

The Influence Of Income On Health: Views Of An Epidemiologist

Does money really matter? Or is it a marker for something else?

by Michael Marmot

ABSTRACT: Income is related to health in three ways: through the gross national product of countries, the income of individuals, and the income inequalities among rich nations and among geographic areas. A central question is the degree to which these associations reflect a causal association. If so, redistribution of income would improve health. This paper discusses two ways in which income could be causally related to health: through a direct effect on the material conditions necessary for biological survival, and through an effect on social participation and opportunity to control life circumstances. The fewer goods and services are provided publicly by the community, the more important individual income is for health. Under present U.S. circumstances, a policy of counteracting growing income inequalities through the tax and benefit system and of public provision appears justified.

INCOME &
HEALTH

31

DOES MONEY MATTER FOR HEALTH? If so, why? If it does matter, there are at least three ways in which it could be important: not having enough money, maldistribution of money, and spending it on the wrong things. It is also possible that health could matter for money, that the causal direction could be the other way around.

Of course, money could only appear to matter. It may be that poor people have worse health not because they have insufficient money but for some other reason. Similarly, a society characterized by a high degree of income inequality could have poor average health for reasons other than the distribution of income. Or countries that spend more money on surgeons may have better health because they are democratic, not because of the surgery. In each of these cases, money appears to matter because it is a marker for something else.

Michael Marmot is professor and head of the Department of Epidemiology and Public Health, and director of the International Centre for Health and Society, at University College London. He was a member of the Scientific Advisory Committee, which prepared the 1998 Independent Inquiry into Inequalities in Health, under the leadership of Sir Donald Acheson. In 2000 Marmot was awarded a knighthood "for services to epidemiology and understanding health inequalities."

The distinction between really mattering and appearing to matter is important. For example, if it really matters, a policy devoted to income redistribution could have health benefits. If it only appears to matter, such a policy, whatever other positive or negative features it might have, will not benefit health. This is important for policy, and I return to it after considering the evidence.

In asking if money matters, two types of evidence are relevant: the relation of income to health between and within countries, and the relation of income inequality to health. I also deal with two related debates: the degree to which the apparent relation of income to health should be thought of as a question of poverty or inequality; and the role of material and psychosocial factors in generating inequalities in health. I note that there is evidence that health can affect income, but that it is not the major explanation of the link between income and health. This has been dealt with elsewhere.¹

I confine my attention largely to the rich countries of the world, not because the problems of health inequalities are absent from poor countries, but because the policy questions are different—lack of sanitation, clean water, and adequate nutrition, for a start—although I suspect that some of the policy questions may not be so different.

Aspects Of Poverty: Material Conditions And Social Participation

We cannot discuss income without considering its lack: poverty. There has been a long debate as to the merits of describing poverty in absolute or relative terms.² To understand why income may be important for health, it is worth distinguishing two aspects of low income, which for simplicity I label “poor material conditions” and “lack of social participation.”

Let me illustrate with a simple thought experiment. Suppose there were a set of material conditions, such as clean water and good sanitation, adequate nutrition, and adequate housing and warmth, that were necessary for good health. Suppose, too, that these material conditions were correlated with income until a threshold was reached. Clean water is necessary for good health. Once water is safe, higher income does not make it safer. Below the threshold, the lower the income, the worse the health because of the link with material conditions. Above the threshold level, differences in material conditions no longer have any plausible connection with differences in pathology. For people above the threshold, there still could be substantial inequalities in health that are related to differing opportunities for social participation, for leading a fulfilling and satisfying life, and for control over one’s life. Depending on how society was organized, these opportunities could show a strong

direct link with individual income. In this case, income would be causally linked to health, albeit not through material conditions. Alternatively, the link to income of opportunities for participation and control could be more tenuous, in which case, once the threshold was reached, the relation of income to health would be weaker. Other socioeconomic markers, more strongly related to participation and control, would show a stronger relation to health.

One could argue that it mattered little which pathway was important, material conditions or participation. If there were a link between income and health, a policy of equalizing incomes would reduce health inequalities. But what if such a policy were politically unacceptable? Do we not need to understand why incomes might be related to ill health in order to have the possibility to interrupt the chain of causation from economic position to health?

