

Health in an unequal world: social circumstances, biology and disease

Sir Michael Marmot

In poor countries, tragically, people die unnecessarily. In rich countries, too, the higher death rate of those in less fortunate social positions is unnecessary. Can there be a link between these two phenomena: inequalities in health among countries and inequalities within? Surely, it might be argued, the depredations of grinding poverty – lack of food, shelter, clean water, and basic medical care or public health – that ravage the lives of the poor in developing countries are different in kind from the way that social disadvantage leads to poor health in modern Britain, for example. The diseases of the slums of Nairobi are, to be sure, different in kind from the diseases that affect the disadvantaged in east London or Harlem, and have different proximate causes.

There is, however, a link. The unnecessary disease and suffering of the disadvantaged, whether in poor countries or rich, is a result of the way we organise our affairs in society. I shall argue that failing to meet the fundamental human needs of autonomy, empowerment, and human freedom is a potent cause of ill health. In making this case, I shall bring together two rather disparate streams of work. The first is a report of my own research endeavour. I have sought explanations for the social gradient in health, as observed in the Whitehall studies, pointing to the fundamental importance of the circumstances in which people live and work. I emphasise control and the opportunities for full social engagement.¹ The second draws on the work of development economists Amartya Sen and Nicholas Stern. Sen suggests we should see development as freedom to lead the life people have reason to value.² Stern's concept of empowerment is close to Sen's freedom.³ Without empowerment, argues Stern, economic growth will not bring improvements in health and education as well as relief from poverty.

Both in the case of the social gradient in health within countries, and the differences in health among countries, changing social conditions to ensure that people have the freedom to lead lives they have reason to value would lead to marked reductions in health inequalities. In both cases the active involvement of individuals, and communities, in decisions that affect their lives is crucial.

Drawing attention to the central role of human freedoms in health is a statement of philosophical position and a call to social action. It is also based on a synthesis of a great deal of medical and social research. William Harvey, who established these orations, famously encouraged the orator to exhort the fellowship of this College to search out the secret of Nature by way of experiment. For an epidemiologist, of course, Nature herself provides the experiments – grand natural experiments. For this epidemiologist, Nature is in league with Society. Societies organise their affairs in different ways and these differences are the grand experiments that provide the researcher with the opportunity to search out the causes of health and disease. I make the connection between social conditions and biological pathways that plausibly provide the link to cardiovascular and other diseases. I do not stop at biology, however.

William Harvey said that the feast and oration should be not only to encourage scientific experiment but for the honour of the profession to continue mutual love and affection amongst themselves. Outside observers might feel that Fellows of the Royal College of Physicians need no further encouragement to indulge in mutual love. I will focus on the honour of the profession. Our profession seeks not only to understand but to improve things. Some doctors feel queasy about the prospect of social action to improve health. It smacks of social engineering. Yet, a physician faced with a suffering patient has an obligation to make things better. If she sees a hundred patients the obligation extends to all hundred. And if a society is making people sick? We have a duty to do what we can to improve the public health and to reduce health inequalities among social groups where these are avoidable and hence inequitable or unfair. It is a moral obligation, a matter of social justice.

Because of this moral obligation, the World Health Organization (WHO) set up a Commission on Social Determinants of Health, which I chair, that is seeking to reach evidence-based policy recommendations on what can be done to reduce health inequalities and improve the health of the disadvantaged.^{4,5} In bringing together research on the social gradient in



The Harveian Oration is given annually at the Royal College of Physicians of London under an indenture of William Harvey of 1656. This article is based on the 2006 Oration given on 18 October 2006 by **Michael Marmot** FRCP PhD FFFPHM FMedSci, Director, International Institute for Society and Health; MRC Research Professor of Epidemiology and Public Health, University College London

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health within countries and inequalities among countries, I am seeking to provide a clear intellectual justification for the Commission's work.

In arguing that to control disease we need an understanding of disease mechanisms *and* social and political action, I have distinguished antecedents. If an appeal to authority be needed then Rudolph Virchow (1821–1902), whose biology has made appearances in these orations, will amply suffice.

A postgraduate lesson in the importance of environment – the study of migrants

As physicians we are trained that the patient comes first and last. Searching out individual causes of disease, however, does not negate the importance of environmental causes. Studies of migrants show that as environments change, disease rates change.

I learnt this lesson through engagement with Leonard Syme and others in a study of men of Japanese ancestry, living in Japan, Hawaii, and California. As Japanese men migrate across the Pacific, the rate of coronary heart disease rises and the rate of stroke falls.⁶ Part of the reason must lie in diet and its effect on plasma cholesterol.⁷ But my study, with Len Syme, of the Japanese of California showed a clear relation between degrees of acculturation and coronary heart disease rates – more Americanisation, more disease – that was independent of plasma cholesterol, blood pressure, or smoking.^{8,9} We had some evidence that the particular aspect of Japanese culture that was protective was the degree to which people remained within the protective confines of their ethnic group – thus benefiting from the social cohesion of Japanese culture.

Coming back to Britain, I studied the health of migrants to England and Wales.¹⁰ In general, migrants showed some persisting effects of disease patterns of the country from which they came and clear changes towards the disease patterns of the host country.¹¹

The general point was that as people change their environment, disease rates change. Crucial to this changed environment

seemed to be aspects of social relationships. It suggested that the way both to understand disease causation and to change the rates of disease was to pay attention to the social environment.

One thing led to another. Paying attention to the social environment led to the body of research summarised below and to collaboration with other key individuals in scientific enquiry on the relation of society to health.¹² I am now involved in the process of trying to change these relations via the vehicle of the Commission on Social Determinants of Health.

Inequalities in health within societies

The social gradient in richer countries . . .

My starting point is the Whitehall study of British civil servants. Figure 1 shows results from the 25-year mortality follow-up of men, originally aged 40–69, by age at death.¹³ The graded phenomenon – the social gradient in mortality – is the challenge to understanding. The gradient is a broader issue than that of poverty and health. We have no difficulty in contemplating how dirty water, lack of sanitary facilities, inadequate nutrition and shelter could cause the diseases of poverty. But this is Whitehall not Kibera (the shanty town in Nairobi that is home to 500,000 people). Here, we have clean water and bathrooms, an excess in supply of calories to eat, and shelter from the elements. Yet among these civil servants, none of whom is destitute, men second from the top have a higher rate of death than men at the top. Men third from the top have a higher rate of death than those second from the top. I have been writing about this gradient for 28 years¹⁴ and it has been at the core of my research agenda.¹⁵ Why, among men who are not poor in the usual sense of the word, should risk of dying be intimately related to where they stand in the social hierarchy?

The Whitehall II study, launched 20 years after the first Whitehall study, extended the observation to women.¹⁶ Further, the gradient in mortality extended to most of the major causes of death.¹⁷ Most of our attempts at explanation have focused on cardiovascular disease because there has been such a large body of research on the biological pathways involved in coronary heart disease. The real puzzle is why there should be a social gradient in so many different causes of death.

