Measurement Problems in the National Healthcare Disparities Report

Presented at

American Public Health Association 135th Annual Meeting & Exposition, Nov. 3-7, 2007, Washington, DC

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ADDENDUM
(March 12, 2008)

This addendum addresses two issues relating to the referenced presentation. The first involves clarification of the methodology employed by the Agency for Healthcare Research and Quality (AHRQ) for measuring healthcare disparities. The second involves the implication of that clarification with regard to a particular point made in the presentation.

A. Clarification of AHRQ Methodology

The section discusses two points. The first involves the method of calculating the relative difference in favorable outcomes and the second involves AHRQ's choice of whether to measure disparities in terms of relative differences in the favorable or adverse outcome. The first point is solely a technical one. But understanding it is essential to understanding the second point.

In my more recent descriptions of the way measures of differences between rates are affected by the overall prevalence of an outcome (since June 2006), I have generally presented the relative differences between rates of experiencing a favorable outcome on the basis of the ratio of the advantaged group's rate to that of the disadvantaged group's rate (Ratio A) while presenting the relative difference in the adverse outcome on the basis of the ratio of the disadvantaged group's rate of experiencing that outcome to that of the advantaged group's rate (Ratio B). (I use the phrase "on the basis of" rather than "in terms of" because the ratio is not itself the relative difference; rather the relative difference is the ratio minus one when the ratio is greater than one and one minus the ratio when the ratio is less than one.) The more common practice, and the employed by AHRQ, is to use the disadvantaged group's rate as the numerator in both ratios, as I had done in reference 1 and in most of the pre June 2006 treatments of this issue since 1987 (as reflected in section A of this page: **http://www.jpscanlan.com/homepage/measuringhlthdisp.html).**

Initially my reason for changing the approach was mainly to facilitate the showing of the way relative differences in experiencing an outcome and in avoiding an outcome change in opposite directions as the prevalence of the outcome changes, by presenting both ratios on the same page, as in Figure 2 of the instant presentation. The recognition of the significance of the intersection of the two ratios with respect the patterns of change in absolute differences and odds ratios, as first discussed in reference 2, and as also discussed in the instant presentation, provided additional reason always to use the advantaged group's rate as the numerator in the ratio underlying the relative difference in the favorable outcome.

In the instant presentation, I explained that the choice of numerator would make a small difference between how one characterized the size of a relative difference – *e.g.*, whether the difference between 60% and 80% is characterized as a 25% difference (20/80) or a 33% difference (20/60) – but was immaterial to the point of the presentation. But the choice of numerator is of some consequence to the additional point I wish to make in this addendum.

Further, while not particularly germane to the additional point, it does warrant note that the difference between the percentage differences according to choice of numerator will not always be in range suggested by the example. While such range will typically be observed when rates are high, it may not be observed when rates are quite low. For example, in the case of the 2001 carotid endarterectomy rates of 1.44% for blacks and 4.41% for whites in Table 2 of Jha et al.,[3] (which is one of the subjects of reference 2), with the white rate as the numerator, the ratio of rates would be 3.06 and the relative difference 206%;with the black rate as the numerator the ratio of rates would be .326 and the relative difference 67%. But I make this point concerning ranges of differences principally for clarification, and it has little bearing on the point that follows. For even modest differences between the sizes of the differences in the adverse outcome, depending on which group's rate is used as the numerator, can have an effect with respect to the following issues:

In the presentation (at 1), I make the point that AHRQ will "always or almost always" measure healthcare disparities in terms of relative differences in adverse outcomes. And such fact underlies my point that, while AHRQ seems to think that improvements in healthcare will tend to reduce disparities, in fact, improvements will tend usually to increase disparities as measured by AHRQ. That is, because improvements in healthcare (measured in terms of increased rates of favorable outcomes) will tend to increase relative differences in adverse outcomes, AHRQ will tend to find improvements in healthcare to be correlated with increased disparities.

As discussed in the 2006 *Chance* article and various other places, the National Center for Health Statistics has recommended that all health (including healthcare) disparities be measured in terms of relative differences in adverse outcomes. AHRQ, however, has apparently not completely adopted that recommendation. Rather, it measures disparities in terms of whichever relative difference is larger – the relative difference in the favorable or the adverse outcome (again, while always using the disadvantaged group's

rate as the numerator). As it happens, in the case of almost all of the core measures in the NHDR, the relative difference in the adverse outcome is larger than the relative difference in the favorable outcome, which formed the basis for my statement on page 1 of the presentation..