A second reason for making the distinction between material conditions and participation is that the latter constitutes an important part of what people report poverty is about in Britain and other European countries. Poverty includes not having a hobby or leisure activity, not having friends or family round for a snack, not taking children swimming, not having a family holiday. These are related to individual incomes to a greater or lesser extent depending on purchasing power and public provision. They are not “material,” in the sense that clean water and good sanitation are.

A third reason for making the distinction is that one can envisage circumstances in which there is a threshold level above which material conditions no longer influence health, but degree of participation and control could show no such threshold. Inequalities in these could account for inequalities in health above a threshold of material provision. Conversely, people who are relatively poor could have good health if their social participation were high.

With these distinctions in mind, it is helpful to develop a little historical perspective on the question of poverty and health.

Poverty And Health In Perspective

■ **Infant mortality.** Infant mortality traditionally has been viewed as the measure of health, more strictly ill health, that is most sensitive to poverty. Let us look at one historical example.

Benjamin Seebohm Rowntree was the son of Joseph Rowntree, a chocolate manufacturer, Quaker, and philanthropist in York, England. B.S. Rowntree conducted a study to draw attention to the conditions of what he called the working-class population. He studied three typical areas of the town that housed the working class, grading them according to their degree of poverty.³

Infant mortality rates (the number of deaths in the first year of life

“We should not view individual incomes in isolation from the community in which people are located.”

compared with the number of live births) varied according to area. In the worst-off area the rate was 247 per 1,000 live births; in the middle working-class area, 184 per 1,000; and in the highest, 173. By contrast, among York’s “servant-keeping class” it was 94.

Rowntree was ready to attribute the high rate in the poorest area to overcrowding and poor-quality housing. He wondered why the rate in the highest working-class area was double that of the servant-keeping class. In the highest working-class area there was no overcrowding and no back-to-back houses but, rather, wide streets and houses with gardens. To Rowntree, this did not provide a ready explanation. He concluded that the cause must be ignorance—ignorance in the feeding and management of infants “rather than to other causes arising out of the poverty of the people.”

■ **Ignorance versus poor conditions.** This view—that there is no relation between poverty and health and that it is all due to ignorance—was still being propounded in Britain in the 1980s by government ministers. To put it kindly, it was a limited view in the 1980s, as it was eighty years earlier. We now have a different view.

Even were it true that the high infant mortality of the higher working class was due to ignorance, how are we to account for an infant mortality rate of 94 per 1,000 among the wealthiest people of York around 1900? In England and Wales infant mortality in 2000 was 3.7 per 1,000 among infants born to fathers in the top social class and 8.1 among those born into the bottom class.⁴ Among single mothers, the rate was 7.6. The richer members of the community at the end of the nineteenth century had infant mortality rates that were much higher than the worst-off members of the community at the end of the twentieth century.

What are the implications of this comparison? The major determinants of high infant mortality are those associated with poverty of material conditions: lack of sanitation; malnutrition; low-quality housing and overcrowding; and lack of medical care including care before, during, and after childbirth. The threefold higher infant mortality rate of the poorest people of York was the result of worse conditions. It is less clear why the best-off people of 1900 should have so much higher rates than the worst-off in the country 100 years later. We can guess that although privileged economically, they were “deprived” of the conditions for low infant mortality: good sanitation, nutrition, and medical care.

■ **Condition of the community.** This is a rather dramatic clue that factors other than individual income play a powerful role in the determinants of health conditions that we associate with poverty. This is a conclusion reached by Sam Preston.⁵ Two tentative conclusions from this example run through the discussion that follows. First, we should not view individual incomes in isolation from the community in which people are located. The rich people of York in 1900, in some relevant respects, lived under worse conditions than do poor people in the same city a century later. The community is richer now. Money and technical knowledge have allowed the community to invest in conditions that favor an alleviation of the conditions that lead to high infant mortality. If we are using individual income as a measure of standard of living, then it does only a partial job, because it misses out on the benefits to be derived from living in a richer community.

■ **Black-white health differences.** The second conclusion relates to the first. In Preston's terms, factors "exogenous" to income have been responsible for much of the health improvement in the twentieth century. Putting the infant mortality of social class V or single mothers for the year 2000, 7.9 per 1,000, beside that of the servant-keeping class of York for 1900 suggests that the problems of ill health due to material deprivation have, to a large extent, been solved in today's industrialized countries. Why then should such countries continue to suffer from large inequalities in health?

