The Mismeasure of Health Disparities in Massachusetts and Less Affluent Places

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Department of Quantitative Health Sciences
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Personal background

- Lawyer in Washington, DC
- EEOC v. Sears, Roebuck and Co. (nationwide gender discrimination case tried over a ten-month period in 1984-85)
  - Milkman "Women's History and the Sears Case," *Feminist Studies* (1986)
  - Sears Case page of jpscanlan.com
  - Sears Case Illustration subpage of Scanlan's Rule page

- Correct or Incorrect?
- If correct, how many appraisals of differences between outcome rates of two groups have been sound?
- Overriding consideration: What inferences may we draw about processes on basis of examination of outcome rates of advantaged and disadvantaged groups without consideration of patterns addressed here?

- Presentation available with active links Conferences Presentations subpage of Publications page of jpscanlan.com

Four Key Points

Key Point 1

Standard measures of differences between outcome rates (proportions) cannot effectively quantify differences in the circumstances of advantaged and disadvantaged groups because – for reasons inherent in the underlying risk distributions – each measure tends to be systematically affected by the prevalence of an outcome.

- Relative (percentage) differences in a favorable outcome
- Relative differences in the corresponding adverse outcome
- Absolute (percentage point) differences
- Odds Ratios

Key Point 2

Efforts to appraise differences in the circumstances of two groups reflected by a pair of outcome rates in the law and the social and medical sciences have been almost universally undermined by failure to recognize the ways chosen measures tend to be affected by the prevalence of an outcome.

Key Point 3

Even when broadly correct, research employing standard measures of differences between outcome rates is misleading by implying that the chosen measures effectively quantify the difference in circumstances of two groups reflected by their differing outcome rates.

Key Point 4

There exists only one answer to the question of whether differences in the circumstances of advantaged and disadvantaged groups reflected by their favorable or adverse outcome rates have increased or decreased over time or are otherwise larger in one setting than another.

That answer can be divined, albeit imperfectly, by deriving from pairs of outcome rates the difference between means of the underlying risk distributions.

Interpretive Rules 1 and 2

Interpretive Rule 1 (IR1): The Two Relative Differences (aka Heuristic Rule X (HRX), Scanlan's Rule)*

The rarer an outcome

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

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

Absolute Differences/Odds Ratios

- Absolute differences and differences measured by odds ratios are unaffected by whether one examines the favorable or the adverse outcome.
- But for a measure to effectively quantify the strength of the forces causing outcome rates to differ it must remain constant when there occurs a change in overall prevalence akin to that effected by lowering a test cutoff.
- Absolute differences and odds ratios tend also to be affected by the prevalence of an outcome, but in a more complicate way than the two relative differences.

Interpretive Rule 2(IR 2): Absolute Differences/Odds Ratios

- As an outcome goes from being rare to being nearly universal, absolute differences between rates tend to:

  (a) increase to the point where the first group's rate reaches 50%;

  (b) behave inconsistently until the second group's rate reaches 50%;

  (c) then decline.

- As the prevalence of an outcome changes, differences measured by odds ratios tend to change in the opposite direction of absolute differences.

Caveat One

- Do not be distracted by the fact that one commonly finds departures from the patterns described here. Observed patterns are invariably functions of
  - (a) the strength of the forces causing outcome rates to differ and
  - (b) the prevalence-related/distributionally-driven forces described here.
- Society's interest is in (a).
- Only with a mastery of (b) can one understand (a).

Caveat Two

- Do not think that presenting relative and absolute differences (or even both of the two relative differences and the absolute difference) addresses the issues raised here.
- The fundamental problem is that none of the measures is statistically sound.

Caveat Three

- Do not think that increasing relative difference in some adverse outcome when the outcome declines means an increase in “disparity” or “inequality” in any meaningful sense.

- Do not think that decreasing relative difference in some favorable outcome when the corresponding adverse outcome declines means a decrease in “disparity” or “inequality” in any meaningful sense.

Caveat Four

- Uncertainty about the nature of the underlying distributions may indeed complicate the appraisal of differences between rates by a measure unaffected by the frequency of an outcome.
- Uncertainty issues do nothing to validate standard measures.

A Word on Clinical Settings

- Discussion here will largely focus in advantaged and disadvantaged groups.
- Points made apply equally in clinical setting where treated subjects are the advantaged group and control subjects are the disadvantaged group.
- See Subgroup Effects subpage of the Scanlan's Rule page.

What's special about Massachusetts?

- The two relative differences generally
- The absolute difference with respect to the healthcare disparities element Massachusetts Medicaid pay-for-performance program

"In Massachusetts, … female-headed families, who make up only 16% of white families with children, comprise 63% of poor white families with children…"

Forum Page, *Cleveland Plain Dealer* (Nov. 11, 1987)

Proportion FHF make up of poor white families with children is 3.9 times the proportion they make up of all families with children.

- “In Massachusetts, … female-headed families, who make up only 16% of white families with children, comprise 63% of poor white families with children; by contrast, in … Mississippi, although female-headed families make up 35% of black families with children, they comprise only 54% of such families in poverty.”

  Forum Page, *Cleveland Plain Dealer* (Nov. 11, 1987)

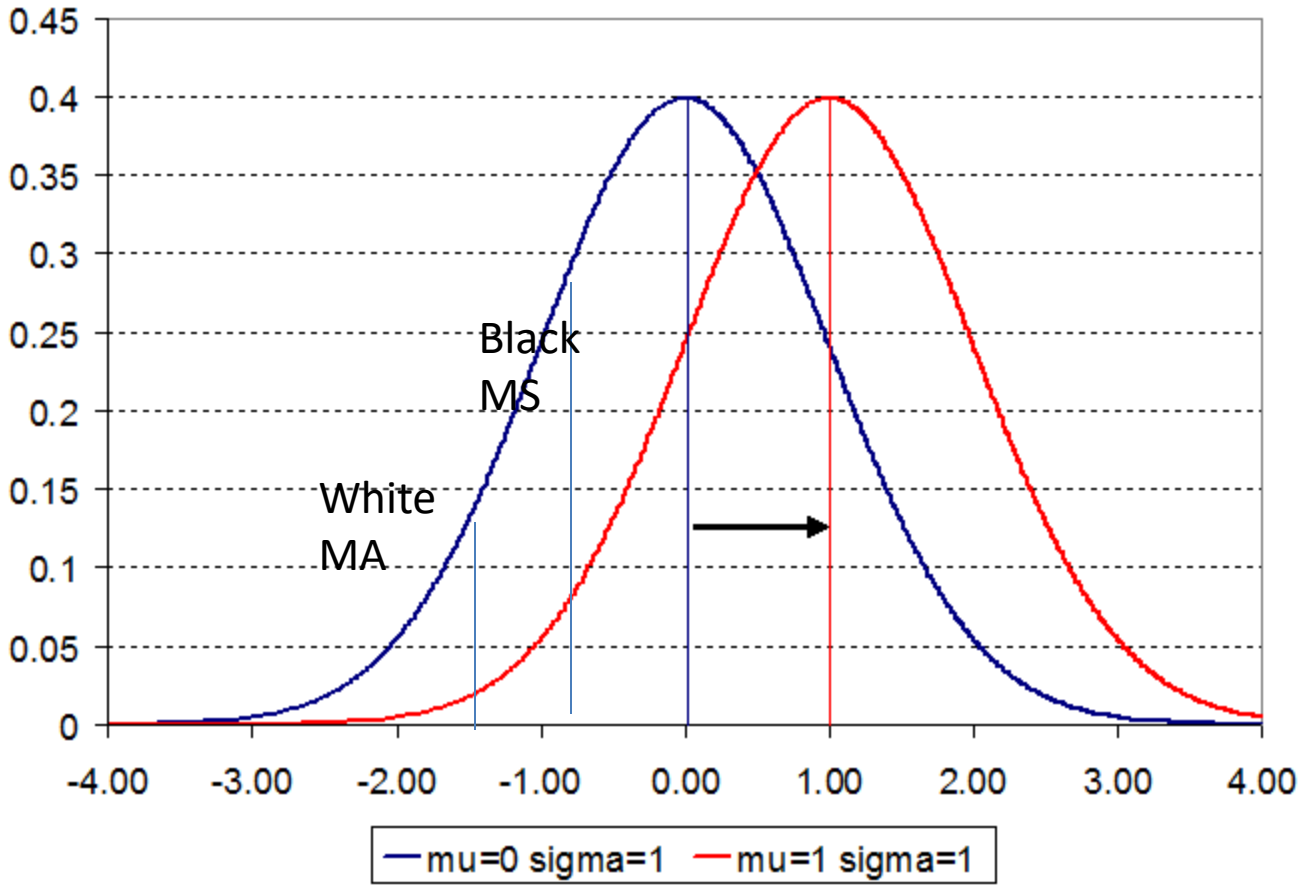
  Massachusetts*: Proportion FHF make up of poor white families with children is **3.9 times** proportion they make up of all white families with children*

  Mississippi*: Proportion FHF make up of poor black families with children is **1.5 times** proportion they make up of all black families with children*

"The inverse relationship between the amount of poverty and the feminization of poverty may also be illustrated by reference to different geographic areas. In Massachusetts, ***because it is a wealthy state,*** female-headed families, who make up only 16% of white families with children, comprise 63% of poor white families with children; by contrast, in ***the very poor state*** of Mississippi, although female-headed families make up 35% of black families with children, they comprise only 54% of such families in poverty."

Scanlan, "The 'Feminization of Poverty' is Misunderstood," *Cleveland Plain Dealer* (Nov. 11, 1987)

Figure 1: Two Normal Distributions



References

Key References

- "Race and Mortality Revisited," Society (2014)*
- "Measuring Health and Healthcare Disparities," Federal Committeeon Statistical Methodology 2013 Research Conference.
- "The Misinterpretation of Health Inequalities in the United Kingdom," BSPS 2006 Conference
- "Can We Actually Measure Health Disparities?," Chance (2006)

  [Aug 18, 2005 NEJM articles using absolute differences]

- "Race and Mortality," Society (2000)
- "Divining Difference," Chance (1994)
- "The Perils of Provocative Statistics," Public Interest (1991)

Index to “Race and Mortality Revisited”

Succinct treatments

- "It's easy to misunderstand gaps and mistake good fortune for a crisis," Minneapolis StarTribune (Feb. 8, 2014) *
- "Things government doesn't know about racial disparities," The Hill (Jan. 28, 2014)
- "The Paradox of Lowering Standards," Baltimore Sun (Aug. 5, 2013)
  "Misunderstanding of Statistics Leads to Misguided Law Enforcement Policies, " Amstat News (Dec. 2012)

Institutional Correspondence

- Boston Lawyers' Committee (Nov. 12, 2015)*
- House Judiciary Committee (Oct. 19, 2015)
- **American Statistical Association (Oct. 8, 2015)***
- Chief Data Scientist of White Hous OSTP (Sept. 8, 2015)
- Dept of Health and Human Services and Education (Aug. 24, 2015)
- Agency for Healthcare Research and Quality (July 1, 2015)*
- City of Minneapolis, Minnesota (June 8, 2015)
- Texas Appleseed (Apr. 7, 2015)
- Senate Comm on Hlth, Educ, Lab and Pensions (Mar. 20, 2015) (Apr 1, 2013)
- Dept of Justice and City of Ferguson, Missouri (Mar. 9, 2015)
- Vermont Senate Comm on Education (Feb. 26, 2015)
- Portland, Oregon Board of Education (Feb. 25, 2015)
- Wisc Council on Families and Children (Dec. 23, 2014)
- Fin Markets and Comm Investment Proggam GAO (Sept. 9, 2014)
- Education Law Center (Aug. 14, 2014)
- IDEA Data Center (Aug. 11, 2014)
- Institute of Medicine II (May 28, 2014) (June 1, 2010)
- Annie E. Casey Foundation (May 13, 2014)
- Education Trust (April 30, 2014)
- Invest and Oversight Subcomm, House Finance Comm (Dec. 4, 2013)
- Mailman School of Public Health of Columbia Univ (May 24, 2013)
- Federal Reserve Board (March 4, 2013)
- Harvard University et al. (Oct. 26, 2012), Harvard University (Oct. 9, 2012)*
- US Department of Justice (Apr. 23, 2012), US Department of Education (Apr. 18, 2012)
- Commonwealth Fund (June 1, 2010), National Quality Forum (Oct. 22, 2009), Robert Wood Johnson Foundation (Apr. 8, 2009)

American Statistical Association Letter Recommendations

- Complex (8-36): Form a committee to examine problems in analyses of demographic differences.
- Simple (36-40): Tell the US government that reducing the frequency of an outcome does not tend to reduce relative demographic differences in rates of experiencing them; it tends to increase those differences.

