

The Misinterpretation of Health Inequalities in Nordic Countries

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In 1997, *The Lancet* published a landmark study ranking western European countries on the size of their socioeconomic health inequalities in morbidity and mortality.¹ [SLIDE 2] To the surprise of many, despite being relatively egalitarian societies, Sweden and Norway showed unusually large health inequalities. In the years that followed, Nordic countries have devoted considerable resources to the study of health inequalities, generally finding that, at least with respect to mortality, those inequalities have been increasing.

Yet this research, including the *Lancet* study, suffers from a serious flaw in the failure to recognize the extent to which differences in experiencing or avoiding an outcome are functions of the prevalence of the outcome. Most notably, the research fails to recognize the following fundamental statistical tendency (which I display in the next slide [SLIDE 3], and term Interpretative Rule 1 (IR1)):

When two groups differ in their susceptibility to an outcome, the rarer the outcome, the greater tends to be the relative difference in experiencing it and the smaller tends to be the relative difference in avoiding it.²⁻⁶

Now this is merely a tendency that can be heightened or mitigated by other factors. But it is a powerful tendency. And while it may not be the whole story as to

¹ Accompanying PowerPoint presentation may be found at:
http://www.jpscanlan.com/images/Esbjerg_Presentation2.ppt

every analysis of changes in group differences, it is almost always an important part of that story.

I will demonstrate the tendency with several illustrations. First, however, let me state its implications with respect to the theme of this presentation. [SLIDES 4-5] First, precisely because they are such healthy countries – with low overall mortality rates – Sweden and Norway will be expected to have large inequalities in mortality rates (though small inequalities in survival rates). Second, as mortality declines one would expect to find increasing inequalities in mortality rates (though declining inequalities in survival rates).

I'll add another implication with respect to morbidity. In contrast to studies of inequalities in mortality, studies of inequalities in morbidity, at least in terms of self-assessed poor health, have not been increasing – as was found in studies of four Nordic countries in a 2000 supplement to the *Scandinavian Journal of Public Health*.⁷⁻¹⁰ But that is just as one should expect because, in contrast to mortality, morbidity (at least in terms of self-assessed poor health) has not been declining.

Again, Interpretive Rule 1 is merely a tendency. So a key question is whether the inequalities in mortality in Norway and Sweden are larger or smaller – relative to those in the rest of western Europe – than one should expect simply on the basis of the low mortality? So far the issue has just not been examined, and I am not sure an answer really exists.

I'll proceed to attempt to demonstrate the validity of IR1 with several illustrations. In the event I do not get through all of them, or I leave you unpersuaded, I

refer you any of these references [SLIDE 6], which will support my position in much greater detail than I am providing today.

The figures that follow are based the normal distribution of two groups of equal size with respect to factors associated with experiencing or avoiding some outcome. The distributions have the same standard deviation and the means differ by one half a standard deviation. Conceptually, one might regard these as distributions of scores on an examination and that imagine that we are observing the implications of lowering a cutoff on a test. But the patterns we observe would hold as well if, rather than lowering a cutoff from one point to another, we improved test performance such that everyone currently scoring between the two points was enable to score at the higher cutoff.

Figure 1 [SLIDE 7] shows the proportion that the disadvantaged group comprises of the part of the total population falling below each cutoff. The numbers along the bottom of the figure reflect the proportion of the advantaged group that falls below each point – that is, that fails the test at each cutoff. The blue line shows the proportion that the disadvantaged group comprises of the total falling below each point. And we observe that, as the cutoff is lowered, and test failure becomes rarer, the disadvantaged group comprises a higher proportion of the total continuing to fail the test.