One could argue that the "high" infant mortality rate of 15 per 1,000 among U.S. blacks in 2000, although a fraction of the servant-keeper rates of the past, was still due to residual problems of material deprivation: poor sanitation, inadequate nutrition, and poor housing.⁶ This is a possibility that must be considered.

But infant mortality is not the main reason for black-white differences in life expectancy in the United States. Arline Geronimus studied sixteen U.S. communities, black and white.⁷ In the United States as a whole, the probability of a fifteen-year-old man surviving to age sixty-five was about 77 percent. For a young black man in New York the probability of survival was 37 percent. The three major causes of death contributing to this tragic waste of life were HIV-related factors, homicide, and cardiovascular disease. We do not think that heart disease is related to poor sanitation, malnutrition, and overcrowded conditions in houses without gardens; not, in other words, to material deprivation of 100 years ago. Can material deprivation explain that? If we want to describe coronary heart disease as a disease of poverty, reversing the decades-long practice of describing it as a disease of affluence, we must take a hard look at what we mean by poverty.

Poverty And Inequality

Since the 1960s British researchers have been conducting longitudinal studies of British civil servants, the Whitehall studies.⁸ A twenty-five-year follow-up from the first Whitehall study found that the higher the position in the occupational hierarchy, the lower the mortality rate from all causes, from coronary heart disease, and from a range of diseases not related to smoking (Exhibit 1).⁹ It should be borne in mind that none of these men was poor in any usual sense of that word. They were all in stable, office-based employment in and around Whitehall, London.

The civil service excludes the richest and poorest of society. Yet among these men there is more than a twofold difference in mortality rates, over the twenty-five years of follow-up, between top and bottom. Also, among these men there is a social gradient in health that runs from top to bottom of the social hierarchy. There is no clear point with good health above and poor health below.

One might assume that something peculiar to the class-based nature of the British civil service accounts for this remarkable social gradient. Not so. For example, a recent publication on British national data classified areas into twentieths according to degree of deprivation.¹⁰ There is no evidence of a threshold, but a clear gradient in mortality for the general population runs from the least to the most deprived.

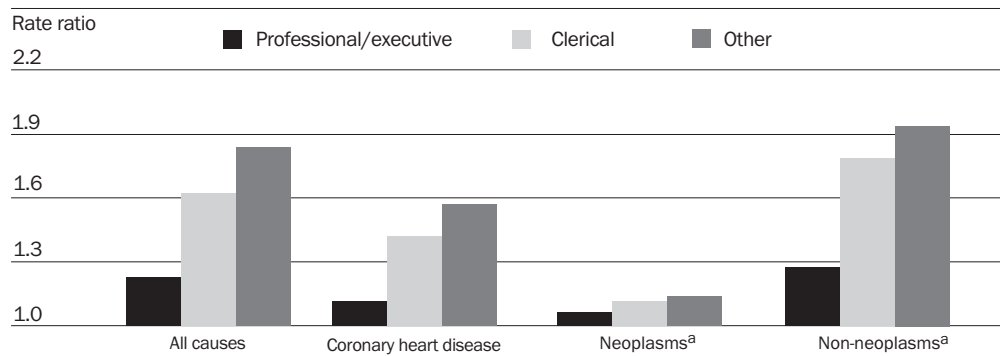
I have argued, on the basis of the Whitehall findings, that the problem for the rich countries today is inequality in health rather than poverty and health.¹¹ For me the distinction is important. Door-

36

INFLUENCE OF HEALTH

EXHIBIT 1

Whitehall Twenty-Five-Year Mortality (British Civil Servants), By Employment Grade



SOURCES: C. van Rossum et al., "Employment Grade Differences in Cause Specific Mortality: Twenty-five Year Follow Up of Civil Servants from the First Whitehall Study," *Journal of Epidemiology and Community Health* (March 2000): 178–184.

NOTE: Ratios are relative to the administrative grade, which equals 1 and is not shown.

^a Not related to smoking.

keepers and messengers in the British civil service are not poor compared with the working-class poor of late nineteenth-century York. If we are dealing with poverty in Britain and the United States, it is in general a different type of poverty than that of nineteenth-century York or of the poorest countries today. Because health follows a social gradient, if we wish to talk of deprivation, we have to appeal to the concept of relative deprivation.

Direct Effects Of Income

The question of whether money matters can be approached in two ways: comparison of countries; and studies of the relationship between income and mortality within countries.