The gradient is not confined to civil servants. I live and work in the London borough of Camden. In about 25 minutes I can cycle from Somers Town, just north of University College London, to Hampstead, a little way further north. The life expectancy gap between men living in these two areas is 11 years.¹⁸ I use the ends of the spectrum – the gap between top and bottom – to illustrate the magnitude of the difference but it should always be borne in mind that the phenomenon is a gradient: the population is ranged along the spectrum from life expectancy of 70 years for men in Somers Town and St Pancras to 81 for men in Hampstead.

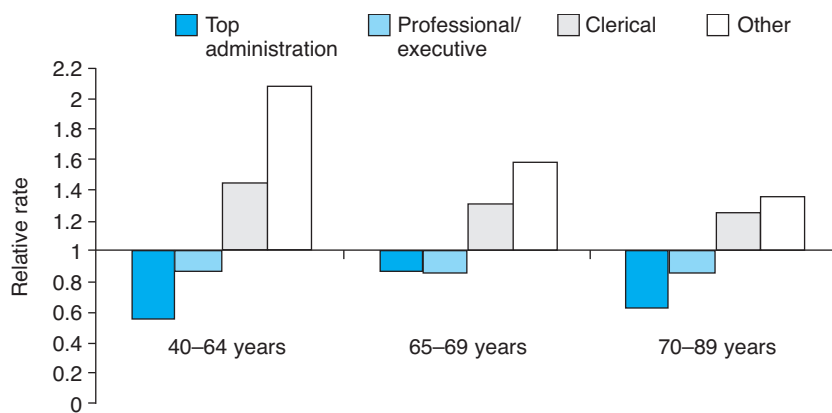


Fig 1. Mortality over 25 years according to the level in the occupational hierarchy: first Whitehall study of British civil servants. Source: Marmot and Shipley (1996),¹³ reproduced with permission of the BMJ Publishing Group.

In Glasgow the gap is bigger. The difference in life expectancy between most deprived and least deprived area was 6.9 years in 1981–5; this had increased to just under 12 years 20 years later.¹⁹ In and around Washington DC, the gap is bigger still – a 20-year gap between poor Blacks in downtown Washington and well-off Whites in Montgomery County, Maryland, a short metro ride away.²⁰

The differences in the USA draw attention to the need to clarify what we think lies behind the social gradient in health. Americans have long looked at British society, and their own, and observed that the British class system does not travel well. Americans do not therefore record their vital statistics, as we have done for so long in Britain, by some measure of social class or socioeconomic group. By contrast, in the USA, tradition has it that statistics are recorded by race. There has been much discussion as to whether racial differences represent something more than socioeconomic differences.²¹ Whether or not the whole story, socioeconomic differences and the wider social environment are important in generating racial differences.

Robert Erikson used the Swedish Census, linked to mortality, and showed a remarkable social gradient in mortality.²² Men with a PhD had lower mortality rates than those with a master's degree who, in turn, had lower mortality than those with a bachelor's and so on. The social gradient in mortality stretched from top to bottom of the social hierarchy.

The Whitehall and Swedish studies make clear that to understand inequalities in health we need to go beyond binary thinking: poverty bad, non-poverty good. Health follows the social gradient. The challenge is to understand how position in the social hierarchy is related to health. We need to go beyond material deprivation,^{23,24} but recognising the importance of the gradient should not lead us to ignore those at the bottom. Particularly egregious examples of the effects of social exclusion on health come from comparisons of health of indigenous peoples in Canada, New Zealand and Australia, with that of the total population (Table 1). In each case the gap between the indigenous group and the total population is substantial. In New Zealand, this has been subdivided further by socioeconomic position.²⁸ At each social level, Maoris have higher mortality than

Table 1. Life expectancy of indigenous peoples: Australia, Canada and New Zealand.

Country	Indigenous (male)	Total (male)	Gap (years)
Australia (1996–2001)	59.4	76.6	17.2
Canada (2000)	68.9	76.3	7.4
New Zealand (2000–2002)	69.0	76.3	7.3

Sources: Canadian data: Health Canada.²⁵
 New Zealand data: New Zealand Life Tables, 2000–2002.²⁶
 Australian data: Australia Human Rights and Equal Opportunities Commission.²⁷

New Zealanders of European origin at, notionally, the same level.²⁸ In the USA too, American Indians and Alaskan Natives have lower life expectancy than the total population.²⁹

... and in poorer countries

A social gradient in health is observed in many poorer countries. Regrettably, few countries have data systems that allow national data to be disaggregated by some measure of social position. This is especially true for adult mortality. Demographic and health surveys yield data on infant and child deaths. These are illustrated in Fig 2.³⁰ In each country, the higher the socioeconomic quintile of the household, the lower the rate of child mortality. It is a gradient, not simply that the poor have high mortality and it is better for everyone else.

Although data on adult mortality by social position are sparse in developing countries, data from Matlab in Bangladesh show clearly that more education is associated with lower adult mortality.³¹ Similarly, in Chile there are marked differences in adult survival according to education. At age 20, women with 13 or more years of education can expect, on average, to live to age 72 compared to about 60 for women with 1–8 years of education.³²

In the transition economies of Central and Eastern Europe and the former Soviet Union, the social gradient is clear. In the Russian Federation, to take one example, we used a survey method to reconstruct mortality data of men by education. In a population survey we asked whether husbands and brothers were still alive and, if dead, when they died.³³ Figure 3 shows that those with little education had higher mortality than those with university education, and the gap has been growing bigger as the years since the collapse of the Soviet Union increase.

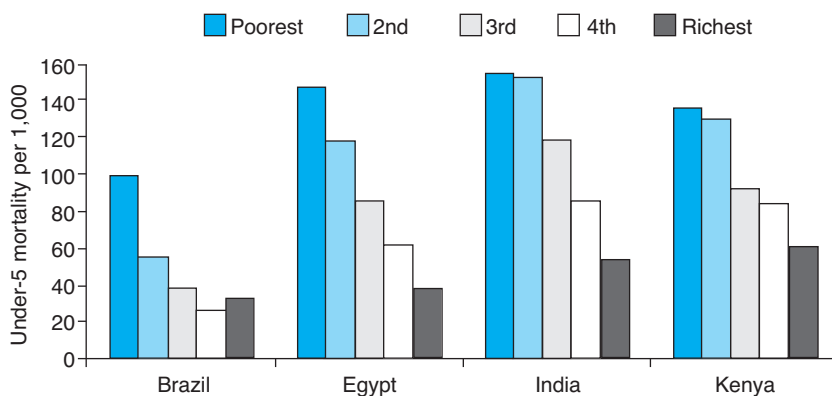


Fig 2. Under-5 mortality rates by socioeconomic quintile of household. Source: Gwatkin et al (2000).³⁰

