[The comment below was posted on journalreview.org on April 28, 2010. Following the closing of that site, the comment was posted here in September 2012.]

Interpreting racial differences in hypertension control

The study by Rehman et al.[1] discussing the comparative size of racial differences in blood pressure control in Veterans Affairs (VA) and other health care sites raises a number of measurement and presentation issues.

It initially warrants note that the authors state that "[t]he explanation for persisting ethnic differences in hypertension control and in cardiovascular and renal outcomes is not fully known but may include biological, cultural, social, health care provider, and health care system factors, such as insurance and access to care and medications." Yet the authors overlook the most obvious reason to expect a racial difference in hypertension control. Blacks are more likely than whites to suffer from hypertension. And where one group is more susceptible to some outcome than another group, it is generally the case that the degree of greater susceptibility is even larger for more severe forms of the outcome.[2-4] Put another way, if blacks are to some degree more likely than whites to have systolic blood pressure above 139, blacks will generally be to an even greater degree more likely than whites to have systolic blood pressure above 149. And it is naturally harder to bring blood pressure above 149 to below 140 than it is to bring blood pressure between 140 and 149 below 140.

The same features of normal distributions that lead to lower control rates among blacks than whites raise issues about measurement of the size of differences between outcome rates in different settings, since those features also case standard measures of differences between rates to be affected by the overall prevalence an outcome, as described in references 2-4 and various other references made available on the Measuring Health Disparities page of jpscanlan.com.[5] As it happens, data on blood pressure can provide some of the more concrete illustrations of the patterns described in the aforementioned references, and thus demonstrate the problems with standard measures of differences between outcome rates for appraising the size of health or healthcare disparities. Figure 7 of reference 6, the underlying data from which is reproduced as Table A among the tables made available in connection with this comment,[7] uses NHANES data on systolic blood pressure (SBP) of black and white men age 45 to 64 to show how generally reducing SBP tends to increase relative differences in hypertension rates while reducing relative differences in avoiding hypertension – hence illustrating the pattern whereby the rarer an outcome, the greater tends to be the relative difference in experiencing it and the smaller tends to be the relative difference in avoiding it. Table A also illustrates the way that rates at which black and white men experience SBP levels above 139 are in ranges where reducing blood pressure generally will tend to reduce absolute differences between hypertension rates but increase differences measured by odds ratios (as explained generally in reference 6 and in the introductory section to the Scanlan's Rule page of jpscanlan.com[8]).

But the analysis of differences in control of hypertension among persons deemed hypertensive raises additional issues. Persons deemed hypertensive are truncated segments of each group's

overall population. Even when a factor is normally distributed in the subject groups in the overall population, the distribution of the factor will not be normal in the truncated segments of those groups. Even so, within the truncated population the relative differences in experiencing and avoiding an outcome will tend to exhibit the same patterns of correlations with overall prevalence as found in the overall population. That is, as an outcome becomes rarer relative differences in experiencing it tend to increase while relative differences in avoiding it tend to decrease. Thus, for example, just as general reductions in SBP will tend to increase relative differences in hypertension rates while reducing relative differences in rates of avoiding hypertension, such reductions will tend to increase relative differences in rates of failing to control hypertension while reducing relative differences in rates of control of hypertension.

Absolute differences between rates in truncated populations tend also to exhibit patterns of correlations with overall prevalence similar to those observed in the overall population. That is, broadly, as a rare outcome becomes more common absolute differences tend to increase; as common outcomes become even more common absolute differences tend to decrease. (I note, however, that even when the overall distributions are perfectly normal, within the truncated segments of such populations, one will observe departures from the pattern described in reference 8 whereby the maximum of the absolute difference will fall between the points where the rate of either group is 50% (for either outcome). Differences measured by odds ratios, however, will not reflect correlations with overall prevalence at all similar to those one observes is the overall population. These general patterns are illustrated in Figures 6 and 8 of reference 5 with regard to normal data and in Figure 10 of reference 5 (reproduced as Table B in reference 6) with regard to NHANES data on systolic blood pressure. Illustrations based on data of the nature underlying Figures 6 and 7 are set out in Table 1 to the Truncation Issues sub-page of Scanlan's Rule page of jpscanlan.com.[9]

It should be recognized that even though one will observe patterns of correlations of absolute difference within the truncated population similar to those observed in the overall population, one will not observe the situation described above with respect to relative differences whereby changes in overall prevalence will have the same effects on the measures within the subpopulation that are found in the overall population. Rather while general reductions in SBP will tend to reduce absolute differences in hypertension rates within the overall population, such reductions often will tend to increase relative differences in control within the truncated subpopulation. That occurs because, for the general population the rates of being below (or close to below) the relevant SPB levels are in the comparatively high ranges where further increase in such rates tend to reduce absolute difference between hypertension rates; but for the hypertensive population the rates of being below (or close to below) the relevant SBP levels often are in the comparatively low ranges where further increases tend to increase absolute differences.