■ **Comparisons of countries.** A 1993 World Bank report examined the relationship between life expectancy and gross national product (GNP) per capita in more than 100 countries from about 1900 to 1990.¹² It extended the work of Preston, who showed these relationships for an earlier period.¹³ The report makes two key points. First, at low levels of GNP, a small increase in GNP corresponds to a large increase in life expectancy. As GNP increases, the relation levels off. Above about \$5,000 per capita in 1991, there is a shallow relationship between a country's average income and life expectancy.

Second, for a given GNP, life expectancy increased during the twentieth century. This suggests that the finding in York was part of a general pattern. In 1900 rich people in York had high infant mortality rates compared with those rates 100 years later. Something was responsible for the improvement that was not related to income. I speculate that even the servant-keepers would have been subject to some of the same environmental insults that we now associate with deprivation. With the improvement of water and sanitation, for example, this was removed.

That improvements in life expectancy in rich countries can happen for reasons unrelated to income was further emphasized by Amartya Sen.¹⁴ He looked at improvements in life expectancy in Britain by decade, from 1901 to 1960. The decades 1911–1921 and 1940–1951 had the fastest increases in life expectancy—decades that embraced the World Wars. These decades of fast expansion in life expectancy corresponded to slow growth of per capita GDP. Sen doubts that it is simply a time lag between economic growth and reduction of mortality rates. He attributes the rapid improvement in life expectancy in the two decades to policies of support: sharing of means of survival, including sharing of health care and the limited food supply (through rationing and subsidized nutrition). The psychology of sharing in beleaguered Britain made radical public arrangements for the distribution of food and health care acceptable

and effective. Even the National Health Service (NHS) was born during the war years of World War II.

In the introduction I suggested that the commonalities between rich and poor countries might be greater than they appear. Sen attributes improvements in life expectancy in poor countries despite sluggish economic growth to “support-led” strategies; these include spending on public goods such as education, public health, and basic health care.

■ **Income and health within rich countries.** *The United States.* If average income as measured by GNP is weakly related to overall health among rich countries, what do we find when we make comparisons within these countries? That is, the previous section relates to country averages. Now let us group individuals within one country, such as the United States, according to their income and ask how it relates to health.

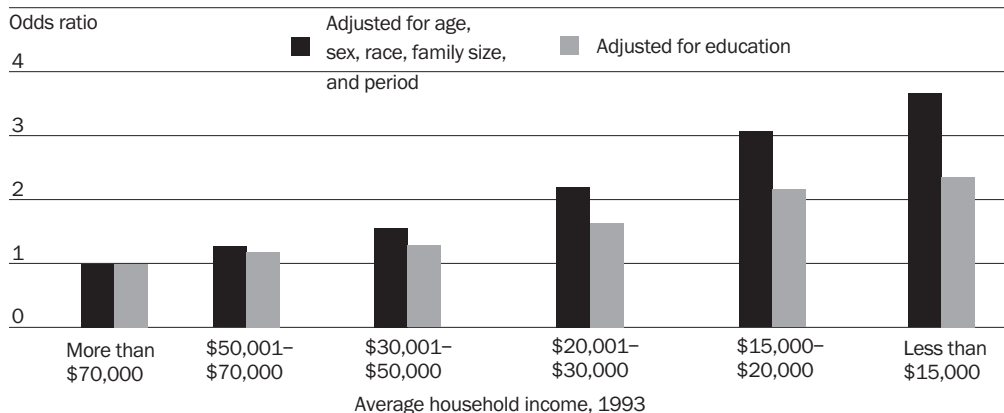
Exhibit 2 shows an example. It comes from the U.S. Panel Study of Income Dynamics, a national sample of people who have been followed since 1972.¹⁵ The high-income group, with average household income greater than \$70,000, is the standard to which all others are compared. The low-income group, with household income below \$15,000, had 3.9 times the mortality rate of the best-off, but there is a gradient: The higher the income, the lower the mortality. Although the bottom group has particularly high mortality, it accounts for about 7 percent of the population. This means that its members make a relatively modest contribution to all of the deaths that can be attributed to having an income below the highest level.

38

INFLUENCE OF HEALTH

EXHIBIT 2

Risk Of Death According To Household Income, Shown As Odds Ratios With And Without Adjustment For Education, Persons Ages 45–64



SOURCE: P. McDonough et al., “Income Dynamics and Adult Mortality in the United States, 1972 through 1989,” *American Journal of Public Health* (September 1997): 1476–1483.

