The Emerging European Acceptance of "Scanlan's Rule" in Health Disparities Research:
Will the United States Be Left Behind?

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Oral Presentation Accompanying PowerPoint Presentation

There is a statistical pattern that I have been writing about since 1987, which I have sometimes called interpretive rule 1 or heuristic rule x, and which researchers in the UK recently called Scanlan's Rule, which I was happy enough to adopt. The pattern is inherent in the shapes of normal risk distribution and may be stated as follows:

SLIDE 2

When two groups differ in their susceptibility to an outcome, the rarer the outcome:

(a) the greater tends to be the relative difference in experiencing it, and

(b) the smaller tends to be the relative difference in rates of avoiding it.

SLIDE 3

Here are a few implications of this pattern.

- As mortality declines, relative differences in mortality tend to increase while relative differences in survival tend to decrease.

- As rates of appropriate healthcare increase, relative differences in receipt of appropriate care tend to decrease while relative differences in rates of failing to receive appropriate care tend to increase.

- Lowering blood pressure generally will tend to increase relative differences in hypertension while decreasing relative differences in rates of avoiding hypertension.

- Improving overall folate levels will tend to increase relative differences in low folate while reducing relative differences in adequate folate.

- Among relatively advantaged subpopulations (college-educate, high SES, young) relative differences in adverse outcomes tend to be large while relative differences in favorable outcomes tend to be small.

And so on.

SLIDE 4

But there is a broader issue. Again, solely for reasons related to the shapes of the underlying distributions, all standard measures of differences between outcome rates tend to be affected by the overall prevalence of an outcome.

The failure to recognize these patterns, has led to disarray and futility in health and healthcare disparities research – particularly with regard to measuring changes over time or otherwise comparing the size of disparities in different settings.

But the failure to recognize these patterns has not been limited to health disparities research. One observes the same disarray and futility in every other area in the law and the social and medical sciences where differences between outcome rates are a matter of consequence.

SLIDES 5 AND 6

I'll illustrate some of these patterns below. But because the issues somewhat complex, I like to first provide some references in order that you may clarify any matters where I have left you puzzled or unpersuaded. This presentation will be available on jpscanlan.com under Section B of the Measuring Health Disparities page. The posted copy will provide links to each of the items listed here. References 1 include several articles and two APHA presentations.

- Can we actually measure health disparities? (*Chance* 2006)

- Race and mortality (*Society* 2000)

- Divining difference (*Chance* 1994)

- Measurement Problems in the National Healthcare Disparities Report (APHA Conf 2007)

- Approaches to Measuring Health Disparities that are Unaffected by the Prevalence of an Outcome (APHA Conf 2010)

References 2 provides links to pages on jpscanlan.com exploring particular issues in depth. The measuring health disparities page (MHD) contains links to about 130 references exploring the implications of these patterns with regard to particular contexts in the law as well as the social and medical sciences.

- Pages on jpscanlan.com:

- Measuring Health Disparities (MHD) (esp. Sec. D and Sec. E7) (and sub-pages)

- Scanlan's Rule (SR) (and sub-pages)

- Mortality and Survival

- Measures of Association

The measuring health disparities page (MHD) contains links to about 130 references exploring the implications of these patterns with regard to particular contexts in the law as well as the social and medical sciences.

The Scanlan's Rule page and its sub-pages describes the nuances of the patterns I discuss here.

The Mortality and Survival page discusses the way that researchers, especially in cancer journals discuss disparities in mortality and survival interchangeably in cancer journals, while generally relying on relative differences to measure health disparities, researchers commonly discuss

disparities in mortality and disparities in survival interchangeably – even sometimes speaking as if they are analyzing one disparity while in fact analyzing the other. In doing so, however, they exhibit no recognition that, for example, as cancer survival increases, relative differences in survival tend decrease while relative differences in mortality tend to increase, or that among the more survivable cancers relative differences in survival tend to be small while relative differences in mortality tend to be large

SLIDE 7

This slide lists the most common approaches to health disparities measurement:

-        Many (perhaps most researchers) rely on relative differences in adverse outcomes with regard to things like mortality and morbidity, while relying on relative differences in favorable outcomes for things like health care.

-        But the National Center for Health Statistics always relies on relative differences in adverse outcomes – including as to healthcare. That is, for example, it relies on differences in failure to be immunized rather than differences in immunization.

-        The Agency for Healthcare Research and Quality relies on whichever of the two relative differences is larger.

 -        The Health Policy Group of Harvard Medical School usually relies on absolute differences between rates.

In a moment I'll show that as the prevalence of outcomes like appropriate healthcare increase, absolute differences tend to change in the same direction as the smaller of the two relative differences. Because much AHRQ-funded healthcare disparities research, at Harvard and elsewhere, lately relies on absolute differences between rates, such research tends to reach opposite conclusions from those AHRQ would reach.

In my title I mention the US being left behind. But the leading authorities on health disparities measurement issues in North American are actually from Canada – Sam Harper and John Lynch. They frequently discuss relative and absolute differences as if both are telling a particular truth even when the measures yield different conclusions as to directions of changes over time. Harper and Lynch have lately argued that value judgments are involved in choosing a disparities measure, as in a recent Milbank fund article

That view, however, fails to recognize that there is in fact an underlying reality – and only one underlying reality – as to whether a disparity is increasing or decreasing. And if that does not become clear in this presentation, please see a more specific treatment of the point on the [Relative Versus Absolute](#) subpage of the Measuring Health Disparities page.