Civil Rights Enforcement Anomalies

- Fair lending
- School discipline
- Racial disproportionality in special education
- Criminal justice (see letter to DOJ and City of Ferguson)

Measurement pages of jpscanlan.com

- Measuring Health Disparities (MHD)
  - Journal Comments (144)
  - Between Group Variance*
  - Pay for Performance*
- Scanlan's Rule (SR)
  - Subgroup Effects
  - Illogical Premises
  - Framingham Illustrations*
  - Collected Illustrations
  - Consensus
- Immunization Disparities
- Mortality and Survival
- Immunization Disparities
- Educational Disparities
- Disparate Impact
- Discipline Disparities
  - Massachusetts Disparities 8
- Lending Disparities
- Employment Discrimination
- Feminization of Poverty

[This page and the next two pages should be ignored. They have negligible relevance to the subject of this seminar. I happened to include them only to express my delight to a Massachusetts group that a Boston University web page has recently made a point to which I give a lot of attention on the Times Higher Subpage of my Vignettes page. I have not pulled them because in other documents I make reference to this presentation by slide number.]

Boston University Medical School webpage on Relative Risk (Sept. 18, 2015), regarding risk ratio of 4.2 (original emphasis):

"To be precise, it is *not* correct to say that those who had an incidental appendectomy had 4.2 times *more* risk **(wrong)** or 4.2 *times greater* risk **(wrong)**. In fact, those with the incidental appendectomy had a 320% increase in risk."

[Ignore this slide for reasons discussed in slide 32]

Subpages of the Vignettes page

- Times Higher
- Percentage Points
- Multiplication Definition
- Journalists and Statistics

[Ignore this slide for reasons discussed in slide 32]

Table D1. Ratios of Incorrect to Correct Usages of "Times Greater"/"Times as Great" and "Times Higher"/"Times as High" from Times Higher Subpage of Vignettes Page (2009)

Journal	Times Greater Ratio	Time Higher Ratio
American Journal of Epidemiology	3.7	6.9
American Journal of Public Health	3.9	3.9
BMJ	20.6	19.1
CDC	14.9	5.7
Lancet	35	27.3
JAMA	15.5	21.9
Science	4.3	6.2
New England Journal of Medicine	**0.2**	**0.8**

Illustrations of Interpretive Rules 1 and 2

Table 1(a). Explanation of Terms with Respect to Four Measures of Differences Between Favorable or Adverse Outcome Rates of Advantaged Group (AG) and Disadvantaged Group (DG)

(a) AG Fav Rt	(b) DG Fav Rt		(1) AG/DG Ratio Fav	
80%	63%		1.27	

In this presentation, the larger figure is always used as the numerator in the rate ratio (RR) (aka “risk ratio” or “relative risk”); hence the relative difference is always RR -1

(1) AG/DG Ratio Fav = a/b (1.17; relative difference is 27%) - BLUE

That some would treat the rate ratio in terms of .788 (63%/80%), with associated relative difference of 21.3% if of no consequence to any issue addressed here.

Table 1(b). Explanation of Terms with Respect to Four Measures of Differences Between Favorable or Adverse Outcome Rates of Advantaged Group (AG) and Disadvantaged Group (DG)

(a) AG Fav Rt	(b) DG Fav Rt	(c) AG Adv Rt	(d) DG Adv Rt	(1) AG/DG Ratio Fav	(2) DG/AG Ratio Adv	
80%	63%	20%	37%	1.27	1.85	

(1) AG/DG Ratio Fav = a/b (1.27; relative difference is 27%) - BLUE

(2) DG/AG Ratio Adv = d/c (1.85; relative difference is 85%) - RED

Table 1(c). Explanation of Terms with Respect to Four Measures of Differences Between Favorable or Adverse Outcome Rates of Advantaged Group (AG) and Disadvantaged Group (DG)

(a) AG Fav Rt	(b) DG Fav Rt	(c) AG Adv Rt	(d) DG Adv Rt	(1) AG/DG Ratio Fav	(2) DG/AG Ratio Adv	(3) Abs Df (pp)	(4) Odds Ratio
80%	63%	20%	37%	1.27	1.85	17	2.35

(1) AG/DG Ratio Fav = a/b (1.27; relative difference is 27%) - BLUE

(2) DG/AG Ratio Adv = d/c (1.85; relative difference is 85%) - RED

(3) Abs Df (pp) = a-b (17 percentage points) - GREEN

[see Percentage Points subpage of Vignettes page]

Table 1(d). Explanation of Terms with Respect to Four Measures of Differences Between Favorable or Adverse Outcome Rates of Advantaged Group (AG) and Disadvantaged Group (DG)

(a) AG Fav Rt	(b) DG Fav Rt	(c) AG Adv Rt	(d) DG Adv Rt	(1) AG/DG Ratio Fav	(2) DG/AG Ratio Adv	(3) Abs Df (pp)	(4) Odds Ratio
80%	63%	20%	37%	1.27	1.85	17	2.35

(1) AG/DG Ratio Fav = a/b (1.27; relative difference is 27%) - BLUE

(2) DG/AG Ratio Adv = d/c (1.85; relative difference is 85%) - RED

(3) Abs Df (pp) = a-b (17 percentage points) - GREEN
[see Percentage Points subpage of Vignettes page]

(4) Odd Ratio = (a/c)/(d/b) (2.35) – ORANGE

That some would treat the odds ratio in terms of .426, which is the reciprocal of 2.35 is of no consequence to any issue treated here.

Table 2(a): Simplified Illustration of Effects of Lowering Test Cutoff on Relative Difference Between Pass Rates and Relative Difference Between Failure Rates

Cutoff	AG Pass	DG Pass		DG/AG Ratio Pass	
High	80%	63%		1.27	
Low	95%	87%		1.09	

As a result of lowering the cutoff:

(a) Rate ratio for passing decreased from 1.27 to 1.09 (i.e., relative difference between pass rates decreased from 27% to 9%)

Table 2(b): Simplified Illustration of Effects of Lowering Test Cutoff on Relative Difference Between Pass Rates and Relative Difference Between Failure Rates

Cutoff	AG Pass	DG Pass	AG Fail	DG Pass	DG/AG Ratio Pass	DG/AG Ratio Fail
High	80%	63%	20%	37%	1.27	1.85
Low	95%	87%	5%	13%	1.09	2.60

As a result of lowering the cutoff:

(a) Rate ratio for passing decreased from 1.27 to 1.09 (i.e., relative difference between pass rates **decreased** from 27% to 9%);

(b) Rate ratio for failure increased from 1.85 to 2.60 (i.e., relative difference between pass rates **increased** from 85 percent to 160%).

Fig. 1. Ratios of (1) DG Fail Rate to AG Fail Rate and (2) AG Pass Rate to DG Pass Rate at Various Cutoff Points Defined by AG Fail Rate

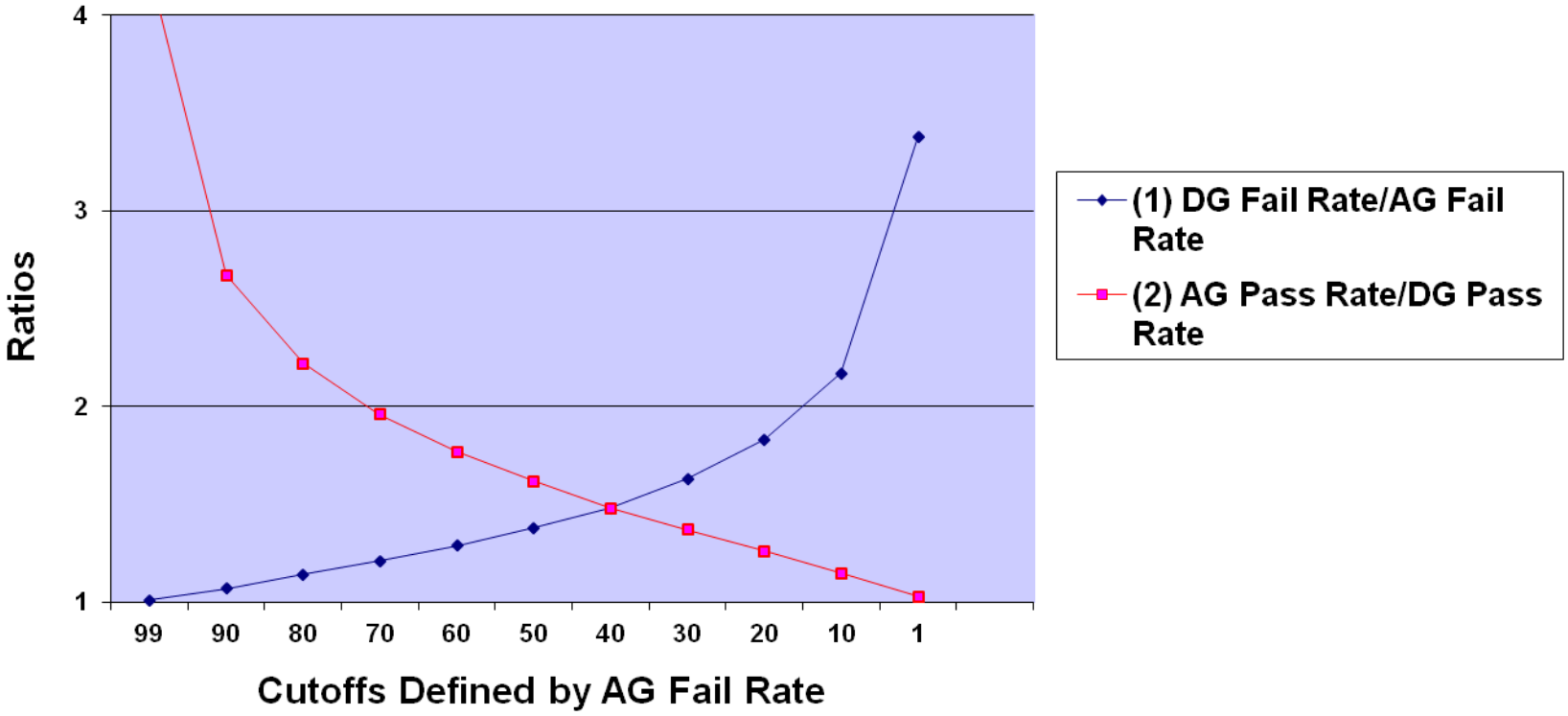


Table 3: Simplified Illustration of Effects of Lowering Test Cutoff on Relative Difference Between Pass Rates and Relative Difference Between Failure Rates (with absolute differences and odds ratios)