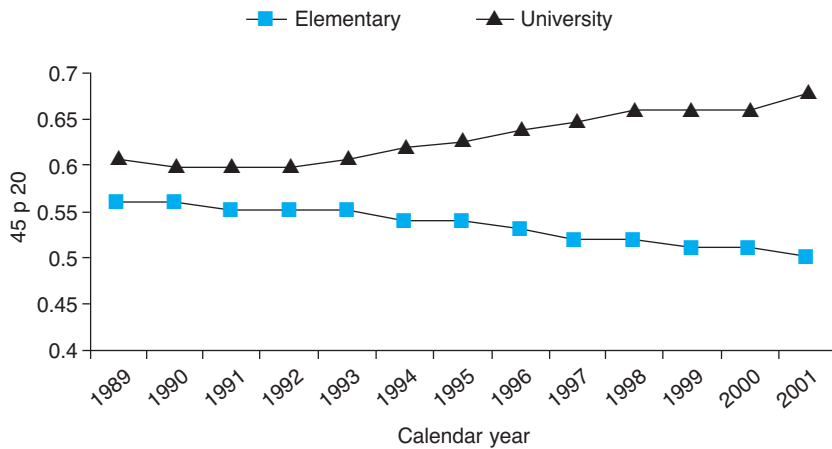


Fig 3. The widening trend in mortality by education in Russia, 1989–2001; 45 p 20 = probability of living to 65 years when aged 20 years. *Source:* Murphy *et al* (2006);³³ reprinted with permission from the American Public Health Association.

Inequalities among countries

Life expectancy for some countries is shown in Table 2, along with Gross Domestic Product (GDP) adjusted for purchasing power. (The US\$ is taken as the standard, and purchasing power in each country adjusted to it.) The range of life expectancy is staggeringly large: from 32.5 (both sexes) in Swaziland to 82 in Japan.³⁴

The gap between healthier and unhealthier has been growing. Figure 4³⁴ has much to encourage us and much to depress. Life expectancy in the high-income countries of the OECD (Organisation for Economic Co-operation and Development) increased from 71.6 to 78.8 in the 30 years from 1970–75. In

Table 2. Life expectancy (LE) and Gross Domestic Product (GDP) in purchasing power parity (PPP) US\$ in 2003.

	LE at birth	GDP
Japan	82.2	27,967
Sweden	80.2	26,750
Switzerland	80.5	30,552
Spain	79.5	22,391
France	79.5	27,677
UK	78.4	27,147
Greece	78.3	19,954
Costa Rica	78.2	9,606
USA	77.4	37,562
Cuba	77.3	5,400
Sri Lanka	74.0	3,778
Russia	65.3	9,230
India	63.3	2,892
Kenya	47.2	1,037
Swaziland	32.5	4,726

Source: Human Development Report (2005).³⁴

South Asia, the improvement was even more impressive. In two regions, however, the grounds for depression are considerable. In the 1970s, life expectancy in Central and Eastern Europe and the Soviet Union was 69, ie 2.6 years behind the high-income OECD countries. Thirty years later it had declined to 68.1, now 10.7 years behind the OECD countries. At the other end of the life expectancy scale is Sub-Saharan Africa where overall life expectancy increased by 0.3 years at a time when it increased by 7.2 in the richest countries. This lack of increase masks dramatic declines in many African countries: from 49 to less than 33 in Swaziland; from 50 to 36 in Lesotho; from just under 56 to just under 37 in Zimbabwe.

Some of this decline is due to the terrible toll of HIV/AIDS. Stephen Lewis cries in anguish that we cannot consider AIDS in Africa without considering the state of women and their special vulnerability to rape and sexual violence, early and forced marriage, lack of educational access, lack of economic and learning power, lack of rights to own and inherit land or property.³⁵ My statement at the beginning of this article that the avoidable deaths of people in poorer countries has to do with the way we organise our affairs in society has no better illustration than the link of gender inequality to the AIDS epidemic in various parts of the world, especially Africa.

Similarly, I do not think we can understand the lack of improvement, even decline, in the countries of Central and Eastern Europe and the former Soviet Union without considering the opportunity of people to lead flourishing lives in the sense that I am using the term: autonomy and social participation.¹

Inequalities in health are not inevitable

Before diving into the question of explanations of inequalities in health and, hence, what we could do about them, it is worth making clear that they are not inevitable. Starting first with inequalities among countries, there is nothing inevitable about the data in Fig 4. The rapid health improvements in some countries and the lack of improvement in others suggest that changes in social and environmental conditions, and in public health and basic medical care, could do much to change things for the better.

But what of the social gradient in health within countries – is that not inevitable? Social hierarchies are inevitable. Whether or not we could imagine a society without a hierarchy, we would need to search hard to find it. Hierarchies may be inevitable but the health gradient linked to hierarchies is less so. Simple observation shows that the magnitude of the difference in health between top and bottom (as one measure of the size of the gradient) varies within a society over time and among societies.

Figure 3 showed that the gap in expected survival between those with university education and those with little education

grew in Russia over the years since the collapse of the Soviet Union. In England and Wales, the gap in male life expectancy between bottom and top social classes grew from 5.5 years to 9.5 years in the space of 20 years (between 1972–76 and 1992–96), and then narrowed slightly.³⁶

Similarly we see differences in the size of the socioeconomic gaps among countries. Figure 5 shows that the gap in mortality between men in manual and non-manual occupations varies among nine countries in Europe.³⁷ Notably, the gap in Sweden is amongst the smallest. The same study showed that relative differences varied somewhat differently.³⁸ Relative differences will depend on the size of the denominator as well as the numerator. In Sweden the mortality rate in non-manual occupations is low and the relative gap is sizeable. The absolute difference is, however, quite small – consistent with what might be expected if Sweden’s social democratic policies are leading to smaller inequalities in society.

We need not, then, accept the present magnitude of the social gradient in health as fixed. If it can change, and we can understand why, action is possible to reduce it.

Poverty: lack of money and more

I have set myself the task of trying to achieve a unifying explanation for health inequalities that takes in both the disastrously poor health (life expectancy below 40) of some extremely poor countries and the social gradient in health that we see in rich and poor countries alike. It might seem that I have a steep hill to climb.

Poverty is widespread: 2.5 billion people, 40% of the world’s population, live on less than \$2 a day. That they have poor health as a result is not difficult to comprehend. The ‘Preston’ curves show a clear relation between income of a country and life expectancy (Fig 6).^{39,40} The Millennium Development Goals represent an international agreement drastically to reduce this tide of ill health related to destitution.^{41,42} The other striking finding from Fig 6 is that the relation of national income to life expectancy is strong up to an income of about \$5,000 per capita. Above that level there is little relation between income of

a country and life expectancy. Table 2 illustrates. Taking the USA as example, we see that it is the richest country (bar Luxembourg) but has similar life expectancy, for men, to Costa Rica or Cuba. Russia has a GDP considerably higher than Sri Lanka but considerably shorter male life expectancy.