SLIDE 8 – FIGURE 1 – FAIL RATIOS

The following figures illustrate the way each standard measure of differences between rates tends to be systematically affected by the overall prevalence of an outcome. The figures are based on two normal test score distributions where the advantaged group (AG) has an average that is one half a standard deviation greater than the average for the disadvantaged group (DG).

The numbers along the bottom are AG's failure rates, which are used as benchmarks for overall prevalence. The blue line plots the ratio of DG's failure rate to AG's failure rate at each point. As we move from left to right we observe the effects on that ratio of lowering cutoffs such as to serially enable the population between each point to pass the test. And we observe that as cutoffs are lowered, and test failure becomes less common, the ratio of AG's failure rate to DG's failure rate increases.

SLIDE 9 - FIGURE 2 – PASS RATIOS

Figure 2 adds the opposite side of the picture – the relative difference in pass rates, here presented in terms of the ratio of AG's pass rate to DG's pass rate. As cutoffs are lowered, the relative difference in pass rates decreases.

Thus do we observe the way that relative differences in experiencing an outcome and relative difference in avoiding an outcome, tend to change systematically in opposite directions as the overall prevalence of an outcome changes.

SLIDE 10 – FIGURE 3

Figure 3 addresses the absolute difference between rates, which also changes systematically as overall prevalence changes, though in a more complicated way. When a widespread outcome (more than 50% for both groups) declines, absolute differences tend to increase; when an uncommon outcome (less the 50% for both groups) decreases, absolute differences tend to decline. When the rate is more than 50% for one group and less than 50% for the other (between points A and B) patterns of absolute difference are somewhat harder to predict. The nuances are discussed in the introduction to the Scanlan's Rule page.

Figure 4 presents the odds ratio, which tends to change in the opposite direction of the absolute difference.

SLIDE 12 – FIGURE 5

And figure 5 shows all patterns together. I am spending very little time on this because I have covered it in many places, including the two APHA presentations. Here, however, it is merely background

SLIDE 13 - MORITA

Table 1 is based on data from an award winning study that appeared in Pediatrics in 2008. The authors examined the effects of a school entry hepatitis b vaccination requirement on race/ethnic differences in vaccination rates. Relying on relative differences in vaccination rates as a measure of disparity, the authors found the disparities to have dramatically decreased both for 5th and 9th graders – as reflected in the Favorable Ratio column.

But the next column (the Adverse Ratio column) shows that NCHS, which would rely on relative differences in failure to be vaccinated, would find substantial increases in disparities. Other approaches would yield different results for different time periods.

The final column shows the size of the disparity according to what I maintain is the only appropriate measure of a disparity – that is, an approach that is not affected by the changes in the

overall prevalence of an outcome. It is the subject my 2008 APHA presentation and one addressed on the Solutions sub-page of the MHD. But the details of that approach are outside the scope of this presentation.[1]

SLIDE 14

Table 2 provides an illustration akin to that in Table 1. Here, at issue are uncommon procedures that are increasing in overall prevalence. Consistent with theory, relative difference in receipt of the procedures decrease, while relative differences in failure to receive them increase. Absolute differences increase, which is what typically happens when rates are in this range. Again, the final column shows the true picture.[2]

SLIDE 15 - EUROPEANS

The next slide brings us to back to the title of this presentation, the emerging European recognition that standard measures of differences tend to be affected by the overall prevalence of an outcome and the need to take overall prevalence into account in appraising health disparities. But while there has been a good deal more discussion of these issues in Europe than on this side of the Atlantic, Europe too has a long way to go. Only the first of these items (Carr-Hill) recognizes the theoretical basis for observed patterns. And most of the other authors – though recognizing patterns that call all prior work into questions – have gone on to do further research using the same flawed methods.   In any case, Section E.7 of the Measuring Health Disparities page summarizes the degree of consensus with my thinking both here and abroad.

SLIDE 16 – FURTHER READINGS

My final slide lists some further readings – subpages of pages I previously referenced that address particular issues where standard practices are unsound for failure to recognize the way that various measures of differences are affected by the overall prevalence of an outcome. And if you are going to study health disparities – or study anything about measures of association – I suggest that you will find it useful to read these pages even if you should not agree with them.

As you do, keep in mind that it is not important that one commonly observes departures from the distributionally-drive patterns I have described. Such patterns are merely a part of the picture. But one must understand those patterns to interpret the picture.

Nor does it matter that the underlying distributions may not always be normal or close to normal. Such facts merely complicate an effort to appraise the size of disparities while taking overall prevalence into account. They do not provide a basis for relying on standard measures while

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[1] For a fuller discussion of this study, see my Study illustrates ways in which the direction of a change in disparity turns on the measure chosen. *Pediatrics* Mar. 27, 2008 (responding to Morita JY, Ramirez E, Trick WE. Effect of school-entry vaccination requirements on racial and ethnic disparities in Hepatitis B immunization coverage among public high school students. Pediatrics 2008;121:e547-e552): http://pediatrics.aappublications.org/cgi/eletters/121/3/e547

[2] For a fuller study of this study see my Perceptions of changes in healthcare disparities among the elderly dependant on choice of measure, *Journal Review* 2/12/08 (responding to Escarce JJ, McGuire TG. Changes in racial differences in use of medical procedures and diagnostic tests among elderly persons: 1986-1997. Am J Public Health 2004;94:1795-1799): http://journalreview.org/v2/articles/view/15451752.html

ignoring that those measure are systematically affected by changes in overall prevalence that have nothing to do with meaningful changes in disparities.

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