Cutoff	AG Pass	DG Pass	DG/AG Ratio Pass	DG/AG Ratio Fail	Abs Df (pp)	Odds Ratio
High	80%	63%	1.27	1.85	17	2.35
Low	95%	87%	1.09	2.60	8	2.84

Fig. 2: Absolute Difference Between Rates at Various Cutoffs Defined by AG Fail Rate

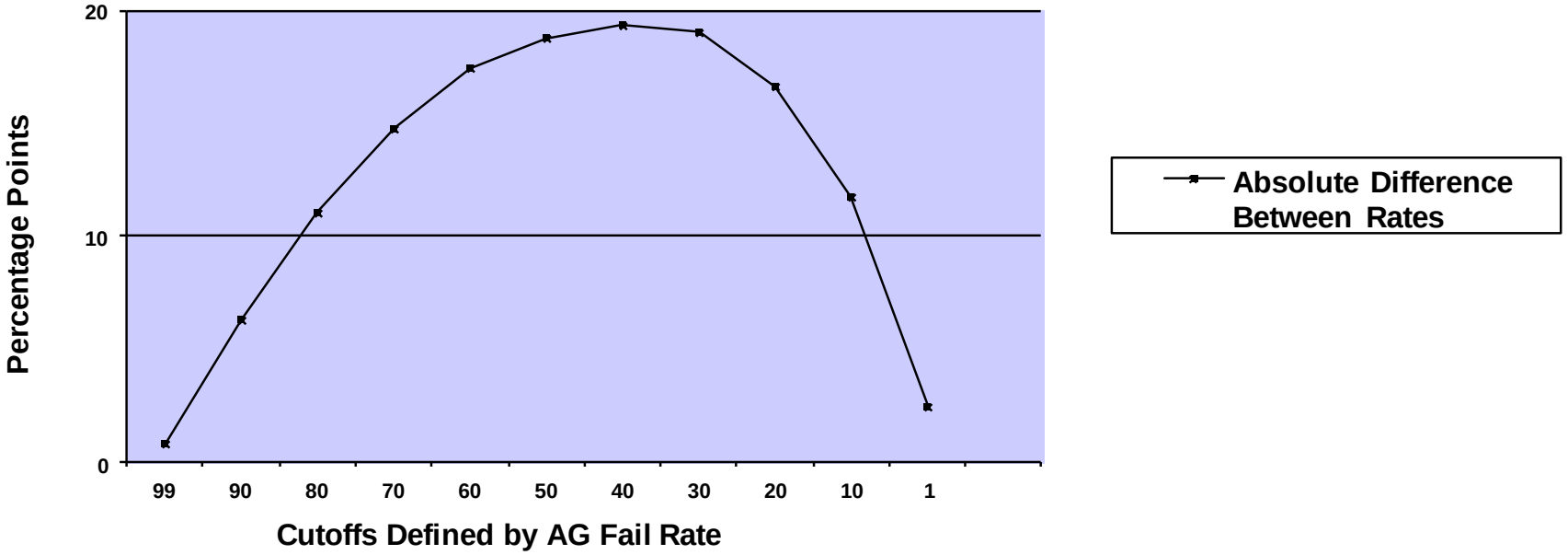
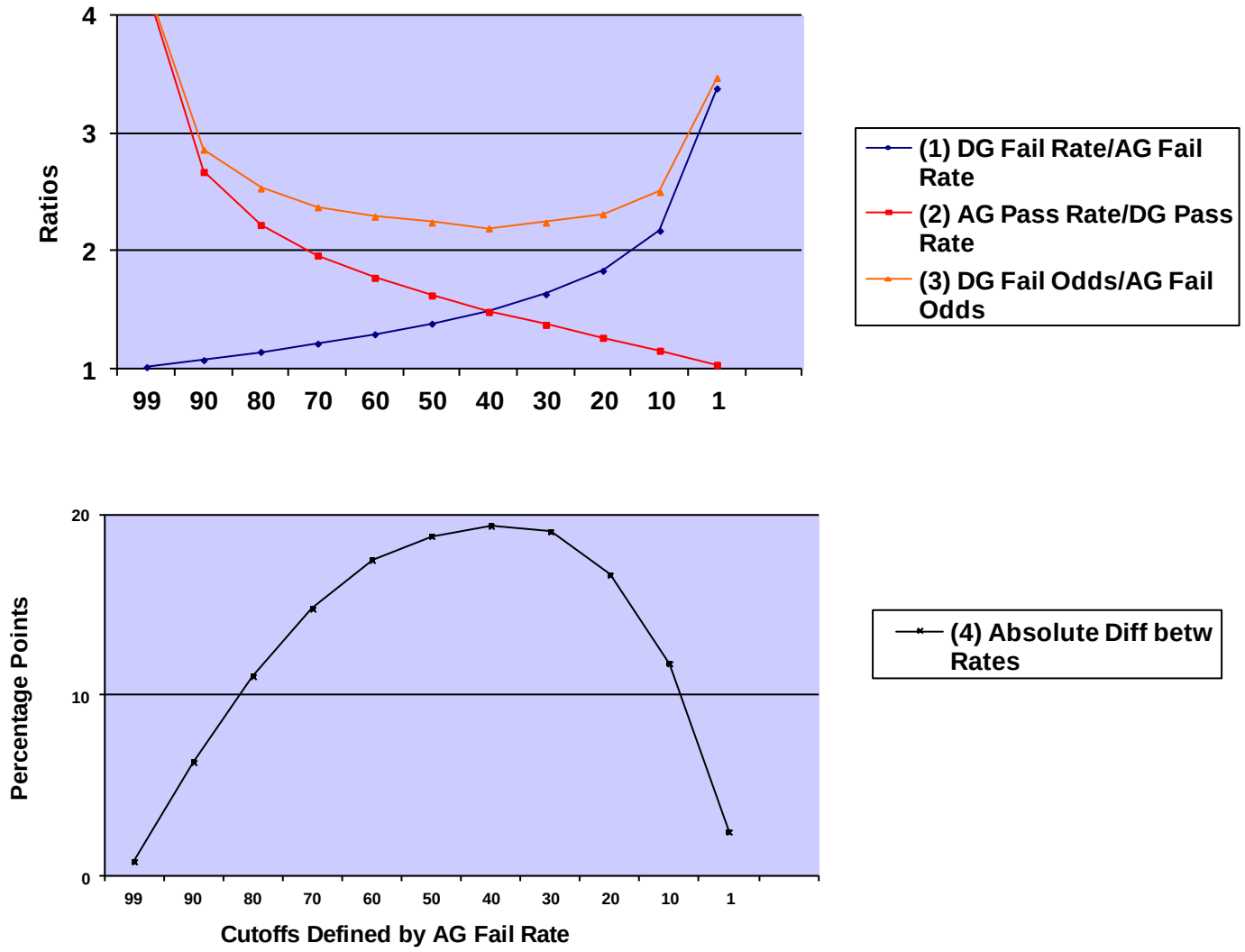


Fig. 3 Ratios of (1) DG Fail Rate to AG Fail Rate, (2) AG Pass Rate to DG Pass Rate, (3) DG Failure Odds to AG Failure Odds; and (4) Absolute Difference Between Rates



Relationship of the Two Relative Differences to the Absolute Difference (and Odds Ratio)

Relationship of the Absolute Difference to the Two Relative Differences (1)

- As the prevalence of an outcome changes, the absolute difference tends to change in the same direction as the smaller relative difference.
- Observers commonly focus on the larger relative difference. Thus, as the prevalence of an outcome changes, there is a systematic tendency for the absolute difference and the examined relative difference to change in opposite directions.

Relationship of the Absolute Difference to the Two Relative Differences (2)

- All measures may change in the same direction (of course).
- But any time a relative difference and the absolute difference change in different directions, the second relative difference will **necessarily** have changed in (a) the opposite direction of the first relative difference and (b) the same direction as the absolute difference.

Relationship of the Absolute Difference to the Two Relative Differences (3)

- Anyone noting that one must make a value judgment in choosing between the absolute difference and the relative difference the person happens to be examining for purposes of appraising the direction of a change in a disparity over time has already, knowingly or not, made a judgment to rely on the relative difference that yields a different result from the absolute difference rather than the relative difference that yields the same result as the absolute difference.

Seemingly Counterintuitive Nature of IR1

Tautological Rather Than Counterintuitive

- The pattern whereby reducing the frequency of an outcome (a) tends to increase relative differences between rates of experiencing the outcome at the same time that it (b) tends to reduce relatively differences between rates of avoiding the outcome may initially seem counterintuitive.
- In fact, however, (b) is implied in (a), if in fact (b) is not exactly the same thing as (a).
- For if reducing the frequency of an outcome tends to increase relative differences in rates of experiencing the outcome, it necessarily follows that increasing the frequency of an outcome tends to reduce relative differences in rates of experiencing the outcome.
- And if one outcome declines in frequency (hence, tending to increase relative differences as to that outcome), it necessarily follows that the opposite outcome increases in frequency (hence, tending to reduce relative differences as to that outcome).

- In a 1958 Special Article in the *New England Journal of Medicine* styled "Shall We Count the Living or the Dead," Mindel C. Sheps, while exploring issues concerning the size of mortality ratios and survival ratios, noted (emphasis added):

  - Such ratios have another feature: there *is no predictable* relation between relative mortality and relative survival. For example, among the three age groups in Table 2, the oldest group shows the greatest relative discrepancy by far in survival rates, but the smallest relative discrepancy in mortality rates.

-

- But she could have said:
  - Such ratios have another feature: there *is* ***[a]*** *predictable* relation between relative mortality and relative survival. For example, among the three age groups in Table 2, the oldest group shows the greatest relative discrepancy by far in survival rates, but the smallest relative discrepancy in mortality rates.

Table S1. Male and Female Survival Figures, with Measures of Difference (from Sheps NEJM 1958)

Source	Age	Percent Male Surv	Percent Female Surv	M/F Mort Ratio	F/M Survival Ratio
Sheps	Birth to Age 40	92.10%	95.10%	1.61	1.03
Sheps	Age 40 to Age 60	81.80%	90.30%	**1.88**	1.10
Sheps	Age 60 to Age 80	33.70%	49.50%	1.31	1.47

Table S2. Male and Female Survival Figures, with Measures of Difference (from Sheps NEJM 1958 and 2006 Life Tables)

Source	Age	Percent Male Surv	Percent Female Surv	M/F Mort Ratio	F/M Survival Ratio
Sheps	Birth to Age 40	92.10%	95.10%	1.61	1.03
Sheps	Age 40 to Age 60	81.80%	90.30%	**1.88**	1.1
Sheps	Age 60 to Age 80	33.70%	49.50%	1.31	1.47
2006 Life Tables	Birth to Age 40	95.85%	97.81%	1.89	1.02
2006 Life Tables	Age 40 to Age 60	89.77%	93.87%	1.67	1.05
2006 Life Tables	Age 60 to Age 80	55.87%	67.63%	1.36	1.21

Table S3. Male and Female Survival Figures, with Measures of Difference (from Sheps NEJM 1958 and 2006 Life Tables)

Source	Age	Percent Male Surv	Percent Female Surv	M/F Mort Ratio	F/M Survival Ratio	**EES**
Sheps	Birth to Age 40	92.10%	95.10%	1.61	1.03	.24
Sheps	Age 40 to Age 60	81.80%	90.30%	**1.88**	1.1	.39
Sheps	Age 60 to Age 80	33.70%	49.50%	1.31	1.47	.42
2006 Life Tables	Birth to Age 40	95.85%	97.81%	1.89	1.02	.28
2006 Life Tables	Age 40 to Age 60	89.77%	93.87%	1.67	1.05	.27
2006 Life Tables	Age 60 to Age 80	55.87%	67.63%	1.36	1.21	.31

Caution

- There is not an inverse relationship between relative differences in experiencing an outcome and relative differences in avoiding an outcome.
- For *any given level of prevalence* the larger the relative difference in one outcome, the *larger* tends to be the relative difference in the opposite outcome.
- But for *any give level of association* the larger the relative difference in one outcome, the *smaller tend*s to be the relative difference in the opposite outcome.

