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

Interpreting data on comparative efficacy of an intervention in settings with different base rates

Based on a smaller percentage reduction in severe rotavirus gastroenteritis achieved by rotavirus vaccination in Malawi compared with South Africa, Madhi et al.[1] conclude that vaccine efficacy was lower in Malawi than South Africa. That reasoning overlooks the statistical pattern whereby, for reasons related to the shapes of normal risk distributions, a factor that reduces an outcome will tend to reduce it proportionately more in the setting with the lower base rate, while increasing the opposite outcome proportionately more in the other setting.[2,3] For example, the 49.4% reduction of severe rotavirus gastroenteritis in Malawi compared with a 79.6% reduction in South Africa noted in the abstract corresponds with a 4.2% increase in the rate of avoiding that outcome in Malawi compared with a 2.6% increase in South Africa, which had the lower base rate of severe rotavirus gastroenteritis. The statistical tendency is only part of the picture of course. But its existence requires that efforts to appraise the comparative efficacy of interventions in settings (or among groups) with different base rates must employ measures that are not affected by differing base rates.[4] See Table A to this comment,[5] which shows such a method applied to the figures just mentioned from the Madhi study.

References:

1. Madhi SA, Cunliffe NA, Steele D, et al. Effect of human rotavirus vaccine on severe diarrhea in African infants. N Engl J Med 2010;362:289-98.

2. Scanlan JP. Divining difference. Chance 1994;7(4):38-9,48. (Accessed February 28, 2009, at http://jpscanlan.com/images/Divining_Difference.pdf.)

3. Scanlan JP. Race and mortality. Society 2000;37(2):19-35. (Accessed February 28, 2009, at http://www.jpscanlan.com/images/Race_and_Mortality.pdf.)

4. Scanlan JP. Interpreting differential effects in light of fundamental statistical tendencies. Presented at 2009 Joint Statistical Meetings of the American Statistical Association, International Biometric Society, Institute for Mathematical Statistics, and Canadian Statistical Society, Washington, DC, August 1-6, 2009. (Accessed February 28, 2009, at http://www.jpscanlan.com/images/JSM_2009_ORAL.pdf.)

5. http://www.jpscanlan.com/images/Table_to_Comment_on_Madhi.pdf (Accessed February 28, 2010.)