The diseases that keep Russian life expectancy low, and that of the USA lower than other rich countries, are not those that we usually associate with poverty. Excess mortality is from non-

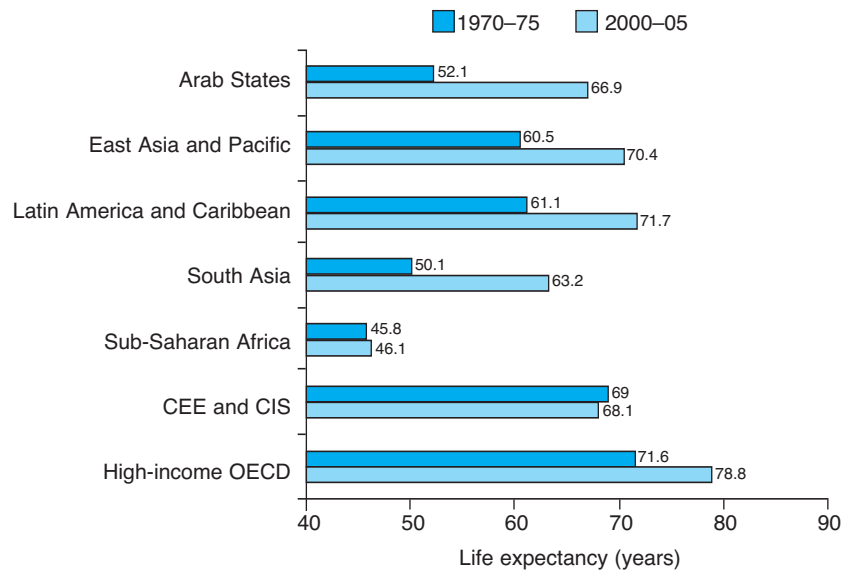


Fig 4. Trends in life expectancy. CEE = Central and Eastern Europe; CIS = Commonwealth of Independent States; OECD = Organisation for Economic Co-operation and Development. Source: Human Development Report (2005).³⁴

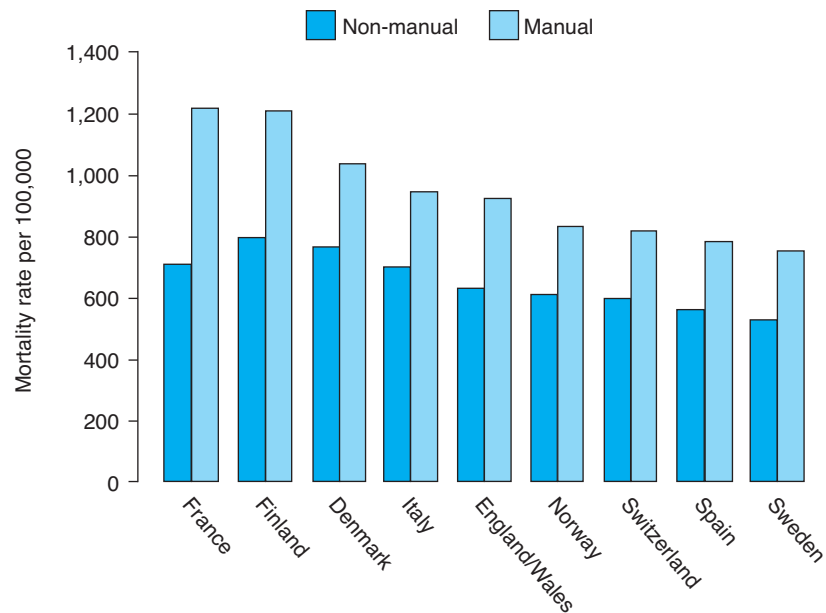


Fig 5. Mortality for non-manual and manual workers in nine European countries. Ranked by absolute level of mortality of manual workers; age groups 45–59. Source: Vagero and Erikson (1997);³⁷ reproduced from *The Lancet*, with permission from Elsevier.

communicable disease and violent deaths. Table 1 showed that Australian Aborigines and Torres Strait Islanders have a life expectancy about 17 years shorter than the average for Australians. But their infant mortality rates are relatively low at 15 per 1,000 live births.⁴⁴ The excess mortality of indigenous Australians is due to high rates of cardiovascular, respiratory and gastrointestinal diseases, endocrine, nutritional and metabolic diseases (including diabetes), and injuries and violence.

These comparisons suggest that ‘poverty’ in a rich country and poverty in a poor country are qualitatively different phenomena and need to be thought about, and acted upon, in totally different ways. Up to a point.

A framework for explanation of inequalities in health within and between countries

In both poor and rich countries poverty is more than lack of money. For its 2000/2001 World Development Report, the World Bank interviewed 60,000 people in 47 countries⁴⁵ about what relief of poverty mean to them. The answers were: opportunity, empowerment, and security. Dignity was a frequently mentioned concept. Indeed, dignity has strong claims for consideration by those of us concerned with society and health.^{46,47} A similar exercise in Europe showed that people felt themselves to be poor if they could not do the things that were reasonable to expect in society: for example, entertaining children’s friends, having a holiday away from home, buying presents for people.⁴⁸ In other words, in rich countries and poor, poverty means not participating fully in society, and having limits on leading the life one has reason to value.

With this concept in mind one can see what might link a low-grade British civil servant and a resident of the slum settlement of Kibera. At first glance the differences seem more obvious than the similarities. The messenger in the Civil Service has the material conditions for good health. If he or she becomes a parent, the chances of their baby dying before the age of one is about 6.5 per 1,000 live births.⁴⁹ The Kibera resident lacks these material conditions for health: infant mortality is probably closer to 200 per 1,000 live births. But both low-grade civil servant and slum dweller lack control over their lives; they lack the opportunity to lead lives they have reason to value. The precise content of those lives will depend on whatever the society of the day deems necessary. (This idea comes from Adam Smith.) The linking concept is that people’s capability to lead a life they value will be influenced by social conditions.

This richer understanding of poverty allows us then to approach the social gradient in health, and poverty and health, with the same framework. Social conditions will determine the degree of limitation on freedom or autonomy. The greater the limitation, the worse the health. Improvement of material

conditions and basic services explain why the civil servant has better health than the Kenyan slum dweller. In both cases, however, low social position means lack of opportunity, empowerment and security.

A second phenomenon, in addition to seeing social disadvantage as lack of empowerment, makes the search for a unifying explanation of health inequalities more feasible. The major burden of disease worldwide is non-communicable disease and injury and violent deaths.⁵⁰ In the poor countries of Sub-Saharan Africa, the burden of communicable disease matches that of non-communicable disease and injury. But in every other region of the world, non-communicable diseases dominate. It is a reasonable starting position that the causes of coronary heart disease or specific cancers will be the same wherever they may be found. Causes found to apply in rich countries where there has been much research will probably apply to the same diseases in poorer countries, where there has been less research.

Armed with a richer understanding of poverty and the realisation that, increasingly, we need to explain the occurrence of the same disease, we can now turn to the explanatory framework. I want to start by using development economics as an analogy for reduction in health inequalities and then argue that it is more than an analogy.

Nicholas Stern, former Chief Economist at the World Bank, and colleagues argue strongly that development in poor countries rests on two pillars: economic growth and empowerment.³ The factors necessary for economic growth, such as a favourable investment climate, are indeed important. But the impact of growth on poverty, in all its dimensions including health and income, will be far more powerful if it comes hand-in-hand with empowerment of people and communities. Empowerment is both a means to social development and an end in itself if it equates with leading a life one values.