Density Function

- Lambert PJ, Subramanian S (Disparities in Socio-Economic outcomes: Some positive propositions and their normative implications. Soc Choice Welf 2014;43:565-576)

- Lambert PJ, Subramanian S (Group inequalities and “Scanlan’s Rule”: Two apparent conundrums and how we might address them. Working Paper 84/2014, Madras School of Economics (2014)).

Implications of and Corollaries to Interpretive Rule 1

IR1 Implications – General

- As mortality and poverty decline, relative differences in experiencing those outcomes tend to increase while relative differences in avoiding them tend to decrease.

- As procedures like immunization and cancer screening become more common, relative differences in receipt of those procedures tend to decrease while relative differences in failing to receive them tend to increase.

- More survivable cancers tend to show larger relative differences in mortality, but smaller relative differences in survival than less survivable cancers. Mortality and Survival page and Table N4 *infra.*

- Generally reducing blood pressure (or improving folate levels) tends to increase relative differences in hypertension (or low folate) while reducing relative differences in normal blood pressure (or adequate folate). NHANES Illustrations subpage of SR.

- Relaxing mortgage lending , employment, or public school discipline standards tends to increase relative differences in failing to meet the standards while reducing relative differences in meeting the standards.

IR1 Implications – Comparatively Advantaged Populations/Subpopulations/Settings (1)

- Relative racial, gender, socioeconomic differences in adverse outcomes tend to be larger, while relative differences in the corresponding favorable outcomes tend to be smaller, among comparatively advantaged populations/subpopulations or settings (where the outcomes are less common) than among less advantaged populations/subpopulations or settings.

IR1 Implications – Comparatively Advantaged Populations/Subpopulations (2)

- Racial diff in infant health outcomes among highly-educated or low risk groups ("Race and Mortality")*
- Occupational differences in survival/mortality among British Civil Servants (Whitehall Studies)*
- Racial, gender, and SES differences in survival/mortality among young (Life Tables Illustrations)
- Racial diff in loan approval/rejection among high-income applicants (Disp – High Income) *
- Racial diff in completion/non-completion rates at elite universities ("Race and Mortality")*
- Suburban discipline disparities (Suburban Disparities)*
- Racial and SES diff in mortality in Norway and Sweden (or Minnesota and Massachusetts)

IR1 Implications – Comparatively Advantaged Populations/Subpopulations (3)

- Racial diff in adverse outcomes among high SES groups; SES differences in adverse outcomes among whites.
- Racial diff in healthcare among the insured compared with the uninsured.
- Racial and gender diff in selection/rejection among highly qualified applicants.
- Racial diff in suspensions in pre-school versus K12. Table 7 or Society 2014 and Table E2 infra.
- Effect of records on employment prospect of whites versus blacks (or effect of being black on employment prospects of those with or without criminal records). Table 8 of Society 2014 and table T1 infra.

IR1 Implications – Comparatively Advantaged Populations/Subpopulations (4)

- Scholars describe patterns of large racial differences in adverse outcomes among advantaged subpopulations as “poorly understood.”
- It is fairer to say that they are not understood at all.
- Drawing of inferences based on perceptions about either (a) the large relative differences in adverse outcomes or (b) the small relative differences in favorable outcome within advantaged subpopulations has never been sound.

Table 4: Simplified Illustration of Effects of Patterns of the Two Relative Differences in Advantaged and Disadvantaged Setting

Setting	AG Pass	DG Pass	AG Fail	DG Pass	DG/AG Ratio Pass	DG/AG Ratio Fail
Disadvantaged (e.g., inner city)	80%	63%	20%	37%	1.27	1.85
Advantaged (e.g., suburbs)	95%	87%	5%	13%	1.09	2.60

Advantaged setting has larger difference in failure rates but smaller difference in pass rates.

Fig. 4. Black and White Rate of Bad Health and Black/White Ratios for Bad Health and for Highest and Lowest Income Categories (from Fig. 8 of Commissioned Paper discussed in Harvard letters)

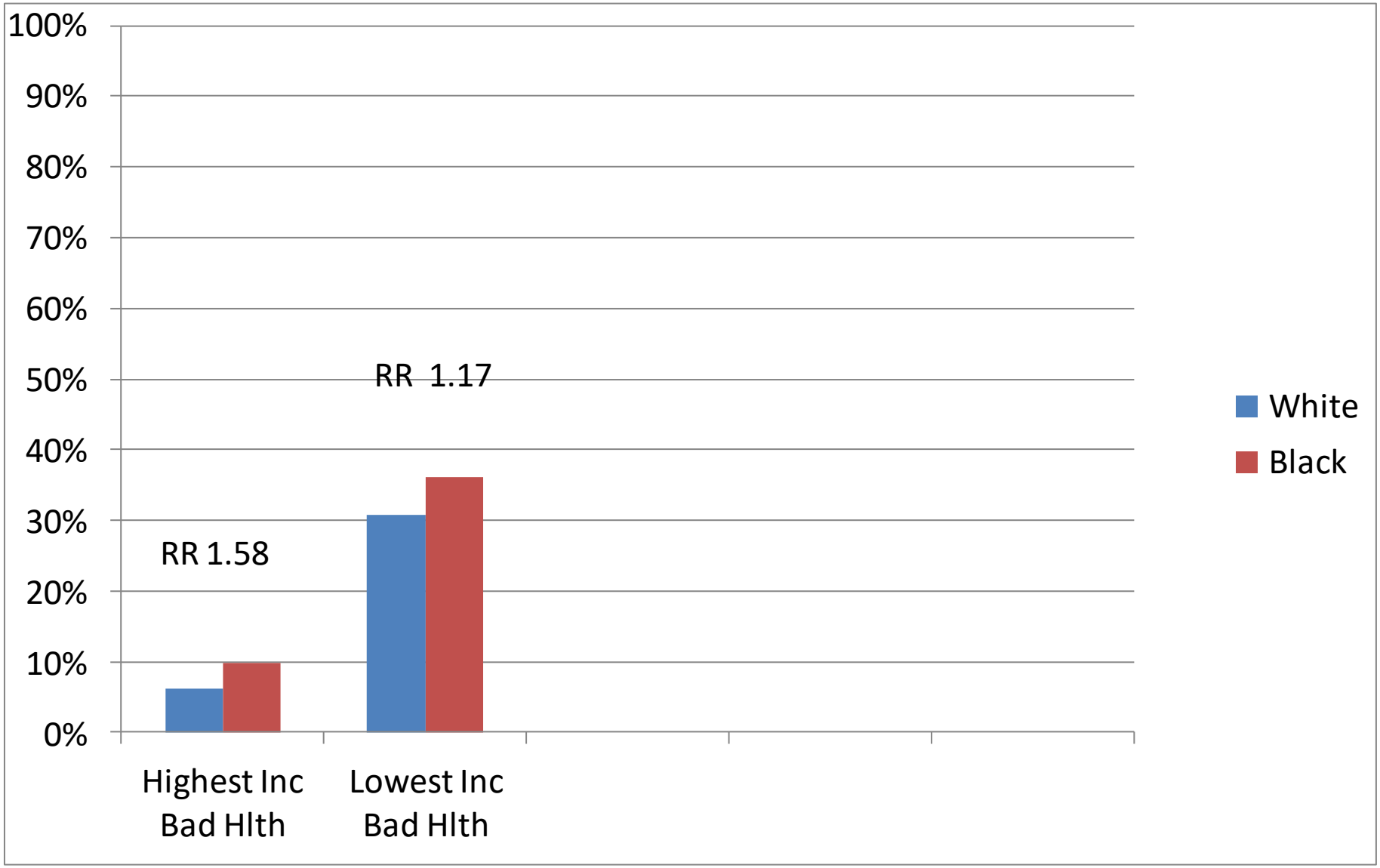


Fig. 5. Black and White Rate of Bad and Good Health and Black/White Rate Ratios for Bad Health and White/Black Rate Ratios for Good Health for Highest and Lowest Income Categories

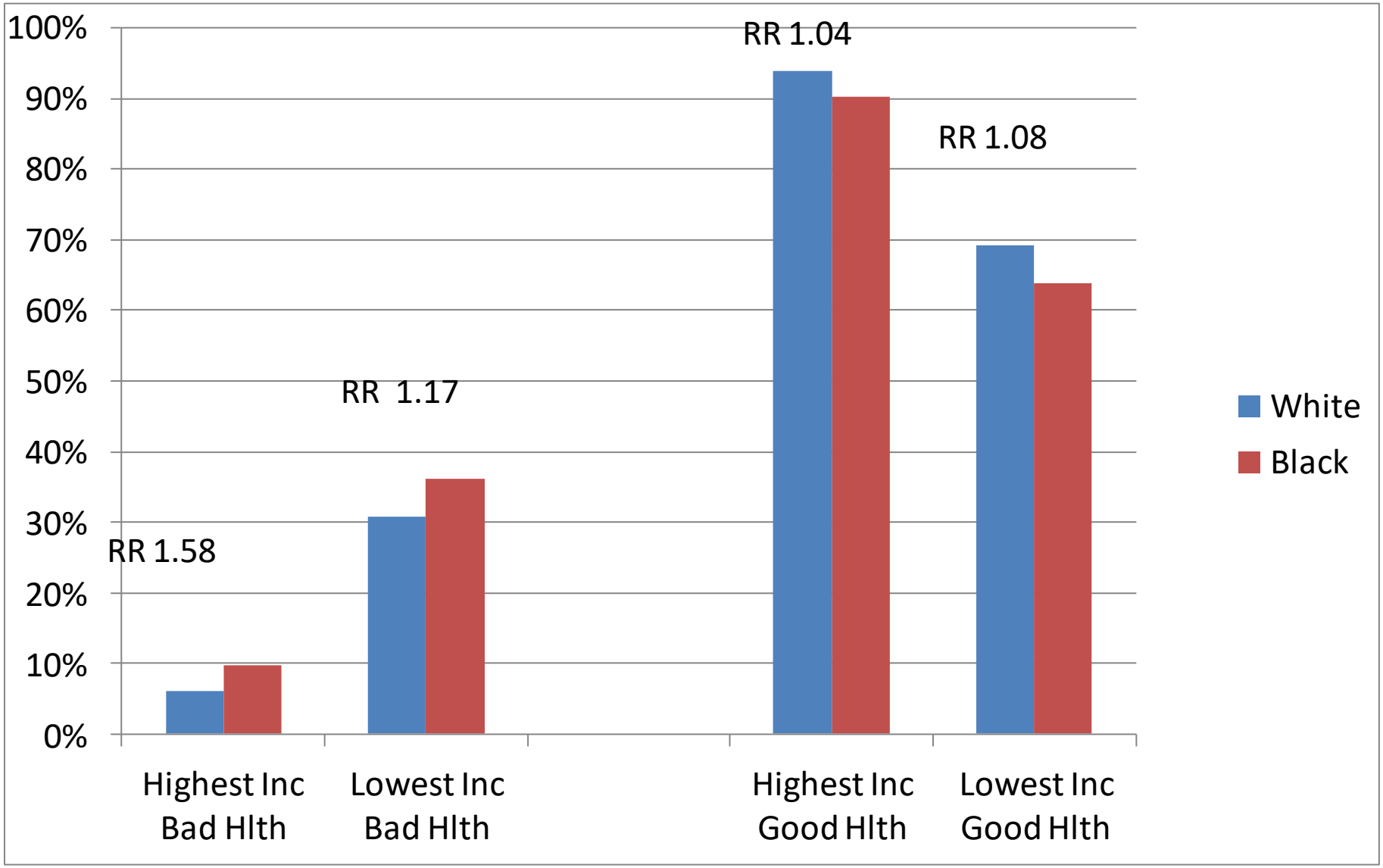


Table B1. Black and White Suspension Rates, Massachusetts and Nationally, from 2014 Boston Lawyers' Committee Study, with Measures of Difference

