**Relative differences in survival and relative differences in mortality are different things**

In their title and abstract and in many places in the body of their article, Woldemichael et al.[1] refer to demographic disparities in AIDS survival rates and/or changes in those disparities between pre-HAART and HAART eras. But their evaluation of changes is based on relative differences in mortality rates. Changing relative differences in survival and changing relative differences in mortality are by no means the same thing.

The more common an outcome, the smaller tends to be the relative difference in experiencing it and the larger tends to be the relative difference in avoiding it.[2-5] A corollary to this tendency is that whereby, as an outcome increases in overall frequency, the group with the lower baseline rate tends to experience a larger proportionate increase in the outcome but a smaller proportionate decline in failing to experience the outcome.[3,4]

Thus, as a favorable outcome like survival increases, statistical factors will tend toward causing the group with lower survival rates to experience a larger proportionate increase in survival though a smaller proportionate decline in mortality. The result in terms of hazard ratios is typically that, as survival increases, relative differences in survival rates tend to decrease while relative differences in mortality rates tend to increase. Such patterns have often been evident with regard to infant mortality, where increased survival rates (declining mortality rates) have been attended by declining relative differences in survival rates but increasing relative differences in mortality rates.[3,5,6]

In a particular setting, of course, meaningful changes in susceptibilities may counter the statistical tendency as to one outcome and enhance it as to the other. In the main, that seems to have occurred in the circumstances examined by Woldemichael et al., where usually both the relative difference in 5-year survival and the relative difference in 5-year mortality increased. On the basis of the departure from the usual pattern of change in the relative difference in survival rates, one may infer a meaningful increase in disparity.

But a couple of comparisons would yield different results depending on whether one examined the favorable or the adverse outcome. Relying on the adjusted analysis in their Table 3, the authors highlight as a considerable increase the change from a relative difference of 63% to one of 128% for the over-49 age group compared with the 13-29 age group. Survival rate data in their Table 2, which can form the basis only for unadjusted comparisons, also show that increase to be a seemingly substantial one (from 26% to 95%). But the data in Table 2 also show that relative difference in survival rates actually decreased from 22.6% to 22.2%. Thus, as far as increased survival is concerned, the two groups in fact benefited approximately equally. Table 3 also shows that the relative difference in mortality for the 30-49 age group compared with the 13-29 age group

increased from 19% to 23%.  Data in Table 2 similarly show an increase in the unadjusted relative difference in mortality (from 9% to 21%); but those data also show that the relative difference in survival rates decreased from 8% to 5%.

One can still infer a meaningful increase in the disparity for the over-49 age group compared with the 13-29 age group on the basis that relative difference in survival did not decline more than negligibly despite the statistical forces driving it in that direction.  For the comparison between the 30-49 and 13-29 age groups, the issue is more complicated (though the method described in reference 7, and explained more fully on the Solutions sub-page of the Measuring Health Disparities page of jpscanlan.com, suggests that this disparity also increased, though very slightly).

A recent study of racial and ethnic disparities, which, like the Woldemichael study, also involved Chicago and also was carried out by researcher in the Chicago Department of Public Health, illustrates how crucial whether one examines the favorable or the adverse outcome may sometimes be.  Morita et al.[8] examined the effects of a school-entry Hepatitis B vaccination requirement on racial and ethnic differences in vaccination rates.  The requirement substantially increased vaccination rates for all groups.  Measuring disparities in terms of relative differences in vaccination rates (the favorable outcome), the authors found dramatic decreases in racial and ethnic disparities.  Those who rely on relative differences in the adverse outcome, however, would have found dramatic increases in the disparities.[9]   There, as here, however, determining whether disparities increased or decreased in a meaningful sense involves a more complex inquiry than examining the change in relative differences in a favorable outcome or in an adverse outcome, and that inquiry must be informed by an understanding of the ways differences between rates are affected by changes in the overall frequency of an outcome.  The same holds with regard to appraising whether a disparity ought to be regarded as a large one or a small one.

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