“Education could be a better indicator than is income of some of the social factors that are important for health.”

.....

More of the excess deaths will come from the 30 percent of the population in the \$30,001–\$50,000 range, who have 59 percent more mortality than is true of the richest group.

Canada. A similar continuous relation between income and mortality has been shown in Canada.¹⁶ The relative measure means that as you move from the top income to the \$30,000–\$50,000 range, mortality is multiplied about 1.6 times. As you move down two further categories, to the \$15,000–\$20,000 range, it is multiplied by about 1.9 again, to give three times higher mortality than is true for the group with the highest income. But this approximately constant relative increase must correspond to an increasing mortality disadvantage if measured on an absolute scale. To illustrate, suppose that the annual mortality rates in the three income categories just described were 1 percent, 1.6 percent, and 3 percent, respectively. The increase in mortality in going from the richest to the \$30,000–\$50,000 range is 0.6 percent per year. The further increase in going down to the \$15,000–\$20,000 range is 1.4 percent—more than twice as great.

■ **Impact of redistribution of income.** Angus Deaton has shown this nonlinear increase in probability of dying with decreasing income.¹⁷ He draws an important implication from this. If at low levels of GNP, a small increase corresponds to a large increase in longevity, then taking some money from rich people will have less effect on their mortality than giving the same money to the poor will affect theirs. Therefore, other things being equal, a population with more egalitarian distribution of income will have better health than another with the same average income but greater income inequality. Whether this would work as a policy depends on losses in the system. I return to this in the next section.

■ **Education factor.** There is another point worth emphasizing about Exhibit 2. The relative risk of mortality rises in monotonic fashion with falling income throughout the range. This suggests that income is measuring something that is causally related to mortality throughout the range of incomes. Notice that I did not say that income was causally related. One might have gained the impression from the World Bank study that there would be little relation between income and mortality above about \$5,000. Yet as Exhibit 2 shows, the relation is quite strong up to about \$50,000. That it may not be income itself is shown by the effect of adjusting for education. Once education is included in the model, the effect of income on

mortality is markedly reduced. This may be because education affects health precisely because those with more education have higher incomes. It could, however, be because education is a better indicator than is income of some of the social factors, linked to social position, that are important for health.

■ **Material deprivation divide.** One way of interpreting the international data is that the level of income of about \$5,000 defines material deprivation, as used in this paper. The strong relationship between income and life expectancy below this level results from the relationship of material deprivation to ill health.

This would imply that more or less everyone in the United States is above the level of material deprivation. The relationship between income and mortality up to incomes of \$50,000 reflects something other than material deprivation, perhaps participation or the complex of factors that underlies Sen's notion of the "support-led" route to low mortality.

■ **Income as measure of social position.** This is consistent with income's defining position in a hierarchy relative to the prevailing standards of society. It may not be income itself that matters, except insofar as it determines ability to participate in the way defined as acceptable by society. To put it more generally, income is an impoverished way of capturing the condition of life that gives rise to health differences. This is illustrated by a comparison of life expectancy among black American men compared with men in Costa Rica. GNP in Costa Rica is around \$2,800, and life expectancy for men is seventy-four years.¹⁸ Among U.S. blacks, mean income is around \$26,000, and life expectancy is sixty-six years.¹⁹ We can adjust for the fact that a dollar in Costa Rica buys more than a dollar in the United States by using a measure of purchasing power parity, taking the United States as standard. This suggests that we should think of the GNP in Costa Rica as more like \$6,600 than \$2,800. This comparison suggest that four times the income among U.S. blacks compared with Costa Ricans goes along with eight years fewer in life expectancy.

I am not using this comparison to argue that poverty is not a problem for U.S. black men or that the social conditions under which black people live in the United States are irrelevant to health. I am using it to argue that important as money might be, we need to go beyond absolute measures of income to understand the relation between social position and health—to understand how social factors affect the position in which people find themselves and hence their health.

