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Recognizing the statistical basis for advances in health care to cause larger relative reductions in mortality in groups with lower base rates.

In finding that improvements in health care in Australia increased relative differences in mortality according to socioeconomic status (SES), Korda et al.[1] overlooked the statistical tendency whereby the rarer an outcome the greater the relative difference between rates of experiencing it and the smaller the relative difference between rates of avoiding it. [2-7] Such tendency can be illustrated with virtually any data set that allows one to examine various points on a continuum of factors associated with experiencing or avoiding some outcome. For example, income data from the United States show how reducing poverty will tend to increase relative differences in poverty rates of whites and blacks while reducing relative differences in rates of avoiding poverty.[2,4] Hypothetical test score data show how lowering a cutoff score (or improving performance such as to enable everyone scoring just below the cutoff to achieve the current cutoff score) will tend to increase the relative difference in failure rates of higher- and lower-scoring groups while reducing the relative difference in pass rates.[5-6] A corollary to these patterns is that, as an outcome declines, groups with lower base rates will tend to experience larger proportionate declines in their rates than groups with higher base rates, though the latter groups will tend to experience larger proportionate increases in rates of avoiding the outcome.

Thus, the patterns discussed in Korda et al., whereby in a period when all SES quintiles were experiencing reductions in avoidable mortality, the rates of reduction were smaller for the lower quintiles are generally to be expected during times of declining mortality. Such differences do not by themselves indicate meaningful changes in inequality – that is, changes that are more than or less than those that would result from an overall decline in mortality in the manner that lowering a test cutoff reduces overall failure rates. Further, Table 2 in the Korda study provides data that allow one to calculate that the increase in avoiding avoidable mortality was greater for the lowest quintile than for the highest quintile.

On the other hand, in the case of non-avoidable mortality, as to which one also observes that all quintiles experienced a decline in mortality with the rates of decline being greater in the higher quintiles, one finds that the rate avoiding non-avoidable mortality increased more in the highest quintile than in the lowest quintile. That departure from the standard pattern might be cautiously read as indicating that there was a meaningful worsening in the relative situation of the lowest quintile. The same may be said of comparisons between various quintiles other than simply the highest and lowest with regard to both avoidable and non-avoidable mortality.

But it should be recognized that drawing inferences about meaningful changes in the relative situation of various groups during times of overall changes in mortality rates when we cannot directly observe the risk distributions is fraught with uncertainty. For while the distributions are likely to be close enough to normal that it makes no sense to try interpret patterns of changing inequalities while ignoring the standard patterns that would occur when distributions are normal, the possibility (or even likelihood) of irregularities in the distributions make it difficult to be certain about any conclusions drawn from departures from the standard patterns.

Three other points warrant mention. First, the authors note that absolute difference between avoidable mortality rates of quintiles 1 and 5 declined during the period. Some observers regard absolute differences between rates as the best measure of health inequalities. Reasons for such preference include that one reaches the same conclusion about directions of change using absolute differences regardless of whether on examines adverse or favorable outcomes. Also, absolute differences in outcome rates provide the best indicator of the extent to which disadvantaged groups are harmed by their greater susceptibility to some outcome. But, like relative differences, absolute difference tend to change simply because the overall prevalence of an outcome changes. In some circumstances the ways absolute differences tend to change as the prevalence of an outcome changes are fairly complicated, as discussed elsewhere.[2,6,8] But in the setting addressed by Korda et al., absolute differences in mortality rates typically will decline as mortality declines, which is to say that in absolute terms the decline in mortality will be greater for the groups with the higher base rate. Thus, the greater absolute decline in the avoidable mortality rate of quintile 1 compared with quintile 5 cannot be read an indicator of a meaningful reduction in inequality.

One might draw inferences from patterns whereby the absolute difference changes in a nonstandard direction, as in the case of the increase in the absolute difference between unavoidable mortality rates of quintiles 1 and 5. But, as with previously discussed efforts at drawing inferences from departures from nonstandard patterns, doing so with absolute differences can be an uncertain undertaking.

Second, as some other observers also have done, Korda et al. discuss as a possible explanation for perceived increasing inequalities that higher SES individual may be better able to take advantage of new medical technologies. The idea seems quite plausible. But it is hard to know whether it means anything other than that we usually observe certain patterns of changes between group rates as adverse outcomes decline in prevalence.

Data in Table 1 of reference 6 can illustrate the issue. Consider the situation where a test cutoff is set at point K, the point where 20% of the advantaged group (AG) and 36.7% of the disadvantaged group (DG) fall below the line. Assuming the groups are each comprised of 1000 persons, the following pattern would exist.