That is not, however, the case with respect to certain other healthcare disparities that AHRQ monitors. For example, as shown in Appendix Table 97a of the 2006 report, in 2004 the rate of receipt of influenza vaccination for high risk adults age 18-65 was 30.5% for whites and 24.2% for blacks. Thus, the relative difference in rates of being vaccinated was 21% (1-(24.2/30.5)), which was a larger difference that 9% relative difference in rates of failing to be vaccinated ((75.8/69.5)-1).[1]

Thus, with respect to some healthcare issues, as the favorable outcome increases (which typically would be accompanied by a decline in the relative difference in the favorable outcome), so long as that relative difference remains larger than relative difference in the adverse outcome (which typically would be increasing as the favorable outcome increased), AHRQ would tend to find the disparity to be declining. At the point where, as a result of continuing increases in rates of the favorable outcome, the relative difference in the adverse outcome became larger than the relative difference in the favorable outcome, AHRQ would commence to measure the disparity in the former and thereafter would typically find further improvements in healthcare to be accompanied by increases in healthcare disparities.

But the pattern would not follow precisely that suggested by the lines in Figure 2 of the PowerPoint Presentation, which is replicated as Figure A1 to this addendum. Moving from left to right on that figures, the intersection of the two lines on that figure reflects the point at which the (increasing) Ratio B commences to exceed the (declining) Ratio A. But, the point of intersection of relative differences in rates of experiencing and failing to experience an outcome differs from the illustrated in Figure A1 when the disadvantaged group's rate is used as a the numerator in the favorable outcome ratio. FigureA2 is similar to Figure A1, but shows the relative differences in adverse and favorable outcomes as they would be measured by AHRQ. The relative difference in the adverse outcome is simply Ratio A minus 1, while the relative difference in the favorable outcome is one minus the reciprocal of Ratio B (i.e., as in the initial example, .75 is the reciprocal of 1.33). Because intervals of the x-axis are rather broad, the differences between the two intersection points may not be evident.

Figures B1 and B2 are counterparts to Figures A1 and 2. But B1 and B2 are limited to the ranges on the X-axis near the points of intersection and they provide greater detail on

[1] By contrast, as shown in Appendix Table 98a or the report, in the over 65 age group, where rates were much higher (with a white rate of 66.4% and a black rate of 45.8%), the relative difference in failing to receive vaccination, 61% ((54.2/33.6)-1) was larger than the relative difference in rates of being vaccinated, 31% (1-(45.8/66.4)). That both the relative difference in the adverse outcome and the relative difference in the favorable outcome are greater in the older group than the younger group would seem to indicate that, in a meaningful sense, the disparity is greater in the older group. According to the methodology described in reference 5, the difference between hypothesized means would be .19 standard deviations for the 18-64 group and .55 standard deviations for the over 65 group.

that axis. Thus, Figures B1 and B2 better illustrate the difference in the points of intersection under the different approaches. Figures B1 shows that Ratios A and B intersect at the point where the advantaged group's adverse outcome rate is approximately 41%. Figure B2 shows that the two relative differences relied upon by AHRQ intersect at the point where the advantaged group's adverse outcome rate is approximately 51%.

B. Implications of AHRQ's Reliance on the Larger Relative Differences with Respect to a Point Made in the Presentation

In the presentation (with regard to Slide 15) and in a few other places, I discuss a 2003 article by Sehgal,[6] which found that during periods of dramatic increase in rates of adequate hemodialysis, racial disparities, measured in terms of absolute differences between rates, declined.[2] I make the point that, while AHRQ officials have cited the article as evidence of the way improvements in healthcare will tend to reduce disparities, relative differences in adverse outcomes (the failure to received adequate dialysis) which AHRQ would use to measure the disparity, actually increased (from 19% to 23%). See also reference 8.