Area	Black	White	B/W Ratio Susp	W/B Ratio No Susp	EES
Mass	10.0%	2.7%	3.7	1.08	0.65
National	16.4%	4.6%	3.6	1.14	0.71

Study: "While Massachusetts' overall out-of-school suspension rate was less than the national average, the same cannot be said for Massachusetts' racial disparities in suspension. Black students in Massachusetts were 3.7 times as likely as their White peers to receive an out-of-school suspension, which is slightly worse than the national average (3.6)."

Table B2. Disabled and Non-Disabled Suspension Rates, Massachusetts and Nationally, from 2014 Lawyers' Committee Study, with Measures of Difference

Area	With Dis	W/O Dis	Dis/NoDis Ratio-Susp	NoDis/Dis Ratio - No Susp	EES
Mass	8.50%	2.80%	3.04	1.06	0.43
National	13.00%	6.00%	2.17	1.08	0.58

Study: "Students with disabilities were disciplined at a rate (37%) double their enrollment (18%), and were suspended out-of-school at three times the rate (8.5%) of their non-disabled peers (2.8%), a disparity much larger than the national average."

Jurisdictions Where Recent Reductions in Discipline Rates Were Accompanied by Increased Relative Differences in Discipline Rates (and DOE Study)

- Los Angeles SWPBS
- Denver Disparities
- Florida Disparities
- Maryland Disparities
- California Disparities
- Connecticut Disparities
- Maryland Disparities
- Minnesota Disparities
- Rhode Island Disparities
- St. Paul Disparities
- Minneapolis Disparities
- Beaverton (OR) Disparities
- Portland (OR) Disparities
- Montgomery County (MD) Disparities
- Henrico County (VA) Disparities.
-
- DOE Equity Report

Corollary 1 to IR1

As an outcome changes in overall prevalence,

(a) the group with the lower baseline outcome rate will tend to undergo a larger proportionate change in its rate for the outcome, while

(b) other group will tend to undergo a larger proportionate change in its rate for the opposite outcome.

Table C01: Simplified Illustration of Effects of Lowering Cutoffs in Terms of Percentage Changes in Pass and Fail Rates of AG and DG EES

Group	HC Pass	LC Pass	HC Fail	LC Fail	Perc Inc Pass	Perc Dec Fail
AG	80%	95%	20%	5%	19%	75%
DG	63%	87%	37%	13%	38%	65%

(a) pass rates to increase by 38% for DG but only 19% for AG;
(b) failure rates to decrease by 75% for AG but only 65% for DG.

Implications of Corollary 1 to IR 1

- Effects of reductions/increases in poverty
- Effects of lowering/raising cutoffs (improving performance)
- Effects of improving health outcomes
- **Explanatory theories: "diffusion of innovation," "inverse equity hypothesis" (Explanatory Theories)***
- **Effects of chronic conditions on self-rated health* (Reporting Heterogeneity, Comment on Delpierre BMC Pub Hlth 2012)**
- Subgroup Effects subpage of SR
- Subgroup Effects – Nonclinical subpage of SR

Interjection – Illogic of the Rate Ratio

- Underlying analyses of subgroup effects and the standard method of applying an observed risk reduction in a clinical trial to calculate the NNT involving a different baseline rate from that in the trial is the notion that, in the usual course, a factor affecting an outcome rate will cause equal proportionate changes in different baseline rates for the outcome.
- Irrespective of IR1, Corollary 1, the assumption is illogical. For anytime a factor causes equal proportionate changes in different baseline rates of experiencing an outcome it will necessarily cause unequal proportionate changes in rates of experiencing the opposite outcome.

Table I1(a). Illustration of the Illogic of The Assumption of a Constant Risk Ratio Across Different Baseline Rates

Baseline	Perc Reduction	End Rate
40%	50%	20%

Table I1(b). Illustration of the Illogic of The Assumption of a Constant Risk Ratio Across Different Baseline Rates

Baseline	Perc Reduction	End Rate
40%	50%	20%
20%	50%	10%

Table I1(c). Illustration of the Illogic of The Assumption of a Constant Risk Ratio Across Different Baseline Rates

Baseline	Perc Reduction	End Rate	Opp Baseline	End Opp Rate	Perc Opp Inc
40%	50%	20%	60%	80%	33.3%
20%	50%	10%	80%	90%	12.5%

Table I1(c). Illustration of the Illogic of The Assumption of a Constant Risk Ratio Across Different Baseline Rates

Baseline	Perc Reduction	End Rate	Opp Baseline	End Opp Rate	Perc Opp Inc
40%	50%	20%	60%	80%	33.3%
20%	50%	10%	80%	90%	12.5%

References Regarding Illogic of the Rate Ratio

- Scanlan's Rule page subpages:
  - Subgroup Effects
  - Subgroup Effects – Nonclinical
  - Illogical Premises
  - Illogical Premises II
  - Inevitability of Interaction
- Comment on Hingorani BMJ 2013
- Joint Statistical Meetings 2009

Corollary 2 to IR1

When an outcome declines in overall prevalence, there will tend to be an increase in the proportion the most susceptible group comprises of both

(a) those experiencing the outcome; and

(b) those failing to experience the outcome.

(Feminization of Poverty, Table 1 of Chance 2006)

Table 6: Simplified Illustration of Effects of Lowering Test Cutoff on Proportion DG Makes Up of Persons Passing and Failing the Test (assuming DG comprises 50% of test takers)

Cutoff	AG Pass	DG Pass	AG Fail	DG Pass	DG Prop of Pass	DG Prop of Fail
High	80%	63%	20%	37%	44%	65%
Low	95%	87%	5%	13%	48%	72%

Implications of IR2

- Improvements in education will tend to increase absolute differences in rate at which advantaged and disadvantaged groups reach advanced proficiency level but reduce absolute differences between rates at which such groups reach the basic proficiency level.
- Improvements in health care will tend to increase absolute differences for uncommon healthcare outcomes but reduce absolute differences for common healthcare outcomes.
- For uncommon outcomes, higher-performing hospitals will tend to have larger absolute differences than lower-performing hospitals; for common healthcare outcomes higher-performing hospitals will tend to have smaller absolute differences than lower-performing hospitals
- Opposite for the odds ratio.

Some Illustrations with Income/Poverty Data

Table P1(a). Illustration of Effect on Standard Measures of Reducing Poverty Such as to Enable Everyone with Income Above 75 Percent of Poverty Line to Escape Poverty (2004 data from "Can We Actually Measure Health Disparities," *Chance* (2006))

Row #	Perc of Pov Line		Prop of Wh Below	Prop of Bl Below		B/W Ratio Below	
1 (bef)	100		10.8%	24.7%		2.29	
2 (aft)	75		7.2%	17.8%		2.47	

Table P1(b). Illustration of Effect on Standard Measures of Reducing Poverty Such as to Enable Everyone with Income Above 75 Percent of Poverty Line to Escape Poverty (2004 data from "Can We Actually Measure Health Disparities," *Chance* (2006))

Row #	Perc of Pov Line	Prop of Wh Above	Prop of Bl Above	Prop of Wh Below	Prop of Bl Below	W/B Ratio Above	B/W Ratio Below
1 (bef)	100	89.2%	75.3%	10.8%	24.7%	1.28	2.29
2 (aft)	75	92.8%	82.2%	7.2%	17.8%	1.13	2.47

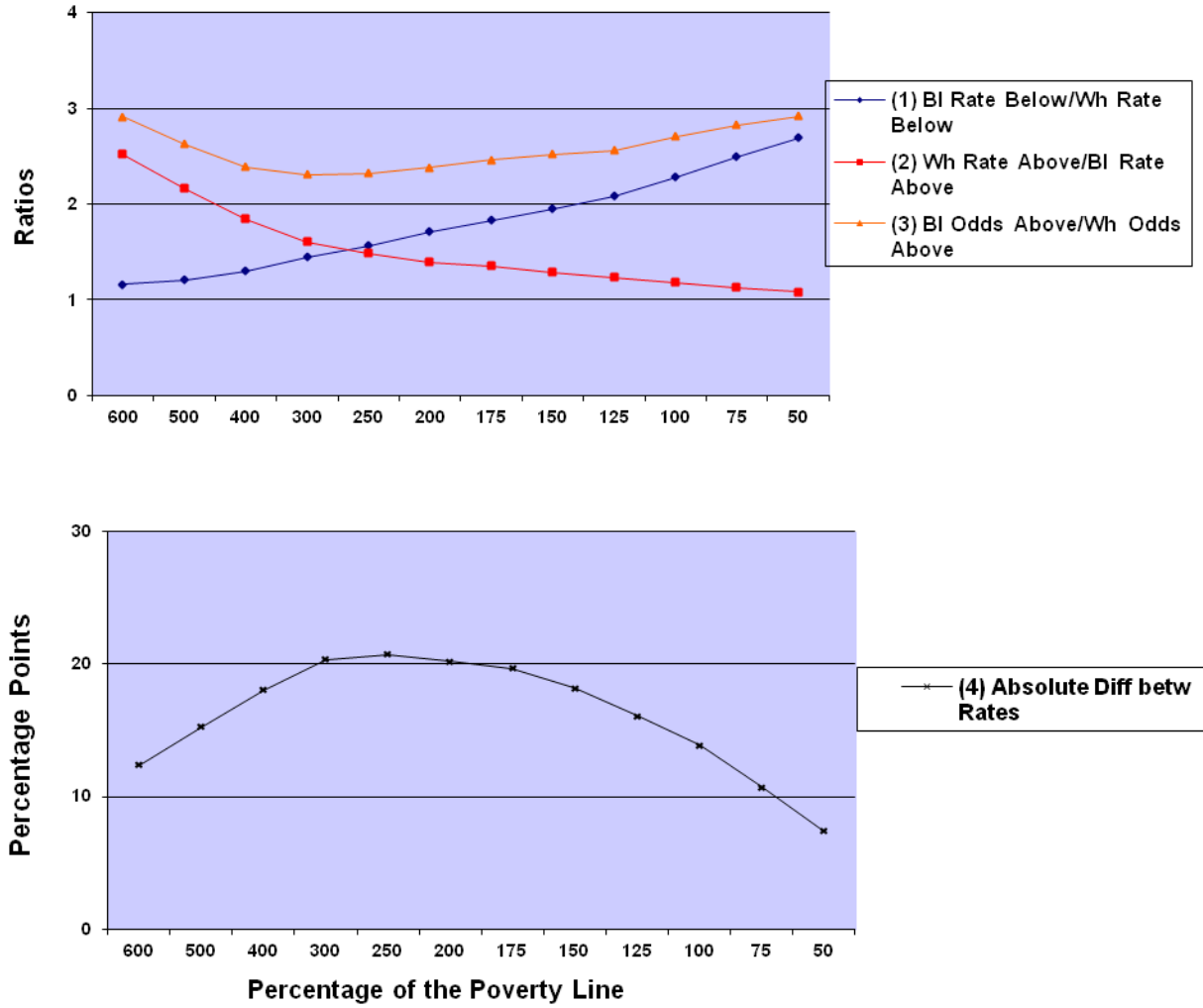
Table P1(c). Illustration of Effect on Standard Measures of Reducing Poverty Such as to Enable Everyone with Income Above 75 Percent of Poverty Line to Escape Poverty (2004 data from "Can We Actually Measure Health Disparities," *Chance* (2006))