Recognizing this aspect of the matter is important to understanding why ratios of rates of experiencing some adverse outcome tend almost invariably to increase as the outcome declines. For progress in virtually every area of human well-being, including reductions in mortality, is generally a matter of serially restricting adverse outcomes to the points where only the most susceptible segments of the overall population continue to experience those outcomes – until, in an ideal world, the adverse outcomes disappear

entirely. And disadvantaged groups comprise larger proportions of each increasingly more susceptible segment of the overall population. Thus, the closer a society comes to eliminating an adverse outcome, the more the outcome will be concentrated within disadvantaged groups, and the greater will be the difference between the rates at which advantaged and disadvantaged groups experience it.

Figure 2 [SLIDE 8] now shows the relative difference in rate of failing the test. And we observed that as the cutoff is lowered, the difference in failure rates increases. I am using a hypothetical distribution of test scores as an illustration. I have elsewhere used income data. But the pattern observed is virtually universal in settings when the distributions are other than highly irregular. And it is always for the same reason: as we saw in Figure 1, reduce an adverse outcome and it will tend to be increasingly concentrated in disadvantaged groups. Correspondingly, the relative difference in experiencing the outcome increases.

Now let us examine the other side of the picture – the relative differences in experiencing the favorable outcome. Figure 3 [SLIDE 9] shows the ratio of the rate at which the advantaged group falls above the line to the rate at which the disadvantaged group falls above the line. Conceptually, we can regard these as the relative pass rates. That ratio declines – *i.e.*, the difference grows smaller – as the overall failure rate declines. Thus, we observe that the size of inequalities in experiencing an outcome and in avoiding the outcome tend to move systematically in opposite directions as the prevalence of the outcome changes.

That increasing differences in experiencing an adverse outcome in times of declining prevalence of the outcome are attended by declining differences in avoiding the

outcome has the following important implication with respect to the evaluation of changes in the size of inequalities. Some might be inclined to maintain that an increase in the difference between rates of experiencing an adverse outcome reflects some true worsening of the relative status of the disadvantaged group, even when the increase results solely from a general decline in the frequency of the outcome. Even allowing the validity of the point for a moment, one would have to regard such a change as a much different occurrence – and a far less consequential occurrence – than a change that went beyond the usual consequences of the overall decline in the outcome. Indeed, one might say we only have interest in identifying the changes that are more than or less than the change that is the usual consequence of an overall decline in the outcome. But it becomes difficult even to maintain that an increase in the difference in adverse outcomes that flows solely from a decrease in prevalence somehow reflects a true worsening of the relative situation of the disadvantaged group when one recognizes that, if one appraises the same matter in terms of the favorable outcome, one has to conclude that the inequality has declined.

Finally, it warrants note that, following the 1997 Lancet article, some observers have pointed out that, if one looked at absolute rather than relative differences, Sweden and Norway seem to have smaller health inequalities than most of the rest of the countries studied.^{11,12} And it is often pointed out that whether inequalities are increasing or decreasing seems to turn on whether one looks at absolute or relative differences. Further, some commentators generally favor using absolute differences rather than relative differences to measure health inequalities. Reasons for this preference include (1) that the absolute difference is the same whether one examines the adverse or the favorable outcome and (2) that the absolute difference gives a better picture than the relative difference of

the proportion of the disadvantaged group that is harmed by its greater susceptibility to an adverse outcome. But we see in Figure 4 that, as with each of the other measures just described, absolute differences also change when there occurs an across-the board change in the prevalence of the outcome. The absolute difference is small at the point where almost everyone from both groups experiences the adverse outcome, grows larger as the adverse outcome becomes less common, and then grows small again as the adverse outcomes becomes rare. So the absolute difference does not provide a ready measure of distinguishing between the sizes of differences that are solely functions of differences in the prevalence of an outcome and those that are not.

Given these patterns of changes in measures that flow solely from changes in the prevalence of an outcome, there are difficult issues as to how we should measure health and even whether we can distinguish between changes in inequalities that are solely functions of changes in the prevalence of an outcome and those that reflect something more meaningful. But, in any case, we cannot usefully study health inequalities without attempting to take these tendencies into account.

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