The relevant figures, as presented in Slide 15 (corrected), are shown below:

Rates of adequate dialysis

Year	White	Black
1993	46%	36%
2000	87%	84%

Summary of changes:

Absolute diff: decreased from 10 to 3

Relative diff in adequate dialysis: decreased from 28% ((46/36)-1) to 4% ((87/84)-1)[3]

Relative diff in inadequate dialysis: increased from 19% ((64/54)-1) to 23% ((17/14)-1)

The relative difference in adequate hemodialysis shown in the summary of changes is based on my approach, with the white rate as the numerator. The relative differences in inadequate hemodialysis is based on the same approach as that used by AHRQ. It would be those figures that underlay the point that AHRQ would find the disparity to increase. But the point was made without regard to the fact in 1993, the relative difference in the favorable outcome was larger than the relative difference in the adverse outcome and that therefore, for purposes of determining the size of the disparity in 1993, AHRQ would have relied on the relative difference in the favorable outcome. Given the possibility that

[2] Reference 2 to this addendum explains why the reductions in absolute differences are generally what would be expected in the circumstances and therefore not necessarily indicative of a meaningful reduction in disparity. Reference 7, however, employed the methodology discussed in Reference 5, does find the disparity to be substantially reduced. See further discussion regarding Table 1 *infra*.

[3] As discussed in note 12 of the annotated oral, these figures reflect corrections of figures presented in the original slide. But the corrections are not germane to the point discussed here.

AHRQ would measure changes in disparity in time by comparing the relative difference in the favorable outcome at one point (because it was the larger relative difference at that point) with the relative difference in the adverse outcome at another point (because it was the larger relative difference at that point in time) – which, under my approach to calculating the relative difference in the favorable outcome would mean that the disparity was larger in 1993 than 2000 (28% versus 23%) – the matter requires some further examination taking into account the different approaches to calculating the relative differences in the favorable outcome.

The AHRQ approach to calculating the relative difference in the favorable outcome would show a relative difference of 22% in 1993 (1-(36/46) and 4% (1-(84/87)[4] in 2000. Thus, in 1993, under the AHRQ approach to calculating relative differences in the favorable outcome, such difference, while smaller than that derived by my method, would also have been larger than the relative difference in the adverse outcome in 1993 (22% versus 19%), but the relative difference in the adverse outcome to be larger than the relative difference in the favorable outcome in 2000 (23% versus 4%).

Thus, assuming that AHRQ were always to rely on the larger relative difference, for the 1993 disparity it would have relied on the 22% relative difference in the favorable outcome; for the 2000 disparity it would have relied on the 23% relative difference in the adverse outcome. I do not know whether AHRQ would measure the change over time by reference to relative difference in the favorable outcome at one point and the relative differences in the adverse outcome at the other point. It would seem to make little sense to do so, though my more general point is that no binary measure provides a useful means of identifying meaningful changes over time. But even if AHRQ were to rely on the relative difference in the favorable outcome in 1993 and the relative difference in the adverse outcome in 2000, it would find the disparity to increase.[5]

To facilitate the above discussion, the relevant figures under the AHRQ approach to calculating relative differences are shown in Table 1 below. The final column (denominated "EES" for "estimated effect size") also shows the difference between means of hypothesized distributions derived as discussed in reference 5 and note 1. These figures suggest that the disparity declined in a meaningful sense.

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[4] The reason the two different approaches yield the same result is due to rounding. The former 4% figure is actually 3.57%, while the latter is actually 3.45%.

[5] By stating that AHRQ would find the disparity to increase, I merely mean that it would one figure larger than another. For purposes of the NHDR, AHRQ formally considers a disparity to have changed only if the relative difference changes by what it terms (at 5) "1% per year." In note xix on the same page it clarifies that to mean a change of one percentage point per year rather than one percent. With respect to that distinction, a change, for example, from a relative difference of 19% to a relative difference of 23%, though a 21% increase, is only a 4 percentage point increase. But, in any case, a change from 22% to 23% would not meat the criterion. Nevertheless, the points about how directions of changes would be perceived depending on the measure examined holds regardless of whether a change is deemed large enough to be treated as in increase or decrease.

Table 1: White and Black Rates of Adequate Hemodialysis in 1993 and 200, with Relative Differences between Rates of Receiving Adequate Hemodialysis and Failing to Receive Adequate Hemodialysis, with EES

Year	W	B	RelFavDf	RelAdvDf	EES
1993	46.00%	36.00%	21.74%	18.52%	0.26
2000	87.00%	84.00%	3.45%	23.08%	0.14

Without resolving whether AHRQ would measure change over time while using relative differences in the favorable outcome at one point and relative differences in the adverse outcome at another, we can observe some illustrations of some of the interpretive issues in the following table, which is based on Table 2 of Morita et al.[10] Relying on changes in relative differences in rates of hepatitis immunization, the authors found "dramatic reductions" in racial and ethnic disparities in vaccination rates following implementation of a school-entry vaccination requirement.

