ARE INEQUALITIES IN HEALTH STATUS IMPROVING?

The le Grand "Answer"

The Black Report says essentially that if things have improved since the War then that improvement is not dramatic, and indeed the difference between social classes in SMR's among middle aged men seems to have widened consistently since the 1930's. So it was difficult to find any evidence of an improvement in inequalities until Julian le Grand calculated his Gini coefficients.

In his paper he starts essentially by counting the number of economists on the Inequalities in Health Working Group and finds none. He argues that economists would do things slightly differently from the way the Black Committee examined extent, causes and policies. The first part of his exposition goes along a well worn path of demonstrating that we do not measure social class terribly well. Almost all of this is published elsewhere and discussed much more sympathetically and constructively by others. He argues that epidemiologists and sociologists believe occupation to be a major determinant of health differentials. This is not a realistic characterisation but it seems to be the build up to a spurious argument which he subsequently uses to justify his use of age of death as an index of health stock. He argues that the use of occupation in explaining mortality incorporates a causal hypothesis. The facts are that age standardised mortality rates differ by occupational group. It is indeed better to measure the extent of the inequality

first and then relate that to possible explanations but it is quite hopeless to believe that the measurement of an individuals health stock could firstly be accurate and secondly be independent of opinion which was to some degree socially determined. Thus if we could take 10,000 people and measure their health stock accurately, repeatably and reliably then it would be good to ask how much of the observed variation was explained by occupational status.

However, of course, this is not possible and his argument is spurious quite simply because he fails to take account of its impossibility. Instead he invents some general virtue of economists who apparently prefer individual measurements as opposed to others who do not. This is just silly, but it turns out to be another tortuous justification for analysing Gini coefficients on age at death.

Of course his Tables 5 and 6 do not tell us anything about differences between occupational groups. But he does not mention that many (if not most) economic indices can be measured on individuals. Inequality in wealth, income, IQ, education etc. are all characteristics which can (in principle) be used to describe individuals. Health (or health stock) is unfortunately not so easily measured on individuals and in particular risk of death can only be reliably estimated by rates among groups of people at specified ages. Thus human capital must be correspondingly difficult to measure on individuals.

Moreover, the Gini coefficient is essentially the coefficient of variation (cv) of the distribution of age at death.

The Gini coefficient is:

$$1/2\left(\frac{\text{(Mean Difference)}}{\text{Mean}}\right)$$

where Mean Difference $= \dfrac{\sum^{i,j} (x_i - x_j)}{N^2}$ $\quad i=1,\ldots N,\ j=1,\ldots N$

But $\quad$ Variance $= 1/2 \left(\dfrac{\sum^{i,j} (x_i - x_j)^2}{N^2}\right)$

Thus it is, in general, highly correlated with the coefficient of variation (cv). That is to say that its changing value will be quite highly correlated with the changing values of the coefficient of variation under stable distributional assumptions. Firstly, to the extent that this is true, it is not at all surprising that the Gini coefficient is decreasing, for leaving infant mortality out as Dr.le Grand does in Table 6, there have been all sorts of medical and public health developments to decrease the chances of dying as a young adult but which have had only a small effect on the chance of dying as an elderly person. Thus there are many reasons to expect the standard deviation of age at death to decrease and for the mean to slightly increase and thus for the cv to decrease. Moreover, of course, quite apart from that, what happens to the cv when the mean of a distribution changes, (from a purely statistical point of view) depends on the shape of the

distribution. Only if the distribution is a log normal distribution will the cv stay constant, but for other distributions (in general) a change in mean implies a change in cv. Age at death is certainly not log normal and therefore changes in the Gini coefficient when life expectation is changing may have nothing to do with changing general inequalities.

Thus le Grand's analysis tells us in a very indirect way what we knew already - that age specific mortality particularly among the young is decreasing. However, until we can be told exactly what aspect of inequality is being measured by such standardised indices as the Gini coefficient we certainly cannot infer anything as strong as le Grand does from his analysis.

It is wholly unreasonable to argue that this decrease therefore reflects improving inequalities between any interesting potentially explanatory variable apart from the general improvements in hygiene, contraception, anaesthesia, occupational exposure etc. that we are all agreed about. What his analysis tells us, terribly crudely, is what we can see much more clearly by looking at changes in age specific death rates over time. And that is all.

We could more productively, as the Black Report does, look for changes in age specific death rate by class. The statistical problem of comparing variation between different time periods or indeed geographic areas is an area of

statistical theory which, it seems to me, is ripe for important development. We would need to define more closely, though, what we meant by inequality.

Klim McPherson,
Department of Community Medicine & General Practice, Oxford.