Occupational hierarchy. This is even more obviously the case when we return to the social gradient in people who are not below the

poverty level. In the Whitehall II study of British civil servants, ten years after the study began we added measures of household income and wealth. Two particular measures of health that we have been studying are a general question of self-perceived health and questions designed to elicit symptoms of depressive illness.²⁰ It turns out that both of these are related to household income in monotonic fashion: The higher the income, the more likely people are to report themselves in good health and the less likely to report depression. Income is only one measure of social position. In Whitehall II the most powerful predictor has always been position in the occupational hierarchy (that is, grade of employment). A statistician's way of testing out which is more important, grade or income, is to put them both into a predictive equation and see if they still predict. When we do this, income is no longer a predictor of ill health and depression. Grade wins this particular battle.

A tentative conclusion is that in a population above the poverty level, income is important as a predictor of ill health because it is a measure of where a person is in the social hierarchy, rather than because of pounds, dollars, or euros in the pocket.

Consumption. Among other aspects of money that economists consider are wealth and consumption. Attempts have been made in Britain to approach the topic of whether wealth might be related to mortality in addition to other social measures such as an occupation-based measure of social class. At the time of the national census in 1971, about half the population lived in households with access to a car, and about half of adults owned their place of residence. The assumption was made that although some people might have made the conscious choice to own neither car nor house, those who had these things were, on average, wealthier than those who did not. The study in Britain that followed a 1 percent sample of the 1971 national census, known as the Office for National Statistics Longitudinal Study, showed that these wealth measures predicted mortality independent of social class based on occupation.²¹

Household wealth. In the Whitehall II study, at the same time as asking about household income, we asked participants to estimate household wealth. As with household income this, too, was related positively to reported health (high wealth, better health) and negatively to depression (high wealth, less depression). As with income, this could have been a reflection of the fact that high-status civil servants have more wealth than their low-status colleagues have. It may therefore be a spurious finding, as appeared likely in the case of income. Unlike the findings with income, however, when we tried to make this finding go away by "adjusting" for the correlation between employment grade and wealth, both grade and wealth con-

tinued to predict ill health and depression.

Among the several possible interpretations of this finding, it is worth dwelling on three (excluding for the moment the possibility that ill health led to lower household wealth). First, wealth may convey psychosocial benefits. In Whitehall II, for example, wealth was correlated with optimism and a sense of control over future events. In this scenario, wealth may be causal in so far as the psychosocial benefits are directly related to the degree of wealth. Second, wealth may be reflecting accumulation of advantage and disadvantage over the life course. Wealth by itself may or may not be the issue, but it reflects a lifetime of different experiences, good and bad, that may affect health. Third, wealth may be simply acting as a marker for other unmeasured dimensions of socioeconomic position.

Income Inequality

Richard Wilkinson drew attention to the apparent contradiction, set out above, that when comparing rich countries, there is little relationship between average income and life expectancy, yet within these countries there is a close relationship between individuals' incomes and their life expectancy and mortality.²² His resolution of this puzzle was that within a society income was a measure of status, of relative position. This is what was related to mortality. When comparing whole societies, however, relative status has little meaning. Hence, the lack of relationship between mean income and a country's life expectancy was because a country's mean income did not convey the same meaning as the relative income level of people within a country.²³

Wilkinson then went on to show that the spread of income—income inequality—was related to a country's life expectancy. This finding has generated a great deal of debate.²⁴ One particular criticism was that the relation was artifactual: For a given level of average income, the higher the income inequality of a society, the higher will be the proportion of people in poverty.²⁵ If, as discussed above, the relation of absolute mortality rates to income is curvilinear, then although the rich will gain from income inequality and the poor will lose, the health advantage for the rich will be less than the health disadvantage for the poor. In the previous section I quoted Deaton as pointing out that we should not think of this as an artifact. This could be one way that redistribution of income in a more egalitarian way could improve the life expectancy of the whole society.

■ **Impact of racial inequality.** Wilkinson's thesis is that characteristics of unequal societies lead to worse health in addition to the effect of poverty. One way his finding was tested was within the United States.²⁶ States with greater income inequality had higher

“Income redistribution would improve overall health by relieving the fate of the poor more than it hurt the rich.”

mortality rates than did those with less inequality.²⁷ Similarly, metropolitan areas with greater income inequality had higher mortality than those with less inequality. Deaton’s counter to this is that the state-level correlation between income inequality and mortality could be accounted for by the percentage of the population who were black. He showed that this percentage correlated with mortality rates among whites. When allowance was made for the percentage who were black, income inequality dropped out of the analysis. In Deaton’s view, this is a refutation of the thesis that income inequality is causally related to mortality. It does not argue that the social environment is unimportant. As Deaton says, it could be argued that he has replaced income inequality with racial inequality.