The most crucial difference between analyses of differences in hypertension rates and analyses of control of SBP among persons deemed hypertensive is that the approach described on the Solutions sub-page the Measuring Health Disparities page of jpscanlan.com[10] does not work within the truncated population (as discussed in the Truncation Issues page [9] and illustrated in Table 2 to that page).

All that said, it does seem that control disparity is smaller within Veterans Affairs (VA) clinics than other clinics. One can draw such inference on the basis that both the relative difference in the favorable outcome and the relative difference in the adverse outcome are smaller in VA clinics than other clinics (as shown in the first and third rows of Table C of the tables to this comment). Without belaboring the nuances, it seems that one can also draw such inference on the basis of the smaller absolute difference between control rates in VA clinics than in non-VA clinics, even though the rates are in ranges where it is not always easy to identify the direction of change that would be driven by statistical forces inherent in the shapes of the distributions. Of course, given the potential for the distributions to be irregular (as illustrated in Table 10 of reference 5), and for the relationship of the black and white distributions in the VA to differ from such relationship outside the VA, it is hard to draw firm conclusions.

Finally with respect to the statistical patterns described at the outset, I note that data presented in the Rehman study also illustrate at least the pattern whereby the rarer an outcome the greater tends to be the relative difference in experiencing it and the smaller tends to be the relative difference in avoiding it. As shown in Table C both inside and outside the VA, the relative differences in control at the 140 SBP level (where such outcome is rarer) is larger than the relative difference in control at the 150 level, while the relative difference in failure to control is greater at the 150 level.

Two presentations points also warrant mention. First, in describing the size of the differences in VA and non-VA clinics, the authors describe as "%" differences what are in fact percentage point differences. Inasmuch as the American Medical Association (AMA) Style Manual make a specific point of distinguishing between percents and percentage points, an AMA journal ought to give attention to the usage issue. See Percentage Points sub-page of Vignettes page of jpscanlan.com.[11]

Second, in an effort to clarify the meaning of a .839 odds ratio for blood pressure control in non-VA clinics compared with control in VA clinics, the authors state: "In other words, African American hypertensive men seen outside the VA were 16.1% (95% confidence interval, 5.1%-25.8%) less likely to have their BP controlled to below 140/90 mm Hg." Inasmuch as .839 was an odds ratio rather than a risk ratio, according to the formula in reference 12, the control rate outside the VA was 10% less than in the VA, not 16.1% less. See Odds Ratios sub-page of the Vignettes page of jpscanlan.com[13]

References:

1. Rehman SU, Hutchison FN, Hendrix K, et al. Ethnic differences in blood pressure control among men at Veterans Affairs clinic and other health care sites. Arch Intern med. 2005;165:1041-104.

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

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4. Scanlan JP. Divining difference. *Chance* 1994;7(4):38-9,48: http://jpscanlan.com/images/Divining_Difference.pdf

5. Measuring Health Disparities page of jpscanlan.com: http://jpscanlan.com/measuringhealthdisp.html

6. Scanlan JP. Can We Actually Measure Health Disparities?, presented at the 7th International Conference on Health Policy Statistics, Philadelphia, PA, Jan. 17-18, 2008:
PowerPoint Presentation: http://www.jpscanlan.com/images/2008_ICHPS.ppt
Oral Presentation: http://www.jpscanlan.com/images/2008_ICHPS_Oral.pdf

7. http://jpscanlan.com/images/Tables_for_Comment_on_Rehman.pdf

8. Scanlan's Rule page of jpscanlan.com: http://jpscanlan.com/scanlansrule.html

9. Truncation Issues sub-page of Scanlan's Rule page of jpscanlan.com: http://jpscanlan.com/scanlansrule/truncationissues.html

10. Solutions sub-page of Measuring Health Disparities page of jpscanlan.com: http://www.jpscanlan.com/measuringhealthdisp/solutions.html

11. Percentage Points sub-page of the Vignettes page of jpscanlan.com: http://www.jpscanlan.com/vignettes/percentgepoints.html

12. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. Zhang J, Yu KF. *JAMA* 1998: 280(19); 1690-1691.

13. Odds Ratios sub-page of Vignettes page of jpscanlan.com: http://jpscanlan.com/vignettes/oddsratios.html