Table 2 below, using the AHRQ approach to determining the relative difference in the favorable outcome, shows the relevant vaccination figures for blacks and white for grades 5 and 9 for the year before and the year after the program was implemented. The table shows that while relative differences in the favorable outcome did decline dramatically for both grades, the relative difference in the adverse outcome increased substantially. Thus, NCHS would regard the disparity to have increased for both grades. It is not clear how AHRQ would regard the changes. For grade 5, the relative difference in the favorable outcome, which declined, remained higher than the relative difference in the adverse outcome. Thus, relying on the relative difference in the favorable outcome for both years, AHRQ might well regard the disparity to have declined. For grade 9, however, in 1996, the relative difference in the favorable outcome was larger than the relative difference in the adverse outcome; but in 1997 the relative difference in the adverse outcome was larger than the relative difference in the favorable outcome. Also, the relative difference in the adverse outcome in 1997 was larger than the relative difference in the favorable outcome in 1996. So it is hard to know what AHRQ would do. In any case, again, the final column provides a measure of the difference that may be unaffected by changes in overall prevalence, and it shows a decline in disparity for both grades.

Table 2: White and Black Rates of Hepatitis Vaccination, Grades 5 and (, 1996 and 1997, with Relative Differences Between White and Black Rate of Receiving Vaccination and Failing to Receive Vaccination, with EES approach

Grade	Vac Requirement	Year	W	B	RelFavDf	RelAdvDf	EES
5	Pre	1996	8%	3%	63%	5%	47
5	Post	1997	46%	33%	28%	24%	34
9	Pre	1996	46%	32%	30%	26%	37
9	Post	1997	89%	84%	6%	45%	24

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Fig A1: Ratios of (1) AG Success Rate to DG Success Rate (Ratio a) and (2) DG Fail Rate to AG Fail Rate (Ratio b) at Points Defined by Favorably Outcome Rates of the Advantaged Group