■ **Effects of economic segregation.** Nancy Ross and colleagues, showing a weaker relation between income inequality among Canadian provinces than among U.S. states, conclude that the relation between income inequality and mortality depends on context.²⁸ There may be a greater degree of economic segregation in the United States than in Canada. This leads to a concentration of people with high social needs in municipalities with low tax bases, which in turn leads to worse provision of public goods and services, such as schools, transportation, health care, and housing. Lack of these public goods leads to worse health in poor areas. The marketplace has a more central role in the allocation of health care and high-quality education in the United States than it has in Canada. Therefore, utilization in the United States tends to be related to ability to pay, whereas these services in Canada are publicly funded and universally available. This Canadian argument appears to have two aspects: Low income and income inequality will both deprive people of access to services more in the United States than they will in Canada.

■ **Social environment.** An important part of the argument that income inequality is a marker of the social environment is that in the United States, areas with high income inequality have not only high mortality but high crime rates, especially of homicide.²⁹ Ichiro Kawachi and colleagues have interpreted the environment in terms of social capital.³⁰ They have shown that measures of social capital appear to mediate the relation between income inequality and mortality. Robert Putnam also points to the relation between income inequality and erosion of social capital.³¹

A Policy For Income?

My purpose in this paper was to take a noneconomist's view of income and health, not especially to speculate about policy implications. But the causal question and the policy question are interlinked. Crucially, would income redistribution matter to health?

First, for the reasons that Deaton set out, income redistribution would improve overall health by relieving the fate of the poor more than it hurt the rich. Deaton has pointed out to me that the benefits of redistribution would be less than would appear from the simple observation of the link between income and mortality. Economists describe as "deadweight loss" the fact that to redistribute a dollar to a poor person usually takes more than a dollar from a rich person. This happens because people both avoid and evade taxes.

Second, lack of income may not be related to deprivation in the sense of that prevailing in York 100 years ago, but lack of income hinders full participation in society. In a "support-led" society, to use Sen's term, with sharing and public provision of goods and services, income would matter less to social participation and receipt of services. In a society where both participation and receipt of services depend heavily on individual income, its lack is serious.

The data on income inequality by state or country should alert us to the powerful role that the social environment might play in health. We are still feeling our way toward understanding what this means. In Britain, on the basis of the Acheson inquiry, we made a series of recommendations for policy development that were related to improving the quality of the social environment to reduce inequalities in health. One of our three headline recommendations was to use the tax and benefit system to improve the living standards of those who are worst off.³²

AT THE LOW END OF THE SCALE, individual incomes matter for health because of their link with both material deprivation and restriction on social participation and opportunity to exercise control over one's life. Above a threshold of material deprivation, income may be more important because of its link with these social factors related to social conditions. Pretax income inequalities have increased in many countries. A policy of not redressing this through the tax and benefit system, linked to lack of investment in public goods that brings the benefits of richer communities to all, will damage health.

Sir Michael Marmot is supported by an MRC Research Professorship and by the John D. and Catherine T. MacArthur Foundation Research Network on Socio-economic Status and Health. The author is grateful to an anonymous reviewer and to Angus Deaton, whose constructive criticisms were invaluable. He also thanks Mandy Feeny for her help with preparation of this paper.