Row #	Perc of Pov Line	Prop of Wh Above	Prop of Bl Above	Prop of Wh Below	Prop of Bl Below	W/B Ratio Above	B/W Ratio Below	Abs Df (PP)
1 (bef)	100	89.2%	75.3%	10.8%	24.7%	1.28	2.29	13.9
2 (aft)	75	92.8%	82.2%	7.2%	17.8%	1.13	2.47	10.6

Table P1(d). Illustration of Effect on Standard Measures of Reducing Poverty Such as to Enable Everyone with Income Above 75 Percent of Poverty Line to Escape Poverty (2004 data from "Can We Actually Measure Health Disparities," *Chance* (2006))

Row #	Perc of Pov Line	Prop of Wh Above	Prop of Bl Above	Prop of Wh Below	Prop of Bl Below	W/B Ratio Above	B/W Ratio Below	Abs Df (PP)	Odds Ratio
1 (bef)	100	89.2%	75.3%	10.8%	24.7%	1.28	2.29	13.9	2.71
2 (aft)	75	92.8%	82.2%	7.2%	17.8%	1.13	2.47	10.6	2.79

Fig. P1. Ratios of (1) Black to White Rates of Falling Below Percentages of Poverty Line, (2) White to Black Rates of Falling Above the Percentage, (3) Black to White Odds of Falling Below the Percentage, and (4) Absolute Differences Between Rates



Refuting the Value Judgment Fallacy

Table J1(a) : Varying Appraisals of the Comparative Degree of Employer Bias Using Different Measures of Disparities in Selection/Rejection Rates

Employer/ Setting	AG Sel Rate	DG Sel Rate	(1) AG/DG Ratio Selection
A	20.0%	9.0%	2.22 (1)
B	40.1%	22.7%	1.77 (2)
C	59.9%	40.5%	1.48 (3)
D	90.0%	78.2%	1.15 (4)

Approach 1 (relative favorable) (BLUE): A,B,C,D

Table J1(b) : Varying Appraisals of the Comparative Degree of Employer Bias Using Different Measures of Disparities in Selection/Rejection Rates

Employer/ Setting	AG Sel Rate	DG Sel Rate	(1) AG/DG Ratio Selection	(2) DG/AG Ratio Rejection
A	20.0%	9.0%	2.22 (1)	1.14 (4)
B	40.1%	22.7%	1.77 (2)	1.29 (3)
C	59.9%	40.5%	1.48 (3)	1.48 (2)
D	90.0%	78.2%	1.15 (4)	2.18 (1)

Approach 1 (relative favorable) (BLUE): A,B,C,D
Approach 2 (relative adverse) (RED): D,C,B,A (opposite of Approach 1)

Table J1(c) : Varying Appraisals of the Comparative Degree of Employer Bias Using Different Measures of Disparities in Selection/Rejection Rates

Employer/ Setting	AG Sel Rate	DG Sel Rate	(1) AG/DG Ratio Selection	(2) DG/AG Ratio Rejection	(3) Abs Diff (pp)
A	20.0%	9.0%	2.22 (1)	1.14 (4)	11 (4)
B	40.1%	22.7%	1.77 (2)	1.29 (3)	17(2)
C	59.9%	40.5%	1.48 (3)	1.48 (2)	19 (1)
D	90.0%	78.2%	1.15 (4)	2.18 (1)	12 (3)

Approach 1 (relative favorable) (BLUE): A,B,C,D
Approach 2 (relative adverse) (RED): D,C,B,A (opposite of Approach 1)
Approach 3 (absolute difference) (GREEN): C,B,D,A

Table J1(d) : Varying Appraisals of the Comparative Degree of Employer Bias Using Different Measures of Disparities in Selection/Rejection Rates

Employer/ Setting	AG Sel Rate	DG Sel Rate	(1) AG/DG Ratio Selection	(2) DG/AG Ratio Rejection	(3) Abs Diff (pp)	(4) Odds Ratio
A	20.0%	9.0%	2.22 (1)	1.14 (4)	11 (4)	2.53 (1)
B	40.1%	22.7%	1.77 (2)	1.29 (3)	17(2)	2.29 (3)
C	59.9%	40.5%	1.48 (3)	1.48 (2)	19 (1)	2.19 (4)
D	90.0%	78.2%	1.15 (4)	2.18 (1)	12 (3)	2.50 (2)

Approach 1 (relative favorable) (BLUE): A,B,C,D
Approach 2 (relative adverse) (RED): D,C,B,A (opposite of Approach 1)
Approach 3 (absolute difference) (GREEN): C,B,D,A
Approach 4 (odds ratio) (ORANGE): A,D,B,C (opposite of Approach 3)

- Is one employer more biased as to selection while another more biased as to rejection?
- Is one more biased in relative terms and another more biased in absolute terms?
- There can be only one reality as to the comparative ranking.

- Which is the correct ranking?
- As all rows are based on the same specifications as Table 2 and Figures 1 to 3 (EES = .5), there is no rational basis for distinguishing among them.
- Any measure that does distinguish among them is a flawed measure.

Table E2. Appraisals of the Differences in Outcome Disparities for AG and DG Applicants with Low and High Qualifications

Row #	Applicant Qualification	AG Sel Rate	DG Sel Rate	AG/DG Ratio Selection	DG/AG Ratio Rejection	Abs Diff (pp)	Odds Ratio
1	Very Low	20%	9.%	2.22	1.14	11	2.53
2	Low	40%	22.7%	1.77	1.29	17	2.29
3	High	59%	40.5%	1.48	1.48	19	2.19
4	Very High	90%	78.2%	1.15	2.18	12	2.50

Note: Some observers would read the smaller relative difference in selection rates (BLUE) among the highly qualified applicants (rows 3 and 4) as evidence that employers are less likely to rely on stereotypes when there are objective indicators of qualifications.

Discrimination Issues

Representational Comparison Issues

It is not possible to draw sound inferences about processes/forces based solely on information as to the proportion a group comprises of persons potentially experiencing an outcome and the proportion it comprises of persons actually experiencing the outcome (e.g., 20% of pool and 10% of selections).

One needs the actual rates at which each group experienced the outcome.

Partial Picture Problems

It is not possible to draw sound inferences about processes/forces based solely on examination of persons who accepted some outcome (e.g., persons accepting different jobs, persons accepting subprime versus prime loans).

References:

"Illusions of Job Segregation," *Public Interest* (1988)

"The Mismeasure of Discrimination," Univ Kansas School of Law Faculty Workshop (2013) (Section F)

"The Perverse Enforcement of Fair Lending Laws," *Mortgage Banking* (2014)

Employment Discrimination page of jpscanlan.com (Section A)

Estimated Effect Size (EES)

EES (Estimate Effect Size)Explained

- Derive from any pair of outcome rates the differences between means of the (hypothesized) underlying distributions in terms of standard deviations. In test score hypothetical EES was .50.
- Probit coefficient

Table E1. Illustrations of EES Values

RR Adverse	DG Adverse Rt	AG Adverse Rt	EES	Percent of DG Above AG Mean
1.2	60.0%	50.0%	0.25	40.3%
1.2	18.4%	15.4%	0.12	45.4%
1.5	75.0%	50.0%	0.67	25.3%
1.5	45.0%	30.0%	0.39	35.0%
2	60.0%	30.0%	0.78	22.0%
2	40.0%	20.0%	0.58	28.3%
2	20.0%	10.0%	0.43	33.7%
2	1.0%	0.5%	0.24	40.9%
2.5	24.2%	9.7%	0.6	27.6%
2.5	7.2%	2.9%	0.43	33.7%
3	14.4%	4.8%	0.59	27.9%
3	2.7%	0.9%	0.43	33.7%

Table E2. Illustration of Effect on Standard Measures of Reducing Poverty Such as to Enable Everyone with and Income Above 75 Percent of Poverty Line to Escape Poverty (with EES)

Perc of Pov Line	Prop Wh Below	Prop Bl Below	B/W Ratio Below	W/B Ratio Above	Abs Df (PP)	Odds Ratio	EES
100	10.8%	24.7%	2.29	1.18	13.9	2.71	.55
75	7.2%	17.8%	2.47	1.13	10.6	2.79	.54

Table E3. White and Black Rates of Multiple Suspensions in Preschool and K-12, with Measures of Difference

Level	White Mult Susp Rate	Black Mult Susp Rate	B/W Ratio Susp	W/B Ratio No Susp	Abs Df (pp)	EES
Preschool	0.15%	0.67%	1.01	4.41	0.52	.49
K-12	2.23%	6.72%	1.05	3.01	4.49	.51

See Society 2014 at 15 re its Table 8 and Preschool Disparities subpage of Discipline Disparities page; see also August 24, 2015 letter to Department of Health and Human Services and Department of Education.

Table E4(a). Figures on Massachusetts and National Black and White Adverse Outcome Rates, Difference, from Richard Dunlap Presentation at April 2014 MMS Leadership Forum, with Measures of Difference

Condition	Area	B	W	RRAdv	RRFav	Abs Df	OR	EES
Infant Mort	US	1.28%	0.55%	2.33	1.007	0.73	2.35	0.31
Infant Mort	MA	0.99%	0.40%	2.46	1.006	0.59	2.47	0.32

Table E4(b). Figures on Massachusetts and National Black and White Adverse Outcome Rates, Difference, from Richard Dunlap Presentation at April 2014 MMS Leadership Forum, with Measures of Difference

Condition	Area	B	W	RRAdv	RRFav	Abs Df	OR	EES
Infant Mort	US	1.28%	0.55%	***2.33***	***1.007***	0.73	2.35	0.31
Infant Mort	MA	0.99%	0.40%	***2.46***	***1.006***	0.59	2.47	0.32
Hypertension	US	42.10%	28.00%	***1.50***	***1.24***	14.10	1.87	0.38
Hypertension	MA	37.10%	28.40%	***1.31***	***1.14***	8.70	1.49	0.23
Obesity	US	47.80%	32.60%	***1.47***	***1.29***	15.20	1.89	0.39
Obesity	MA	32.40%	22.20%	***1.46***	***1.15***	10.20	1.68	0.31
Diabetes	US	12.60%	7.10%	***1.77***	***1.06***	5.50	1.89	0.32
Diabetes	MA	11.0%	9.00%	***1.22***	***1.02***	2.00	1.89	0.11

- With standard measure observers examine either:

  (a) difference between AG and DG rates at different points in time or in different settings, or

  (b) comparative changes of AG and DG rates over time or differing effects of factor on each rate

- Same holds for EES

Table E5: Simplified Illustration of Effects of Lowering Cutoffs in Terms of Percentage Changes in Pass and Fail Rates of AG and DG, with EES

Group	HC Pass	LC Pass	HC Fail	LC Fail	Perc Inc Pass	Perc Dec Fail	EES
AG	80%	95%	20%	5%	19%	75%	0.80
DG	63%	87%	37%	13%	38%	65%	0.80

(a) pass rates to increase by 38% for DG but only 19% for AG;
(b) failure rates to decrease by 75% for AG but only 65% for DG.