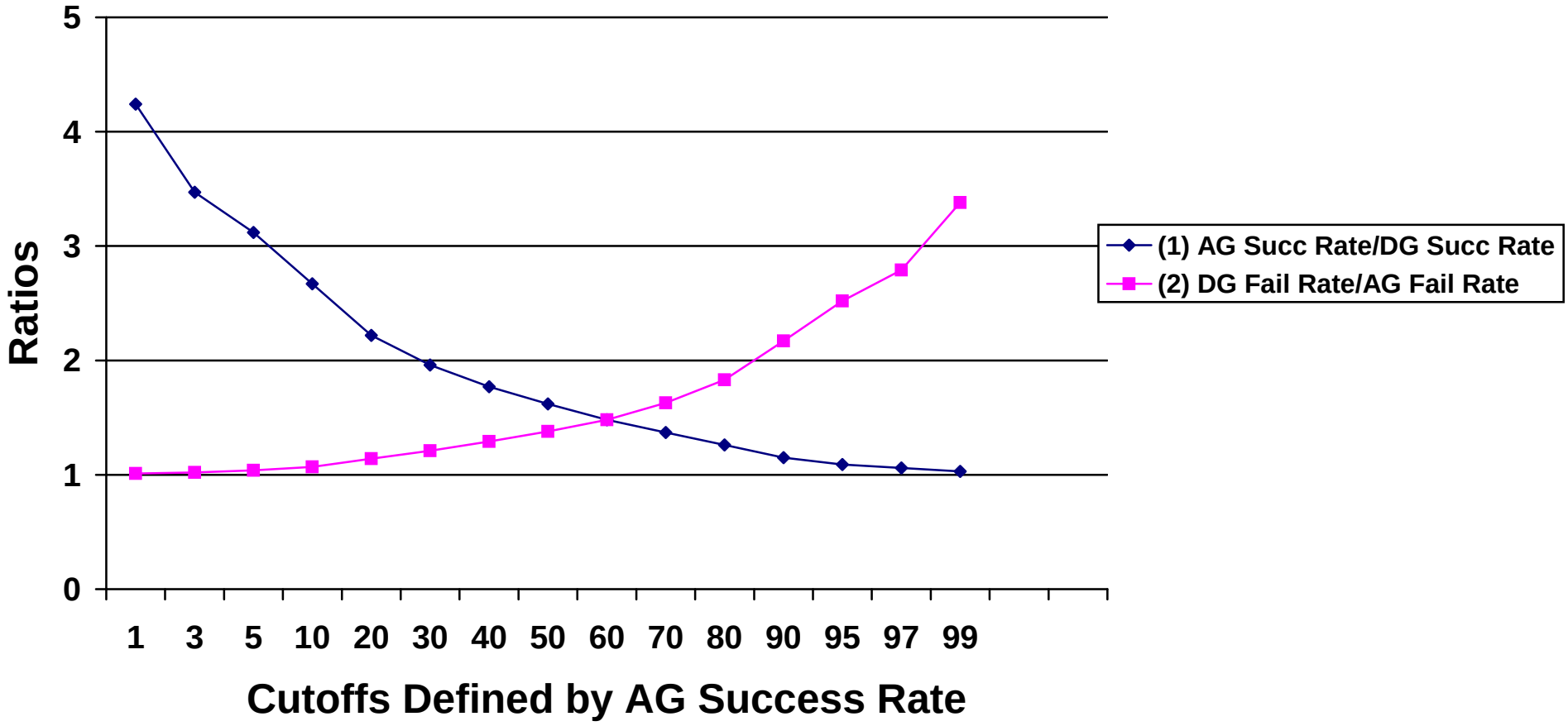

Fig A2: Favorable and Adverse Relative Differences at Points Defined by Favorable Outcome Rate for the Advantaged Group