NOTES

1. J.P. Smith, "Healthy Bodies and Thick Wallets: The Dual Relationship between Health and Socioeconomic Status," *Journal of Economic Perspectives* (Spring 1999): 145–166.
2. See, for example, papers in D. Gordon and P. Townsend, *Breadline Europe* (Bristol, England: Policy Press, 2000).
3. B.S. Rowntree, "Poverty: A Study of Town Life (1901)," in *Poverty, Inequality, and Health in Britain, 1800–2000: A Reader*, ed. G. Davey Smith, D. Dorling, and M. Shaw (Bristol, England: Policy Press, 2001), 97–106.
4. National Statistics, "Infant and Perinatal Mortality by Social and Biological Factors, 2000," *Health Statistics Quarterly* (Winter 2001): 78–82.
5. S.H. Preston, "The Changing Relation between Mortality and Level of Economic Development," *Population Studies* (March 1974): 19–51.
6. *Healthy People 2010* (Washington: U.S. Department of Health and Human Services, 2000).
7. A.T. Geronimus et al., "Excess Mortality among Blacks and Whites in the United States," *New England Journal of Medicine* (21 November 1996): 1552–1558.
8. M.G. Marmot, M.J. Shipley, and G. Rose, "Inequalities in Death—Specific Explanations of a General Pattern," *Lancet* (5 May 1984): 1003–1006; and M.G. Marmot et al., "Health Inequalities among British Civil Servants: The Whitehall II Study," *Lancet* (8 June 1991): 1387–1393.
9. C. van Rossum et al., "Employment Grade Differences in Cause Specific Mortality: Twenty-five Year Follow Up of Civil Servants from the First Whitehall Study," *Journal of Epidemiology and Community Health* (March 2000): 178–184.
10. C. Griffiths and J. Fitzpatrick, *National Statistics: Geographic Variations in Health* (London: Stationery Office, 2001).
11. M.G. Marmot, "Inequalities in Health," *New England Journal of Medicine* (12 July 2001): 134–136.
12. World Bank, *World Development Report 1993* (New York: Oxford University Press, 1993).
13. Preston, "The Changing Relation between Mortality and Level of Economic Development."
14. A. Sen, *Development as Freedom* (New York: Alfred A. Knopf, 1999).
15. P. McDonough et al., "Income Dynamics and Adult Mortality in the United States, 1972 through 1989," *American Journal of Public Health* (September 1997): 1476–1483.
16. M. Wolfson et al., "Career Earnings and Death: A Longitudinal Analysis of Older Canadian Men," *Journal of Gerontology* (July 1993): 167–179.
17. A. Deaton, "Health Inequality and Economic Development" (Working paper, Princeton University Research Program in Development Studies and Center for Health and Wellbeing, 2001).
18. World Bank, *World Development Report 1999/2000* (New York: Oxford University Press, 2000).
19. D.R. Williams, "Race, Socioeconomic Status, and Health: The Added Effects of Racism and Discrimination," in *Socioeconomic Status and Health in Industrial Nations: Social, Psychological, and Biological Pathways*, ed. N. Adler et al., *Annals of the*

- New York Academy of Sciences, Vol. 896 (December 1999), 173–188.
20. P. Martikainen et al., “The Effects of Income and Wealth on GHQ Depression and Poor Self-Rated Health in White-Collar Women and Men in the Whitehall II Study” (Unpublished manuscript, University College London, 2001).
 21. P. Goldblatt, *1971–1981 Longitudinal Study: Mortality and Social Organisation* (London: Stationery Office, 1990).
 22. R.G. Wilkinson, *Unhealthy Societies: The Afflictions of Inequality* (London: Routledge, 1996).
 23. R.G. Wilkinson, *Mind the Gap: Hierarchies, Health, and Human Evolution* (London: Weidenfeld and Nicolson, 2000).
 24. For a comprehensive review, see Deaton, *Health Inequality and Economic Development*.
 25. H. Gravelle, “How Much of the Relation between Population Mortality and Unequal Distribution of Income Is a Statistical Artefact?” *British Medical Journal* (31 January 1998): 382–385.
 26. G.A. Kaplan et al., “Inequality in Income and Mortality in the United States: Analysis of Mortality and Potential Pathways,” *British Medical Journal* (20 April 1996): 999–1003.
 27. J. Lynch et al., “Income Inequality and Mortality in Metropolitan Areas of the United States,” *American Journal of Public Health* (July 1998): 1074–1080.
 28. N.A. Ross et al., “Relation between Income Inequality and Mortality in Canada and in the United States: Cross Sectional Assessment Using Census Data and Vital Statistics,” *British Medical Journal* (1 April 2000): 898–902.
 29. M. Wilson and M. Daly, “Life Expectancy, Economic Inequality, Homicide, and Reproductive Timing in Chicago Neighbourhoods,” *British Medical Journal* (26 April 1997): 1271–1274.
 30. I. Kawachi et al., “Social Capital, Income Inequalities, and Mortality,” *American Journal of Public Health* (September, 1997): 1491–1498.
 31. R. Putnam, *Bowling Alone: The Collapse and Revival of American Community* (New York: Simon and Schuster, 2000).
 32. *Independent Inquiry into Inequalities in Health: Report* (London: Stationery Office, 1998).