	AG	DG	DG % of Total
Above K	800	633	44.2
Below K	200	367	64.7
Between K & L	100	149	59.8
Below L	100	218	70.7

Consider that a technology is developed to improve test performance and that it enabled everyone between point K and point L to reach the cutoff at point K. From one perspective, one might say that the AG disproportionately benefited from the technology, since DG comprised a smaller proportion of the population the technology enabled to reach the higher cutoff (59.8%)

than it did of the population initially falling below K (64.7%). Such characterization is akin to the way Korda et al. characterize the seemingly disproportionate benefit of advances in health care as a situation where “of those in need of heath care, higher SES individuals were more likely to have benefited from it that those of lower SES.” In terms of characterizing the matter as one where AG disproportionately benefits from the technology one might also note that that DG comprises a smaller proportion of those the technology enabled to reach the higher cutoff than it does of those continuing to fall below the cutoff (70.7%) (which accounts for the increase in the relative difference in rates of falling below the cutoff).

On the other hand, however, DG comprises a much larger proportion of the population the technology enabled to reach the cutoff at point K (59.8%) than of those previously reaching that cutoff (44.2%) (which accounts for the decrease in the relative difference in falling above the line). That might be seen as DG’s disproportionately benefiting from the technology. DG also comprises a higher proportion of the population benefiting from the technology than it comprises of the total population (which accounts for the decline in the absolute difference). However, there are other points on the distributions where the same type of change that reduced overall failure rates would increase the absolute difference.

Thus, while there are various ways to characterize the matter such that one group or the other seems to be differentially affected by certain trends, I am not sure whether they add anything beyond the main point above – that, given the usual shape of distributions of susceptibilities to various outcomes, we will tend to observe certain patterns of changes in differences between rates as an outcome increases or decreases in prevalence.

Third, in appraising the impact of some factor such as improved health care on groups having different base rates, it should be borne in mind that there is no reason ever to expect a factor to have the same relative effect on outcome rates of each group (save by happenstance). For certainly there is no more reason to expect a factor to cause an equivalent proportionate increase on both groups’ rates of one outcome (say, mortality) than there is to expect it to cause an equivalent proportionate decrease in rates of the opposite outcome (survival), and it is mathematically impossible to do both (as should be evident from the tables in references 2, 5, and 6, and as shown in a simple example in reference 9 [9]). Hence, one should be very cautious about attaching significance to an observed lack of equivalence in the effect of some factor on the rates of two groups with different base rates.

References:

1. Korda RJ, Butler JRG, Clements MS, Kunitz SJ. Differential impacts of health care in Australia: trend analysis of socioeconomic inequalities in avoidable mortality. Int J Epidemiol 2007;36:157-165.

2. Scanlan JP. Can we actually measure health disparities? Chance 2006;19(2):47-51: http://www.jpscanlan.com/images/Can_We_Actually_Measure_Health_Disparities.pdf

3. Scanlan JP. Measuring health disparities. J Public Health Manag Pract 2006;12(3):294 [Lttr]: http://www.nursingcenter.com/library/JournalArticle.asp?Article_ID=641470

4. Scanlan JP. Race and mortality. Society 2000;37(2):19-35: http://www.jpscanlan.com/images/Race_and_Mortality.pdf

5. Scanlan JP. Divining difference. Chance 1994;7:38-39,48: http://jpscanlan.com/images/Divining_Difference.pdf

6. Scanlan JP. The misinterpretation of health inequalities in the United Kingdom. Paper presented at: British Society for Population Studies Annual Conference 2006, Southampton, England, Sept. 18-20, 2006: http://www.jpscanlan.com/images/BSPS_2006_Complete_Paper.pdf

7. Carr-Hill R, Chalmers-Dixon P. The Public Health Observatory Handbook of Health Inequalities Measurement. Oxford: SEPHO; 2005: http://www.sepho.org.uk/extras/rch_handbook.aspx

8. Scanlan JP. Effects of choice measure on determination of whether health care disparities are increasing or decreasing. *Journal Review* May 1, 2005, responding to Vaccarino V, Rathore SS, Wenger NK, et al. Sex and racial differences in the management of acute myocardial infarction, 1994 through 2002. *N Engl J Med* 2005;353:671-682: http://jpscanlan.com/images/Vaccarino_NEJM_2005.pdf

9. Interpreting departures from expected patterns of relative differences. J Epidemiol Community Health June 4, 2007, responding to: Mustard CA, Etches J. Gender differences in socioeconomic inequality in mortality. J Epidemiol Community Health 2003;57:974-980: http://jech.bmj.com/cgi/eletters/57/12/974