The analogy with health is that we can think of improvement

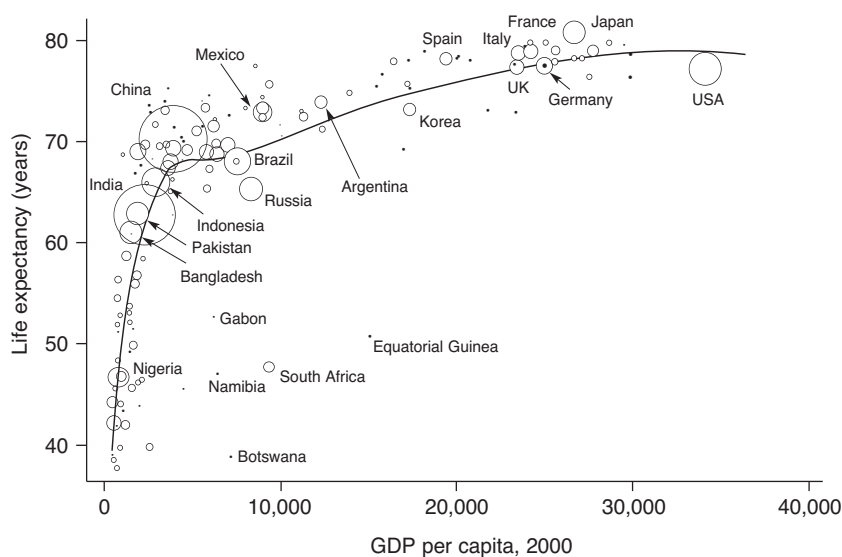


Fig 6. The Millennium Preston Curve. Circles have diameter proportional to population size. GDP per capita is in purchasing power parity dollars. Source: Deaton (2004);⁴⁴ reproduced with permission from the Brookings Institution.

in health of disadvantaged people as built on two intertwining pillars: material conditions for good health, and control of life circumstances or empowerment. In the first category come food, water, sanitation, provision of medical and public health services; in richer countries, these will include, among other things, availability of healthy food, opportunities for exercise, and crime-free neighbourhoods. The second pillar is empowerment. It is important to stress that empowerment may act at the individual level or at the level of the community. As I shall describe below, one way in which empowerment can operate is that control over life circumstances reduces chronic stress and has favourable biological effects. Empowerment at the community level may also be important as a means of securing resources for health. For example, Simon Szreter has made the case that in 19th century England, collective efficacy of communities helped secure access to clean water supplies.⁵¹

The two-pillar (growth and empowerment) model of development may function as more than an analogy. Development, in the sense of relief of poverty, will be important for improvement of health in poor countries. Empowerment may then have an important effect on health through its effect on relief of poverty, as well as more direct effects. Amartya Sen argues that economic growth leads to an improvement in health provided that it is used for poverty reduction and expenditure on public goods. He also points to a second model of health improvement which he calls the support-led model. The examples of this model are in those communities – Kerala, Costa Rica, Cuba, Sri Lanka – that achieved good health without rapid economic growth. Social cohesion, which we may think of as empowerment at the community level, appears to play a key role.²

This explanatory framework can then be applied to the social gradient in non-communicable disease. Non-communicable disease is caused by diet, smoking, lack of physical activity, and excess alcohol, among other determinants. But socioeconomic position matters too, not simply because lack of money somehow translates into risk of non-communicable disease. Above a level where material deprivation is no longer the main issue, absolute income is less important than how much one has relative to others. Relative income is important because, as Sen puts it, it translates into capabilities.⁵² What is important is not so much what you have but what you can do with what you have. Hence control and social engagement.

In rich countries, autonomy and social inclusion may influence disease through their effect on health behaviours such as nutrition, smoking, or alcohol; or through more direct neuroendocrine pathways, ie chronic stress. These pathways may also operate in poorer countries, but have been less studied. Similarly, at the community level empowerment may lead to better availability of resources for health, or operate through psychosocial processes linked to social capital.

Another feature of the demographic and health scene, common to developed and developing countries, in addition to the predominance of non-communicable diseases, is the ageing of the world's population.^{53,54} For example, the proportion of the population aged over 65 is set to increase by 43% in Italy and 54% in Japan between 2000 and 2030. Yet, in many countries at

intermediate stages of development, the projected rate of growth of the ageing population between 2000 and 2030 is much more rapid; for example, 174% increase in India, 227% increase in Mexico, and 277% increase in Malaysia.⁵⁵

Inequalities in health continue in these older age groups. In the English Longitudinal Study of Ageing (ELSA) the onset of disease, disability and poor cognition occurred about 15 years later in people of high social position than in those of lower social position.⁵⁶

Control and social engagement as contributors to inequalities in health

I use control and social engagement as an organising principle, a way of thinking, about human needs that might relate to health on the one hand and the nature of our social arrangements on the other. They are, though, more than an organising principle as there is direct evidence to support them.

We studied control, initially, in the workplace. The context was the Whitehall II study of British civil servants in which the lower the position in the occupational hierarchy the higher the risk of coronary heart disease and other ailments. The old idea that managers at the top of the hierarchy are under more stress than people below them has been replaced by two more explanatory models of work stress. The first, the demand control model, posits that it is not how much demand that is important for stress at work, but how much control there is in relation to demand.⁵⁷ The second suggests that imbalance between efforts and rewards is the determinant of chronic stress.⁵⁸ As evolved beings, we are social animals. Part of living in society is expectation of reciprocal rewards – reward in return for effort expended. This is part of what I mean by full social engagement.

We used both of these models in the Whitehall II study and showed that each was related to coronary heart disease risk independent of the other.^{59,60} A review of the evidence showed that there was a high degree of consistency, at least for the control dimension of the demand control model, from other studies.⁶¹ For example, a recent study from the Netherlands showed that beliefs about personal control over life were related to increased risk of coronary heart disease.⁶² As in the Whitehall II study, lack of control was a contributor to the social gradient in coronary heart disease over and above the contribution of the 'classical' risk factors.⁶³

There are ways of depriving people of control over their lives other than in the workplace. In Whitehall II, we also asked people a simple question about how much control they had at home. Women who had less control at home had higher risk of heart disease than women with more control.⁶⁴ We had similar findings for mental illness.⁶⁵

We have had a programme of work investigating the high rates of morbidity and mortality in the countries of Central and Eastern Europe and the former Soviet Union, of which Fig 3 is but one example.^{66,67} In the Czech Republic, as in Whitehall II, low control at work was associated with risk of myocardial infarction (MI) and contributed to the social gradient in occurrence of MI.⁶⁸ Psychosocial factors at work were also related to

depression in the Czech Republic, Poland and Russia.⁶⁹ We extended the idea of low control over life circumstances beyond the workplace. In a series of cross-sectional studies we showed that low perceived control was related to poor health.^{70,71} These studies have the drawback that both the predictor (low control) and the outcome (poor health or mental illness) are based on self-reports. There is, then, the possibility simply of biased reporting or contamination of predictor and outcome. In an ecological study, in seven Central and Eastern European countries, we showed that mean rates of control of a population sample were related to mortality rates of the country from which the sample was drawn.⁷² ‘Contamination’ of subjectively reported measures is not an issue in this ecological study.

