**MCA & NAEP Achievement Gaps**

**A Comparison of Measures and Metrics over Time**

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December 9, 2014

This is a brief report on the racial/ethnic achievement gaps comparing 2013 MCA and MN NAEP results using two different metrics, mean scores and percent proficient, reporting both in a common standardized difference effect size. MCA data were obtained from the MDE online Assessment and Growth Files[[1]](#footnote-1), which contain test score means and SDs for subgroups. The NAEP Data Explorer[[2]](#footnote-2) was used to estimate subgroup test means and SDs. The results reported here are based on the last NAEP administration, which occurred in 2013 in Reading and Mathematics with students in grades 4 and 8. Data from 2009, 2011, and 2013 are examined.

***Mean Score Differences***

Effect-size based achievement gaps are estimated to facilitate comparison of mean score differences in MCA and NAEP subgroup performance. Standardized mean differences (Cohen’s *d*) are computed for each subgroup compared to White students, by taking the mean difference between each subgroup ($\overbar{X}\_{g}$) and the White reference group ($\overbar{X}\_{W}$) divided by the statewide standard deviation for that grade and test.

Effect size:

$$d= \frac{\left(\overbar{X}\_{g}-\overbar{X}\_{W}\right)}{SD\_{MN}}$$

This puts each difference in a common metric, in terms of standard deviations of difference in mean scores (*d*). For example, *d* = 0.50 indicates a half SD difference in scores; *d* = 1.20 indicates a score difference of 1.20 SDs. The *d* effect size puts all gap estimates on a common metric, since different tests for different grades in different years result in different scales (SDs).

***Proportion Proficient Differences***

Assuming an underlying normal distribution, ***d***probit will be an unbiased estimator of the population standardized mean difference in dichotomized performance (e.g., proficient/not proficient), and this estimator behaved well under controlled simulation in comparison to six other estimators[[3]](#footnote-3). The standardized proportion difference effect size (***d***probit) was computed using the *Practical Meta-Analysis Effect Size Calculator*[[4]](#footnote-4).

**MCA Standardized Mean Differences: *d***

***MCA 2013 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 453 | 853 | 461 | 853 |
| Black | 440 | 839 | 445 | 841 |
| Hispanic | 441 | 841 | 447 | 843 |
| Asian | 448 | 846 | 457 | 852 |
| American Indian | 441 | 840 | 448 | 841 |
| State SD | 15 | 18 | 18 | 14 |

***MCA 2013 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.81 | -0.78 | -0.86 | -0.90 |
| Hispanic | -0.74 | -0.69 | -0.75 | -0.74 |
| Asian | -0.33 | -0.37 | -0.20 | -0.10 |
| American Indian | -0.73 | -0.74 | -0.74 | -0.89 |

***MCA 2011 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 462 | 857 | 460 | 852 |
| Black | 449 | 846 | 444 | 840 |
| Hispanic | 450 | 848 | 446 | 842 |
| Asian | 456 | 853 | 456 | 850 |
| American Indian | 450 | 848 | 447 | 840 |
| State SD | 16 | 14 | 18 | 14 |

***MCA 2011 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.77 | -0.77 | -0.86 | -0.89 |
| Hispanic | -0.74 | -0.69 | -0.76 | -0.73 |
| Asian | -0.37 | -0.30 | -0.18 | -0.15 |
| American Indian | -0.71 | -0.69 | -0.73 | -0.89 |

***MCA 2009 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 461 | 856 | 459 | 854 |
| Black | 447 | 844 | 448 | 840 |
| Hispanic | 448 | 846 | 452 | 844 |
| Asian | 454 | 851 | 459 | 853 |
| American Indian | 450 | 847 | 450 | 842 |
| State SD | 16 | 14 | 13 | 15 |

***MCA 2009 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.85 | -0.83 | -0.89 | -0.97 |
| Hispanic | -0.82 | -0.75 | -0.58 | -0.68 |
| Asian | -0.43 | -0.36 | -0.04 | -0.05 |
| American Indian | -0.71 | -0.68 | -0.71 | -0.82 |

**MCA Standardized Proportion Differences: *d***probit

***MCA 2013 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .62 | .61 | .79 | .66 |
| Black | .29 | .29 | .44 | .29 |
| Hispanic | .31 | .31 | .48 | .34 |
| Asian | .47 | .44 | .69 | .60 |
| American Indian | .29 | .31 | .49 | .29 |

***MCA 2013 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.86 | -0.83 | -0.96 | -0.97 |
| Hispanic | -0.80 | -0.78 | -0.86 | -0.82 |
| Asian | -0.38 | -0.43 | -0.31 | -0.16 |
| American Indian | -0.86 | -0.78 | -0.83 | -0.97 |

***MCA 2011 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .82 | .74 | .75 | .60 |
| Black | .53 | .43 | .40 | .25 |
| Hispanic | .53 | .46 | .44 | .28 |
| Asian | .66 | .61 | .66 | .52 |
| American Indian | .56 | .46 | .44 | .24 |