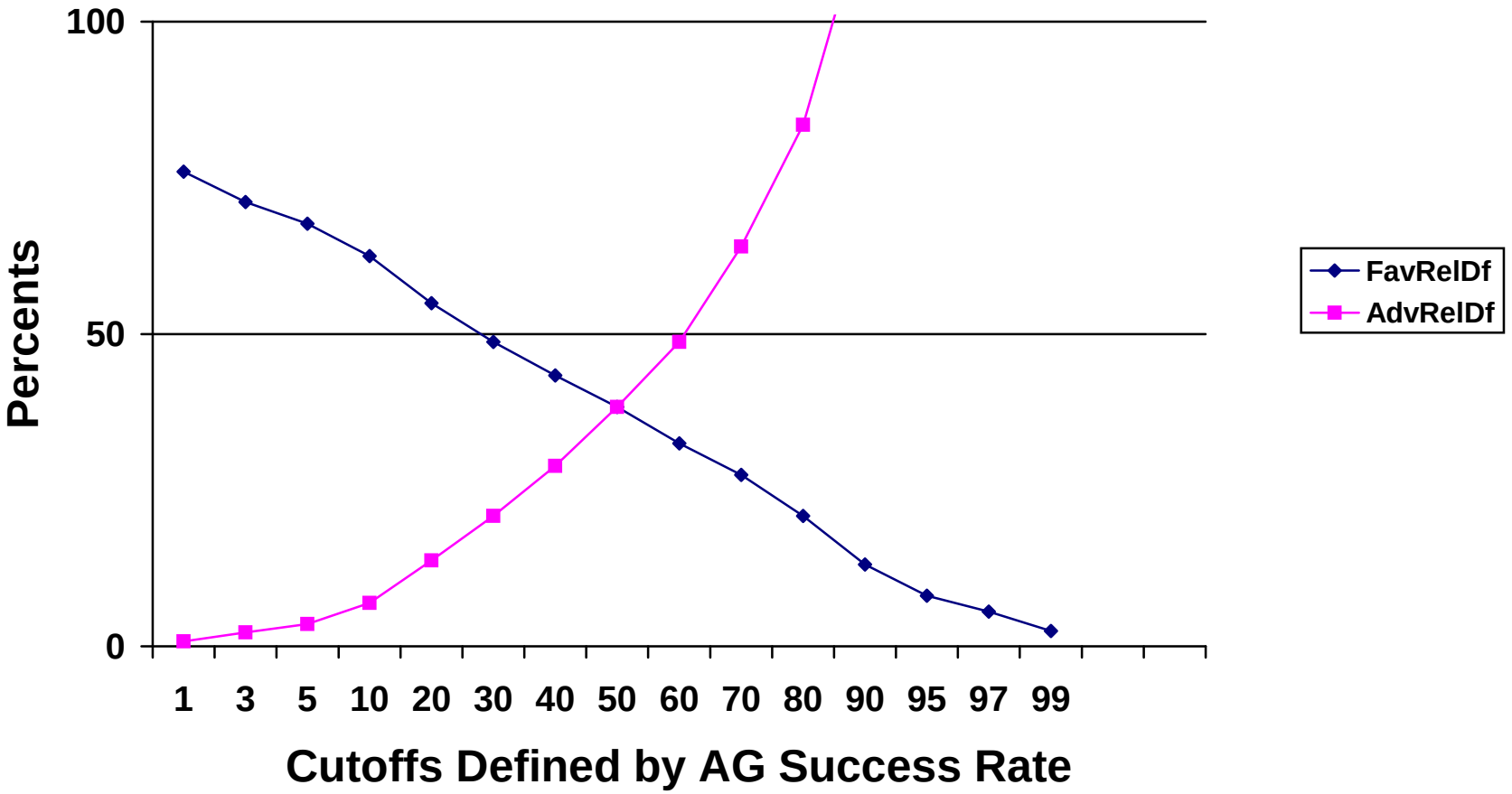

Fig B1: Ratios of (1) AG Success Rate to DG Success Rate (Ratio a) and (2) DG Fail Rate to AG Fail Rate (Ratio b) at Points Defined by Favorably Outcome Rates of the Advantaged Group (limited to AG Success Rates 51% to 70%)

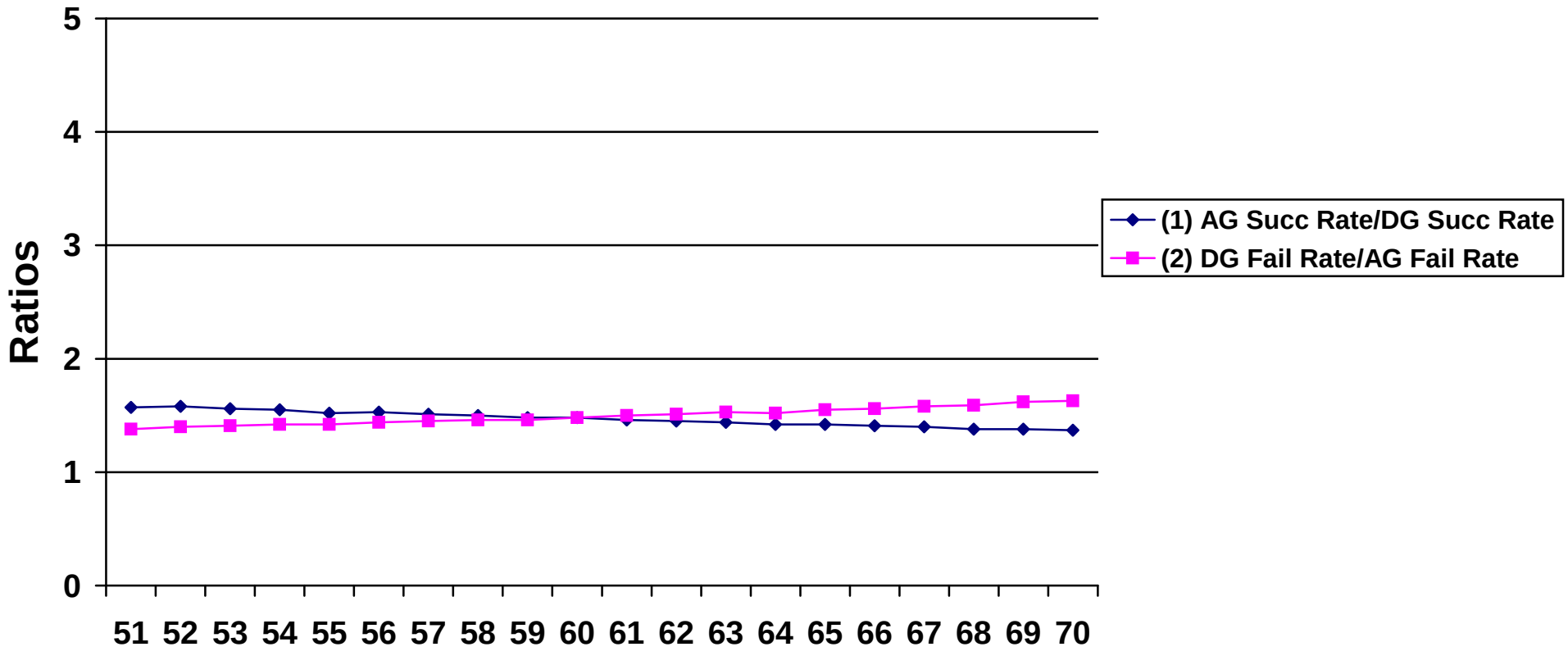

Fig B2: Favorable and Adverse Relative Differences at Points Defined by Favorable Outcome Rate for the Advantaged Group (limited to AG Success Rates 41% to 60%)