Table E6. Comparison of Effects of Beta Blockers on Mortality Among Heart Patients at Different Ages (Gottlieb *NEJM* 1998)

Age	Beta Rate	No Beta Rate	Adverse Reduction	Favorable Increase	EES
<70	11.3%	18.7%	39.6%	9.1%	0.34
>80	22.6%	33.1%	31.7%	15.7%	0.32

Table E7. Comparison of Effects of Hypertension Control on Heart Attack Risk of Women and Men with Similar Risk Factor Profiles (A65,TC300,HDL50,NS, NM), Framingham Study

Gender	SBP 120 Risk	SPB150 Risk	Adverse Reduction	Favorable Increase	EES
F	4.0%	7.0%	42.9%	3.2%	0.28
M	14.0%	19.0%	26.3%	6.2%	0.21

Interjection re Calculation of NNT

- Subgroup Effects subpage of SR, and discussion above, addresses why assumption that an intervention that reduces a baseline adverse outcome rate from 10% to 5% will cause a like 50% reduction in a baseline rate of 20% (i.e., to 10%) is not only incorrect but illogical

- But one can, on the basis of the .36 EES difference reflected by the change from 10% to 5%, estimate that the intervention will reduce a 20% rate to approximately 11.5%.

- See 2009 Joint Statistical Meetings presentation.

EES Problems/Limitations

- Solutions subpage of MHD
- Cohort Considerations subpage of MHD
- Irreducible Minimums subpage of MHD
- Truncation Issues subpage of SR
- Intermediate Outcomes subpage of SR

- Addendum to Ferguson Arrest Disparities of Discipline Disparities

Pay for Performance Issues

Summary re Pay for Performance (P4P)

- Reliance on absolute differences to measure healthcare disparities led to (a) perception in US (where increasing uncommon outcomes were examined) that P4P would tend to increase disparities and (b) perception in UK (where increasing uncommon outcomes were examined) that P4P would tend to reduce disparities.
- Perception in US led Massachusetts to include a disparities element in its Medicaid P4P program, but to employ a measure that is more likely to increase than reduce disparities.

Table PP1: Data on White and Black CABG Rates Before and After Implementation of CABG Report Card From Werner et al. Circulation, 2004 (see Comment on Werner)

Period	Wh Rt	Bl Rt	W/B Ratio CABG	B/W Ratio No CABG	***Abs Df (pp)***	Odds Ratio	EES
1	3.6%	0.9%	4.00	1.03	***2.70***	4.11	0.58
2	8.0%	3.0%	2.67	1.05	***5.00***	2.81	0.48

Rather than find decreasing disparities according to the relative differences in receipt of CABG (BLUE) (as was probably the most common approach at the time), authors rely on absolute difference (GREEN) to find incentive program increases disparities. Study causes numerous researchers to recommend including disparities measure in P4P programs.

Table PP2. Illustration of Changes in Absolute Differences over Time to Low Frequency Outcomes (A) and High Frequency Outcomes (B) (.50 EES)

Outcome – Time	AG Fav Rt	DG Fav RT	Abs Df (pp)
A – Year One	20%	9%	11
A – Year Two	30%	15%	15
B – Year One	80%	63%	17
B – Year Two	90%	78%	12

Increases in low frequency favorable outcomes (A) tend to increase absolute differences; increases in high frequency favorable outcomes (B) tend to increase absolute differences.

Table PP2. Illustration of Absolute Differences at Low and High Performing Hospital as to Low Frequency Outcomes (A) and High Frequency Outcomes (B) (.50 EES)

Hospital–Outcome	AG Fav Rt	DG Fav RT	Abs Df
Low Performing – A	20%	9%	11
High Performing – A	30%	15%	15
Low Performing – B	80%	63%	17
High Performing – B	90%	78%	12

Red highlighted rows reflect situation of Massachusetts Medicaid pay-for performance program. See Between Group Variance subpage of Measuring Health Disparities page, pages 32 to 34 of the FCSM 2013 Research Conference paper, and pages 337-339 of "Race and Mortality Revisited."

Between Group Variance Issues

- For any given pair of rates, as minority representation increases BGV increase until it reaches 50%; as minority representation increases further BVG declines

  See Between Group Variance sub-page of Measuring Health Disparities page of jpscanlan.com.

The National Center for Health Statistics (evolving) Response to IR1 and Other Health Disparities Research

NCHS Response to IR1

- In five official and unofficial documents between 2004 and 2009 (responding to Society 2000 and Chance 1994), NCHS statisticians recognized that determinations of whether health and healthcare disparities were increasing or decreasing would commonly turn on whether one examined relative differences in favorable outcome or relative differences in adverse outcomes.

- Key document: 2005 NCHS monograph "Methodological Issues in Measuring Health Disparities"

- Agency merely recommended that all disparities be analyzed in terms of relative differences in adverse outcomes. Has never addressed the implications of the fact that measures change as the prevalence of an outcome changes with respect to the utility of the measures.

- See "Race and Mortality Revisited" at 4 to 9.

- But see August 24, 2015 letter to Department of Health and Human Services and Department of Education regarding pending reversal.

Healthy People 2010 Technical Appendix at A-8

"Those dichotomous objectives that are expressed in terms of favorable events or conditions are re-expressed using the adverse event or condition for the purpose of computing disparity [12 [sic],18,19], but they are not otherwise restated or changed."

13. Keppel KG, Pearcy JN, Klein RJ. Measuring progress in Healthy People 2010. Statistical Notes, no. 25. Hyattsville, MD: National Center for Health Statistics. September 2004.

18. Keppel KG, Pamuk E, Lynch J, et al. Methodological issues in measuring health disparities. National Center for Health Statistics. Vital Health Stat 2(141). 2005.

19. Keppel KG, Pearcy JN. Measuring relative disparities in terms of adverse outcomes. J Public Health Manag Pract 11(6). 2005.

Note: Few readers of the Technical Appendix would imagine that by measuring things like immunization disparities in terms of relative differences in no immunization one commonly reverses the direction of change over time, at times causing dramatic decreases to be dramatic increases (as in the Morita study in Table 14 infra).

Table N1(a): Illustration Based on Morita (*Pediatrics* 2008) Data on Black and White Hepatitis-B Vaccination Rates Before and After School-Entry Vaccination Requirement

Grade	Year	Period	Wh Vac Rate	Bl Vac Rate	W/B Ratio Vac (Morita)
5	1996	Pre	8%	3%	2.67
5	1997	Post	46%	33%	1.39
9	1996	Pre	46%	32%	1.44
9	1997	Post	89%	84%	1.06

Table N1(b): Illustration Based on Morita (*Pediatrics* 2008) Data on Black and White Hepatitis-B Vaccination Rates Before and After School-Entry Vaccination Requirement

Grade	Year	Period	Wh Vac Rate	Bl Vac Rate	W/B Ratio Vac (Morita)	BW Ratio No Vac (NCHS)
5	1996	Pre	8%	3%	2.67	1.05
5	1997	Post	46%	33%	1.39	1.24
9	1996	Pre	46%	32%	1.44	1.26
9	1997	Post	89%	84%	1.06	1.45

Table 1(c): Illustration Based on Morita (*Pediatrics* 2008) Data on Black and White Hepatitis-B Vaccination Rates Before and After School-Entry Vaccination Requirement

Grade	Year	Period	Wh Vac Rate	Bl Vac Rate	W/B Ratio Vac (Morita)	BW Ratio No Vac (NCHS)	Abs Df (PP) (CDC)
5	1996	Pre	8%	3%	2.67	1.05	5
5	1997	Post	46%	33%	1.39	1.24	13
9	1996	Pre	46%	32%	1.44	1.26	14
9	1997	Post	89%	84%	1.06	1.45	5

Table N1(d): Illustration Based on Morita (*Pediatrics* 2008) Data on Black and White Hepatitis-B Vaccination Rates Before and After School-Entry Vaccination Requirement

Grade	Year	Period	Wh Vac Rate	Bl Vac Rate	W/B Ratio Vac (Morita)	BW Ratio No Vac (NCHS)	Abs Df (PP) (CDC)	OR	EES
5	1996	Pre	8%	3%	2.67	1.05	5	2.81	47
5	1997	Post	46%	33%	1.39	1.24	13	1.73	34
9	1996	Pre	46%	32%	1.44	1.26	14	1.81	37
9	1997	Post	89%	84%	1.06	1.45	5	1.54	24

Table N2. Illustration from Harper et al. (CEBP 2009) Data on Differences in Mammography by Income (see Comment on Harper)

Year	High Inc Mam Rt	Low Inc Mam Rt	H/L Ratio Mam	L/H Ratio No Mam	Abs Df (pp)	OR	EES
1987	36.3%	17.2%	2.11	1.30	19	2.74	0.60
2004	77.4%	55.2%	1.40	1.98	22	2.78	0.62

Abstract: "In contrast, relative area-socioeconomic disparities in mammography use increased by 161%."

Text: "Whether a health outcome is defined in favorable or adverse terms (e.g., survival versus death) can affect the magnitude of measures of health disparity based on ratios (11, 12). Consistent with the Healthy People 2010 framework for comparing across outcomes (13), we measured all breast cancer outcomes in adverse terms."

Relative difference for mammography decreased 64% (111% to 4%); relative difference for no mammography increased by 227%. (3% to 98%)

.

Table N3. Illustration from Baker and Middleton (JECH 2003) Data on Differences in Mammography of Least and Most Deprived (see Mortality and Survival page)

Year	Lst Dpr Mam Rt	Mst Dpr Mam Rt	LD/MD Ratio Mam	MD/LD Ratio No Mam	Abs Df (pp)	Odds Ratio	EES
1991	84.1%	39.0%	2.15	3.83	45	8.26	1.27
1999	98.6%	76.0%	1.30	17.14	23	22.24	1.49

Authors would relied on relative differences in mammography rates to find a decreased disparity.

Harper et al. would find a **570% increase** in the disparity (from 283% to 1714%).

NCHS and AHRQ – would call these either a **1331 percentage point increase** (NCHS) or **1331% increase** (AHRQ), referring to the increase from (from 283% to 1714%).

CDC would call it a **22 percentage point increase**.