***MCA 2011 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.84 | -0.82 | -0.93 | -0.93 |
| Hispanic | -0.84 | -0.74 | -0.83 | -0.84 |
| Asian | -0.50 | -0.36 | -0.26 | -0.20 |
| American Indian | -0.76 | -0.74 | -0.83 | -0.96 |

***MCA 2009 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .82 | .74 | .80 | .65 |
| Black | .49 | .38 | .45 | .25 |
| Hispanic | .49 | .41 | .58 | .35 |
| Asian | .63 | .55 | .76 | .61 |
| American Indian | .54 | .43 | .54 | .31 |

***MCA 2009 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.94 | -0.95 | -0.97 | -1.06 |
| Hispanic | -0.94 | -0.87 | -0.64 | -0.77 |
| Asian | -0.58 | -0.52 | -0.14 | -0.11 |
| American Indian | -0.81 | -0.82 | -0.74 | -0.88 |

**NAEP Standardized Mean Differences: *d***

***NAEP 2013 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 223 | 227 | 259 | 301 |
| Black | 208 | 248 | 232 | 260 |
| Hispanic | 207 | 251 | 234 | 273 |
| Asian | 223 | 266 | 250 | 291 |
| State SD | 36 | 34 | 30 | 37 |

***NAEP 2013 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.69 | -0.84 | -0.90 | -1.11 |
| Hispanic | -0.70 | -0.75 | -0.85 | -0.76 |
| Asian | -0.27 | -0.30 | -0.30 | -0.27 |

***NAEP 2011 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 229 | 274 | 255 | 302 |
| Black | 199 | 246 | 225 | 266 |
| Hispanic | 201 | 257 | 230 | 270 |
| Asian | 217 | 267 | 253 | 282 |
| State SD | 36 | 33 | 30 | 35 |

***NAEP 2011 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.83 | -0.85 | -1.02 | -1.01 |
| Hispanic | -0.80 | -0.51 | -0.82 | -0.91 |
| Asian | -0.35 | -0.23 | -0.08 | -0.56 |

***NAEP 2009 Mean Scale Scores by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | 230 | 275 | 255 | 300 |
| Black | 195 | 244 | 227 | 264 |
| Hispanic | 194 | 247 | 232 | 269 |
| Asian | 219 | 260 | 243 | 283 |
| State SD | 37 | 32 | 28 | 35 |

***NAEP 2009 Racial Achievement Gaps based on the Standardized Mean Difference d***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.96 | -0.96 | -1.00 | -1.05 |
| Hispanic | -0.98 | -0.87 | -0.82 | -0.90 |
| Asian | -0.30 | -0.48 | -0.41 | -0.51 |

**NAEP Standardized Proportion Differences: *d***probit

***NAEP 2013 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .47 | .46 | .67 | .54 |
| Black | .21 | .16 | .32 | .15 |
| Hispanic | .23 | .20 | .34 | .20 |
| Asian | .44 | .34 | .52 | .43 |

***NAEP 2013 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -0.73 | -.89 | -.91 | -1.14 |
| Hispanic | -0.66 | -.74 | -.85 | -.94 |
| Asian | -0.08 | -.31 | -.39 | -.28 |

***NAEP 2011 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .42 | .44 | .60 | .55 |
| Black | .16 | .15 | .23 | .18 |
| Hispanic | .12 | .23 | .28 | .18 |
| Asian | .32 | .37 | .57 | .35 |

***NAEP 2011 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -.79 | -.89 | -.99 | -1.04 |
| Hispanic | -.97 | -.59 | -.84 | -1.04 |
| Asian | -.27 | -.18 | -.08 | -.51 |

***NAEP 2009 Proportion Proficient or Higher by Race***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| White | .43 | .44 | .61 | .53 |
| Black | .12 | .10 | .25 | .13 |
| Hispanic | .13 | .16 | .29 | .21 |
| Asian | .34 | .30 | .44 | .35 |

***NAEP 2009 Racial Achievement Gaps based on the Standardized Proportion Difference d***probit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Reading 4 | Reading 8 | Math 4 | Math 8 |
| Black | -1.00 | -1.13 | -.95 | -1.20 |
| Hispanic | -.95 | -.84 | -.83 | -.88 |
| Asian | -.24 | -.37 | -.43 | -.46 |

1. http://w20.education.state.mn.us/MDEAnalytics/Data.jsp [↑](#footnote-ref-1)
2. National Center for Education Statistics (n.d.). *NAEP Data Explorer*. Washington DC: US Dept. of Education, Institute of Education Statistics. Retrieved from http://nces.ed.gov/nationsreportcard/naepdata/report.aspx [↑](#footnote-ref-2)
3. Sanchez-Meca, J., Marin-Martinez, F., & Chacon-Moscoso, S. (2003). Effect size indices for dichotomized outcomes in meta-analysis. *Psychological Methods, 8*(4), 448-467. [↑](#footnote-ref-3)
4. Wilson, D.B. (n.d.). *Practical meta-analysis effect size calculator*. Retrieved from http://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-SMD10.php [↑](#footnote-ref-4)