These studies from Central and Eastern Europe suggest that whole populations can be, more or less, deprived of control over their lives. These communities suffered during the last two decades of the communist period and, in Russia in particular, they suffered when communism and many social institutions collapsed, real incomes declined by more than half, and there was a dramatic increase in inequality in society.⁶⁷

The other important human need, after autonomy or control, is to be socially engaged. Imbalance between efforts and rewards is part of not having appropriate social reciprocity. I suggest that self-esteem and the esteem of others is part of social engagement. Adam Smith, the great economist and ethicist, pointed to the importance of having whatever was necessary for taking your place in public without shame.² If I am to include all of these under social engagement it may sound a trifle nebulous. Two strands of evidence more directly support the link between social engagement and health: social supports and social capital.

Lisa Berkman, in a range of studies and review of the literature, showed that participation in social networks and having a range of social ties is important for health.^{73–75} Sheldon Cohen has contributed to and reviewed this literature with similarly strong conclusions.⁷⁶ Marriage is one obvious domain in which support may be offered or denied. There has been much debate as to the causal interpretation of the health advantage of those who are married. Does health lead to marriage or marriage to health?⁷⁷ I do not propose to reopen that debate here. It is of interest, however, that in Hungary⁷⁸ and the Czech Republic⁷⁹ the rise in mortality during the last two decades of the communist period was more rapid in unmarried men than in married. The increasing disadvantage of the unmarried state was more marked in men than in women, thus adding fuel to the speculation that marriage is more supportive for men than for women.

Taking social networks and supports to the level of the community leads to ideas of social capital – the idea that some communities are marked out by cohesiveness and trust.⁸⁰ The evidence supporting the links between the social capital of a community and health is suggestive. Kawachi has operationalised the concept and shown links between social capital and health.⁸¹ Diez-Roux has shown that characteristics of areas affect people’s health over and above the socioeconomic characteristics of the individuals who live there.⁸² We have contributed to this literature by showing that these area characteristics may be part of social capital.^{83,84}

My own speculation is that the remarkably good health of Japan may relate to the social cohesion of that society.¹ Similarly, the good health of relatively poor populations such as those of Kerala and Sri Lanka may be attributed to cohesion and social inclusion – particularly of women.²

Pathways linking autonomy and social engagement to health

One set of pathways are those linking autonomy and engagement to resources that lead to better health. Sreter finds no mystery in the link between social capital and health in Victorian England. It led to community action to provide clean water supplies.^{51,85} If social inclusion means that more people are involved in education, they will benefit from all the economic, social and psychological benefits that education can bring. As stated above, an approach to controlling HIV/AIDS in southern Africa that ignores the gender disadvantage of women will have little chance of success.

At a more general level, if empowerment is a key strategy for economic and social development then apart from any direct effect of empowerment on health there will be the indirect benefits that accrue from economic and social development of the whole society.

Conversely, if we see autonomy – leading the life one values – as central then resources are important in creating autonomy and social engagement. For example, having a ready supply of potable water, adequate shelter, and bathroom facilities makes leading a life one values more of a possibility. (See the section below on Creating freedom and empowerment.)

A second set of pathways relate to the familiar risk factors for chronic disease. There are two questions that relate to my theme: to what extent do the ‘classical’ risk factors account for the social gradient in disease occurrence; and might differences in health behaviours be one way that autonomy and social engagement change risk of disease?

In the first Whitehall study, a combination of smoking, plasma cholesterol, blood pressure, overweight and lack of physical activity accounted for under a third of the social gradient in coronary heart disease mortality.¹⁷ Some estimates put the contribution of smoking higher than that,⁸⁶ but these are based on indirect measures that use lung cancer as a proxy measure for smoking and are higher than some other estimates using proxy measures.⁸⁷ Whatever the precise contribution of these risk factors to the social gradient, they are important. Smoking is now linked with social disadvantage in the developing world as well.⁸⁸

Similarly for obesity, we know that, particularly for women, there is a clear inverse association with socioeconomic position.⁸⁹ This association is now emerging in developing countries. The relation of obesity to education, as a measure of socioeconomic position, is shown in Fig 7, with countries classified by degrees of economic development.⁹⁰ Above a GNP of about \$2,990 (so-called upper middle income economies), the higher the education the lower the obesity level.

We need to ask, then, why there should be social gradients in

important risk factors for chronic disease. This is not well understood but autonomy and social engagement may be important. The point has been well made that women who are socially disadvantaged and have little opportunity to control their lives or gain personal fulfilment may have little motivation to refrain from smoking.⁹¹

A third type of pathway linking autonomy and engagement, or human flourishing, to health is through chronic stress pathways.^{92,93} Sapolsky has shown the plausibility of stress mechanisms linking social circumstances and status to health in non-human primates.⁹⁴ Both the hypothalamic pituitary adrenal (HPA) axis and sympho-adreno-medullary axes are important. Sapolsky and others have shown that low-status animals have higher cortisol levels than high-status animals.⁹⁵ The strength of this link between low status and cortisol varies across animal species; the more frequently low status is associated with being on the receiving end of stressful encounters the stronger the link between low status and cortisol.⁹⁶

In the Whitehall II study we were particularly interested in two elements of stress pathways linking low social position to increased risk of cardiovascular disease: plasma fibrinogen as an inflammatory marker and the metabolic syndrome. Both are linked to low social position.^{93,97} We have also shown that psychosocial factors are linked to the metabolic syndrome. Figure 8, from the Whitehall II study, shows that the more frequently people reported that their jobs were high strain (low control, high demands, little support) the greater the likelihood of having the metabolic syndrome. Likely mechanisms linking psychosocial factors to the metabolic syndrome are both the autonomic nervous system and HPA axis.^{98,99}

My colleague, Andrew Steptoe, studies these psychobiological pathways in the laboratory. He shows the plausibility of linking stressful stimuli to cardiovascular, endocrine, and immune responses,¹⁰¹ and that these responses differ according to socioeconomic position.¹⁰² One interesting finding was that it was not so much the height of the biological stress response that differed by socioeconomic position, but that low-grade civil servants had slower rates of biological recovery after stress.¹⁰³

Medical care?

