriate that Geoffrey Rose's book, *The strategy of preventive medicine*,<sup>1</sup> was published in the same month as the white paper on the health of the nation, because Rose has been one of the most prominent individuals concerned with the development of strategies for the prevention of disease, playing an important and influential role in changing the views of many people. *The health of the nation*<sup>2</sup> is an important document because it demonstrates the concern of the Government to distinguish between the provision of health services and the provision of services and policies for the promotion of health, rather than the promotion of health services. But in considering strategies of prevention it is important to look at the issues involved in greater depth than either of these two documents have done.

The first issue of importance is that of the underlying philosophy of prevention. The one given fact of life is that of

dying. However, the policies of prevention in many cases have failed to recognise this fact, with the result that in some instances there has been a failure to assess properly whether preventing a particular disease could result in an individual having a life of such a low quality that it would have been preferable for him to die. There are many anecdotal stories of eminent individuals, particularly cardiologists, who have argued that they would rather die of a heart attack than be resuscitated. It is therefore both significant and admirable that *The health of the nation* aims to not only extend people's lives but also to improve their quality of life as well.

Rose's monograph illustrates the importance of applying preventive policies to the population as a whole rather than simply concentrating on high risk groups. To an epidemiologist this concept is fine, but it is far harder to convince the general public and, while the strategy of prevention demonstrates the need for policy makers to be concerned with absolute rather than relative risk, the examples provided by Rose are not the most convincing. The example given of exposure to radiation shows that although there may have been an increased relative risk, the numbers involved were still relatively small. Although Rose refers to the difficulty which the media and public have in understanding the importance of absolute risk, neither publication succeeds in developing a coherent argument about how to assess risk and develop an appropriate preventive strategy. This would detail not only the magnitude of the absolute risk but also the problems of effective preventive and/or curative intervention. It is this aspect of preventive medicine which needs to be debated, which neither publication has succeeded in doing.

Both *The health of the nation* and *The strategy of preventive medicine* have to some extent tackled the easy problems first. Neither have revealed that in areas such as psychiatry, rheumatic disorders, or neurological illnesses other than poliomyelitis there is still no known prevention. Although both publications state that research is required, neither has developed a strategy for research along with their strategies of prevention.

Rose discusses the factors which need to be considered when establishing a preventive policy, such as effectiveness, safety, acceptability, and costs, but in trying to develop such a scheme he gives too few details of what a preventive strategy would entail. Nor does he adequately explain how to prevent a condition which is complicated by the involvement of a number of factors. For example, even though there is little doubt that coronary heart disease is the main cause of death in our society a great deal of emphasis is placed on cholesterol as one of the main causes of heart disease when in fact it would be more appropriate to deter individuals from smoking. This is because where both of these risk factors are present the effect of cholesterol, independent of smoking, is relatively minor.

A perfect example of a preventive strategy is provided by the problem of chronic respiratory diseases, which illustrates the gaps in both practice and knowledge. The problem can be considered under various headings.

*Tuberculosis*—Apart from its association with AIDS infection tuberculosis should no longer be an important cause of mortality in the United Kingdom, and yet there were still 106 deaths in individuals aged 5-64 years in England in 1990 and between regional health authorities there was a fourfold difference in age standardised rates. To reduce this incidence requires an improvement in the identification of and access to high risk groups and the ability to persuade these to adhere to prevention and treatment programmes—we have the methods but are poor at implementation.

*Asthma*—Asthma is a condition which is increasing in prevalence and incidence, while the costs and the possibilities of treatment have increased considerably. Apart from some inadequacies in providing appropriate treatment and the lack