Table N4. Illustration from Albain (J Nat Cancer Inst 2009) Data on Survival Rates of White and Black Women for Various Types of Cancers, from Albains et al., with Disparities Measures

Type	Wh Surv Rate	Bl Surv Rate	W/B Ratio Surv	B/W Ratio Mort	Abs Df (pp) *	Odds Ratio	EES
premenopausal breast cancer	77%	68%	1.13	1.39	9	1.58	0.27
postmenopausal breast cancer	62%	52%	1.19	1.26	10	1.51	0.26
advanced ovarian cancer	17%	13%	1.31	1.05	4	1.37	0.18
advanced prostate cancer	9%	6%	1.50	1.03	3	1.55	0.21

Studies finding larger relative differences in survival for more survivable cancers (or among the young) are really about relative differences in mortality. See Mortality and Survival page Mortality/Survival Illustration subpage of Scanlan's Rule page.

Table N5. Rates of Births Attended by Skilled Persons for Highest and Lowest Income Quintiles in Columbia and Bangladesh, from WHO Handbook on Health Inequality Monitoring (2013), with Disparities Measures

Country	Highest Quintile Attend Rate	Lowest Quintile Attend Rate	H/L Ratio Attend (WHO)	L/H Ratio No Attend (NCHS)	EES
Columbia	99.4%	83.7%	1.19	27.17	1.34
Bangladesh	50.6%	4.9%	10.33	1.93	1.67

WHO Handbook cites the 2005 NCHS monograph and seems to think it is following it. But relying on relative differences between attendance rates (BLUE) finds largest disparity for seven countries examined where NCHS would find smallest disparity (RED), and vice versa, with starkly different interpretations as to size .

- No federal agency apart from NCHS has recognized that it is possible for the two relative differences to change in opposite directions, much less that they tend to do so systematically.
- That holds for CDC, of which NCHS is a part, and which issues its own *Health Disparities and Inequalities Reports (CDC 2011, 2012)*
- See FCSM paper at 28-29.

Agency for Healthcare Research and Quality

Yearly National Healthcare Disparities Report Since 2003

See July 1, 2015 letter to AHRQ

Table A1. Four Situations Where 2012 NHDR (AHRQ) Highlighted Decreases in Disparities While NCHS Would Find Increases

Ref	YR	AG Fav Rt	DG Fav Rt	RR Fav	RR Adv	AbsDf (pp)	EES
3	2006	66.50%	49.40%	1.35	1.51	17	0.44
3	2010	83.10%	72.40%	1.15	1.63	11	0.36
4	2005	63.90%	45.70%	1.40	1.50	18	0.46
4	2010	94.50%	91.70%	1.03	1.51	3	0.21
10	2005	63.90%	44.70%	1.43	1.53	19	0.49
10	2010	94.50%	88.30%	1.07	2.13	6	0.40
11	2005	57.90%	41.50%	1.40	1.39	16	0.41
11	2010	92.90%	87.40%	1.06	1.77	6	0.32

See 2013 FCSM presentation Table 14 for clarifying information. Item 10 pertains to Hispanic-White differences in Hospital patients age 65+ with pneumonia who received a pneumococcal screening or vaccination.

Table A2. Closer Look at Situation Where 2012 NHDR (AHRQ)

Highlighted Decreases in Disparities While NCHS Would Find Increases

Ref	YR	AG Fav Rt	DG Fav Rt	RR Fav	RR Adv	AbsDf	EES
10	2005	63.90%	44.70%	1.43	1.53	0.19	0.49
10	2010	94.50%	88.30%	1.07	2.13	0.06	0.40

Pre 2010 (change measured in terms of percentage point change in relative difference in adverse outcome)

60 pct point increase in the relative difference in the adverse outcome (Inc Disp)

60 pct point larger disparity at end of the period than beginning (Inc Disp)

2010 to 2012 (change measured in terms of comparative pct point change in rates)

13 pct point larger change in rate for DG than AG (Dec Disp)

60 pct point larger disparity at end of the period than beginning (Inc Disp)

2013 to _____ (changed measured in terms of percent changes in rates)

Either

(a) 38.6 pct point larger relative change in favorable outcome rate for DG (Dec Disp)

(b) 18 pct point larger relative change in adverse outcome rate for AG (Inc Disp)

60 pct point larger disparity at end of the period than beginning (Inc Disp)

Assorted Anomalies

NEJM (Aug. 18, 2015)

- **Jha et al. NEJM 2005**

  - study of racial differences in receipt of uncommon (increasing) procedures
  - found **usually increasing absolute differences**

- **Trivedi et al. NEJM 2005**

  - examined racial differences in common (increasing) procedures/outcomes
  - found **usually decreasing absolute differences especially for process measure**

Spurious Contradictions

- **1. Escarce and McGuire APHA 2004**
  - racial differences in uncommon (increasing) procedures 1986-1997
  - found usually **decreasing relative differences** in receipt (but would have found usually increasing absolute differences)

- **2. Jha et al. NEJM 2005**
  - similar to no. 1 but for period 1992 to 2001
  - found **usually increasing absolute differences** (but would have found usually decreasing relative differences in receipt)

- **3. Le Cook et al. Med Care Res and Rev 2008**
  - titled "Measuring Trends in Racial/Ethnic Health Care Disparities"
  - relied on absolute differences in things it reported
  - Regarding studies 1 and 2 stated: *"The methods and data in [Jha et al.] were the same as Escarce and McGuire, except for the partial overlap in time periods. Assembly of a longer time series in Medicare would be necessary to reconcile the apparent differences in the findings of the two studies."*

See Spurious Contradictions Subpage of Measuring Health Disparities Page

Vanderbilt AHRQ-Funded Study

- "3. Quality Improvement Interventions to Address Healthcare Disparities, Closing the Quality Gap: Revisiting the State of the Science," Institute for Medicine and Public Health of the Vanderbilt University Medical Center (Aug. 2012)
- AHRQ funded ($6 to $10 million) study of effects of healthcare improvement on racial disparities in healthcare
- 475-page, peer reviewed report with 4258 references
- No discussion of the measures used in particular studies
- See "Race and Mortality Revisited" at 333; AHRQ's Vanderbilt Study subpage of MHD

- *Commissioned Paper: Healthcare Disparities Measurement* , Harvard Medical School and Massachusetts General Hospital (Oct. 2011)
- Discussed in Looking Forward Section of "Race and Mortality Revisited" and letter to Harvard Medical School et al.
- Response of Harvard Medical School and Massachusetts General Hospital: "differences of scientific opinion."

Salient passages from *Commissioned Paper: Healthcare Disparities Measurement (1)*

Page 7:

"Whether to report relative of absolute differences in care of favorable or unfavorable events should be determined in the context of the measure, but neither approach is universally superior for each outcome of interest."

Salient passages from *Commissioned Paper: Healthcare Disparities Measurement (2)*

Page 56:

The choice of a disparity measure can lead to different interpretations when making comparisons over time or among providers. Therefore, both absolute and relative statistics should be calculated; and if they lead to conflicting conclusions, both should be presented, **allowing the readers to make their own interpretations**.

As above with respect to absolute and relative comparisons, public reporting of disparities should calculate statistics using both favorable and adverse events. If the results are notably different, both statistics should be reported, **allowing the readers to judge the importance by taking the context of the report into consideration**.

Table AA1(a). Hypothetical Black and White Poor Quality Rate From Slide Titled "Did Racial-Ethnic Disparities Get Better or Worse Between 2000-2010? Answer: Both" at April 2014 MMS Leadership Forum, with Measures of Difference

YR	B	W	RRAdv	Abs Diff (pp)
2000	40%	25%	1.6	15
2010	20%	10%	2.0	10

Table AA1(b). Hypothetical Black and White Poor Quality Rate From Slide Titled "Did Racial-Ethnic Disparities Get Better or Worse Between 2000-2010? Answer: Both" at April 2014 MMS Leadership Forum, with More Measures of Difference

YR	B	W	RRFav	RRAdv	Abs Diff (pp)	OR	EES
2000	40%	25%	1.25	1.6	15	2.00	.42
2010	20%	10%	1.13	2.0	10	2.25	.44

Tester Illustrations

Table T1. Illustration of Contrasting Interpretations of Effects of Convictions on Callback Rates of Applicants by Race (based on Pager 2003)

Race	No Conviction (AG) CB Rt	Conviction (DG) CB Rt	AG/DG Ratio CB	DG/AG Ratio No CB	EES
White	34%	17%	2.00	1.26	0.54
Black	14%	5%	2.80	1.10	0.56

Note: This table reflect the alternative perspective (comparison of a factor's effects on different groups). Author drew inferences based on comparative size of relative differences in favorable outcomes (blue field). See the Criminal Record Effects subpage of SR for racial differences among those with and without criminal records and a later study with rather different results.

Cardiac Catheterization Tester Study, NEJM 1999

Tester study where 720 physicians made recommendations regarding cardiac catheterization based on videos of 18 symptom scenarios involving 8 actors (WM, WF, BM, BF age 55 and 70)

Conclusion: Our findings suggest that the race and sex of a patient independently influence how physicians manage chest pain.

Schulman KA, Berlin JA, Harless, et al. The effect of race and sex on physicians' recommendations for cardiac catheterization. N Engl J Med 1999;340:618-26.

See my comment originally posted on Journal Review in 2007

Table T2. Catheterization Recommendations from Schulman Study

Group	Recommendation Rate
White Men	90.6%
White Women	90.6%
Black Men	90.6%
Black Women	78.9%
All White	90.6%
All Black	84.7%
All Men	90.6%
All Women	84.7%
All Men	90.6%
All Women (adj)	89.1%

Table T3(a). Patterns of Catheterization Rates, and Measures of Difference, Based on EES from Schulman and Different Symptom Severities, with Measures of Difference

AG	DG	AG/DG Fav	EES
90.6%	84.7%	1.07	0.293
60.0%	48.4%	1.24	0.293
40.0%	29.2%	1.37	0.294
20.0%	12.8%	1.56	0.294
10.0%	5.8%	1.72	0.29

Table T3(b). Patterns of Catheterization Rates, and Measures of Difference, Based on EES from Schulman and Different Symptom Severities, with Measures of Difference

AG	DG	AG/DG Fav	DG/AG Adv	EES
90.6%	84.7%	1.07	1.63	0.293
60.0%	48.4%	1.24	1.29	0.293
40.0%	29.2%	1.37	1.18	0.294
20.0%	12.8%	1.56	1.09	0.294
10.0%	5.8%	1.72	1.05	0.29

Table T3(c). Patterns of Catheterization Rates, and Measures of Difference, Based on EES from Schulman and Different Symptom Severities, with Measures of Difference

AG	DG	AG/DG Fav	DG/AG Adv	Abs Df	EES
90.6%	84.7%	1.07	1.63	5.90	0.293
60.0%	48.4%	1.24	1.29	11.60	0.293
40.0%	29.2%	1.37	1.18	10.80	0.294
20.0%	12.8%	1.56	1.09	7.20	0.294
10.0%	5.8%	1.72	1.05	4.20	0.29

Table 3(d). Patterns of Catheterization Rates, and Measures of Difference, Based on EES from Schulman and Different Symptom Severities, with Measures of Difference

AG	DG	AG/DG Fav	DG/AG Adv	Abs Df	OR	Alt OR	EES
90.6%	84.7%	1.07	1.63	5.90	1.74	0.57	0.293
60.0%	48.4%	1.24	1.29	11.60	1.60	0.63	0.293
40.0%	29.2%	1.37	1.18	10.80	1.62	0.62	0.294
20.0%	12.8%	1.56	1.09	7.20	1.70	0.59	0.294
10.0%	5.8%	1.72	1.05	4.20	1.80	0.55	0.29