I have said little about medical care. There is no question that part of improving health in poorer countries, as in richer, is the provision of comprehensive primary care. In a well-organised society there should be universal access to high-quality medical care. The whole

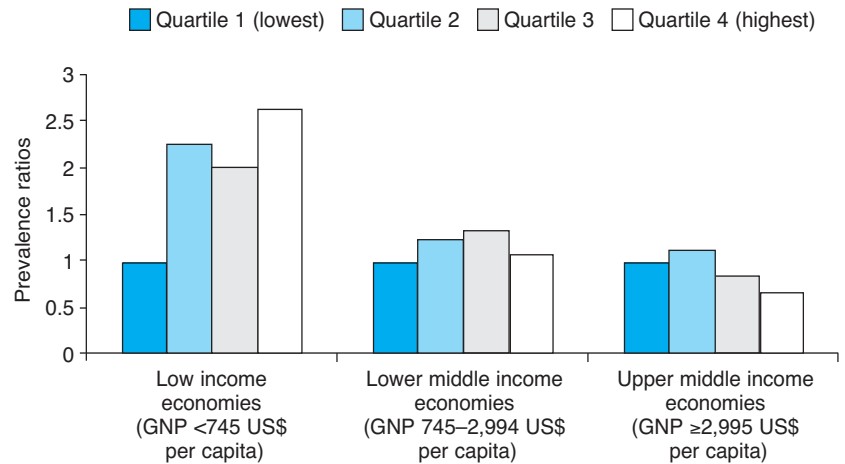


Fig 7. Women's obesity by quartiles of education – various countries. Prevalence ratios based on prevalence of obesity in lowest quartile of education set at 1 for each group of countries. Source: Monteiro *et al* 2004;⁹⁰ reprinted by permission from Macmillan Publishers Ltd: *Int J Obes*,⁹⁰ copyright 2004.

principle of the NHS is universal provision and that seems a principle worth exporting. In poorer countries of the world, as in some richer ones, attempts at universal provision do not guarantee universal access. A study in 21 low- and middle-income countries showed that government expenditure on healthcare favoured, selectively, those of higher incomes (Fig 9).¹⁰⁴ In 15 of the countries, people in the top quintile of income obtained the greatest benefit; in only four did people in the bottom quintile of income benefit most; and in two the benefit from government health expenditure was equally shared between top and bottom income groups.

Gwatkin and colleagues make the point that the health of the poor has more to do with their social and environmental circumstances than with their lack of healthcare. But, as \$380 billion is spent annually on health services in low- and middle-income countries, it is worth asking whether there are ways to ensure that the expenditure benefits those who need it most –

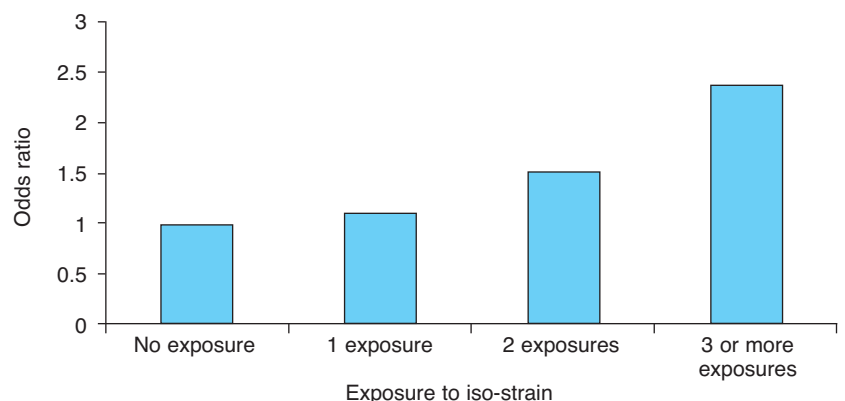


Fig 8. Metabolic syndrome by exposure to iso-strain: Whitehall II study of British civil servants. Odds ratios based on no exposure to iso-strain set at 1, adjusted for age, employment, grade and health behaviours. Source: Chandola *et al* (2006),¹⁰⁰ reproduced with permission of the BMJ Publishing Group.

the people at the bottom of the income scale. These people want policies to be not only pro-poor in intent but also in effect.¹⁰⁵

Among rich countries, there is little relation between expenditure on medical care and health. We conduct the English Longitudinal Study of Ageing (ELSA), which was set up along similar lines to an existing US study, the Health and Retirement Study (HRS). Given that the USA spends \$5,274 per capita on medical care, and the UK \$2,164 (adjusted for purchasing power),³⁴ it was of interest to compare health and health inequalities in the two populations. We compared white men and women, aged 55–64.¹⁰⁷ For each of seven common conditions there is a similar social gradient in health in the two countries, but for each condition more Americans have it than English people. Figure 10 shows the prevalence rates for three of these conditions. One possibility is that Americans have not more illness but more doctors. Greater recognition or recall of illness is not the most likely explanation, however, as in the USA glycosylated haemoglobin was higher, as were levels of C-reactive protein and fibrinogen; levels of high-density lipoprotein (HDL) cholesterol were lower. Each of these biological markers points to more illness in the USA.

Smoking levels were similar in the USA and England, and alcohol consumption was higher among the English. The prevalence of obesity was about 10 percentage points higher in the USA than in England and obesity is likely to be an important factor, particularly for the higher prevalence of diabetes. Although adjusting for the differences in obesity did not abolish the American disadvantage, these were cross-sectional data and we could not look at the cumulative effects of obesity. The higher rate of reported illness is consistent with the higher age-specific mortality rates of the USA compared to the UK in the age range 0–74.¹⁰⁸ Interestingly, the USA has lower mortality rates than the UK in those over 74. We do not have the answer to the conundrum posed by the higher rates of illness in the USA but I would speculate that it has, in part, to do with the circumstances in which people live and work – the social determinants of health.

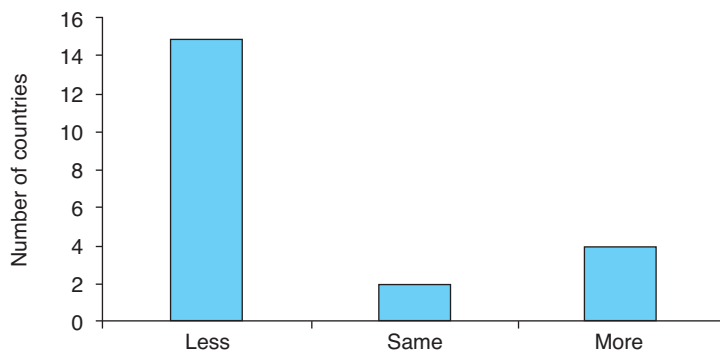


Fig 9. Differing benefits from government health service expenditure. Average for 21 countries: number of countries where the lowest quintile receives less, the same, or more benefit compared with the highest income quintile. Source: Yazbeck *et al* (2005).¹⁰⁶

Creating freedom and empowerment

If empowerment is so important for health, it is worth asking how it arises. Stern conceives of three classes of influence.³ First are individual endowments: assets and human capital. Second are external constraints that come from the context of family, community (including caste and religion), society and systems of governance, all of which shape people’s lives. Third, individuals have internal constraints on their actions associated with their preferences and perceptions of their role. These classes of influence may be inter-related.

One telling example of societal determinants of empowerment comes from a study of 11- to 12-year-old children in India.¹⁰⁹ High-caste and low-caste children were given mazes to solve. Despite the high-caste children having higher levels of parental education, the two groups of children performed identically on the tests. The tests were then repeated, on different groups, but this time attention was drawn publicly to the caste of the children. Under these circumstances, the lower-caste children performed significantly worse. The researchers put this decrement in performance down to an expectation, borne of experience, that lower-caste children would be treated unfairly – it was part of their powerlessness. Confirmation for this speculation was provided by randomly rewarding children, rather than having the decision apparently made by the investigator. Once the rewards were ‘fair’, the performance of the lower-caste children again matched that of the higher caste.

Power, then, is key.¹¹⁰ Control, autonomy and freedoms may sound like psychological properties of the individual. As the Stern framework makes clear, however, this is a partial view. Power relations in society, as they operate through social institutions and the opportunities afforded to those in relatively disadvantaged positions, are the social causes of degrees of empowerment. Interestingly, democracy, which should allow more of us some semblance of control, appears to be good for health even after taking other social conditions into account.¹¹¹

An important caution applies to the concept of freedom. In the sense used by Sen, and here, it does not imply privileging the rights of some individuals at the expense of the well-being of others. Human rights can be taken as implying an obligation on society to do what is necessary to bring about the important freedoms that those rights embody.¹¹²

Research as a guide to action

A mark of our civilisation is that we value scientific understanding for its own sake. The Enlightenment brought with it the idea that critical questioning was a better way to the truth than received wisdom. Hence we prize research and scholarship because they enrich us culturally. It is not against this spirit that we might want to apply our knowledge. As physicians we seek not just to understand but to makes things better. So, too, in public health but the sphere of action is collective rather than individual.¹¹³

We do not seek to improve public health simply by informing individuals of health risks. This is fairly obvious when the health risk comes from the environment. Faced with impure water in a village we understand that asking each villager to drink Perrier is likely to be a less effective strategy than piping clean water to the village. This may be less obvious when it comes to behaviours related to chronic disease, but the same insights apply. Individuals choose to drink, smoke or eat more calories than they consume in physical activity, but their choices are influenced by the environment.

The history of smoking control shows the importance of social action. It has a long history. WHO's Framework Convention on Tobacco Control, adopted by the World Health Assembly in 2003, is a landmark achievement in public health.¹¹⁴ Its basic premise is the necessity of governments to be involved in reduction of smoking by individuals.

I have been concerned with the example of alcohol. Evidence shows that the prevalence of heavy drinking is linked to the overall 'wetness' of a population – the total amount of alcohol consumed.^{115,116} Key drivers of alcohol consumption are price and availability.¹¹⁷ Policies to reduce alcohol-related illness, therefore, should deal with price and availability not head off in the opposite direction.¹¹⁸

Social action is just as important when it comes to autonomy and opportunities for full social engagement. I was distressed to learn that, at a counselling session for workers who were about to be laid off, they were told that Professor Marmot's research shows that control over your own lives is good for health. Now that they would not have to come into work every day these about-to-be-unemployed individuals could look forward to taking control over their lives.

This, of course, is a caricature of the research findings, even a travesty. Individuals' opportunities to control their lives, to be empowered, and to participate fully in society are heavily determined by the way we organise our affairs in society. An excellent review considered the ability of empowerment to improve health.¹¹⁹ It provides encouragement that social change based on insight and understanding can lead to greater empowerment.

The review cautions that evidence for the direct effect of improvements in empowerment on health is more limited.

It was precisely to marshal the evidence on social action to improve health that the WHO set up the Commission on Social Determinants of Health. We have set up nine 'knowledge networks': early child development, employment conditions, social exclusion, women and gender equity, urban settlements, globalisation, health systems, priority public health conditions, and a cross-cutting network on measurement and evidence. We have a number of other mechanisms for generating the knowledge needed for action: distilling the experience of countries that have been taking action, working with civil society groups, engaging with other organisations.¹²⁰ The Commission is due to report in 2008. Its driving principle is social justice: to reduce unfair differences in health between social groups within a country and among countries. A key mechanism is evidence-based policy. Evidence itself is not enough. There has to be the desire, the political will, for change. Given that will – a big given but I am an optimist – the evidence of what works will be a great help.

The physician and social change

Rudolph Virchow has featured many times in these Harveian Orations. Paul Nurse, for example, quotes Virchow's understanding of cells: 'that every animal appears as a sum of vital units, each of which bears in itself the complete characteristics of life'. My first contact with Virchow's writing was in relation to his studies of the blood and blood vessels that are important still for our understanding of the pathology of atherosclerosis.

As well as being a scientist who contributed so much to our understanding of pathology, Virchow was also concerned with improving the public health. He wrote: 'If medicine is to fulfil her great task, then she must enter the political and social life. Do we not always find the diseases of the populace traceable to defects in society?' He went on: 'If disease is an expression of individual life under unfavourable circumstances, then epidemics must be indicative of mass disturbances'.^{121,122} Since disease so often results from poverty, he said, then physicians are the 'natural attorneys of the poor', and social problems should largely be solved by them.

I have made the case that a richer understanding of poverty, based on control and social engagement, links the social gradient in health, and poverty and health. We should focus not only on extremes of income poverty but on the opportunity, empowerment, security, and dignity that disadvantaged people want in rich and poor countries alike.

For Virchow, then, it was not biology or society, but both. We need biological understanding of disease but we need, too, understanding of how society influences biology, in order to change disease risk. This social

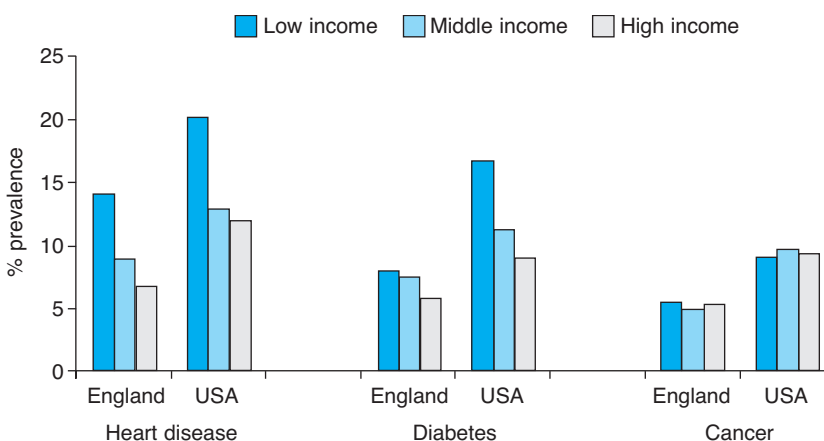


Fig 10. Differences in doctor-diagnosed illness between England and the USA (55- to 64-year-olds). Source: Banks *et al* (2006).¹⁰⁷

understanding is central to the process of change to reduce the burden of disease.

As physicians we need to be the natural attorneys of the disadvantaged. The Commission on Social Determinants of Health was launched in Chile. It seemed appropriate, then and now, to quote Chile's Pablo Neruda and invite you to: 'rise up with me ... against the organisation of misery.'¹²³

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