

Three Questions to Always Ask about Data

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Background: Dilemmas

- Many students **struggle to critically evaluate** stats-based arguments (even if they understand core stats concepts)
- Important to **preview basic measurement/design issues early**, even if detailed treatments appear later
- Students **struggle to organize/connect** the various concepts and examples covered

3 Questions to Always Ask about Data

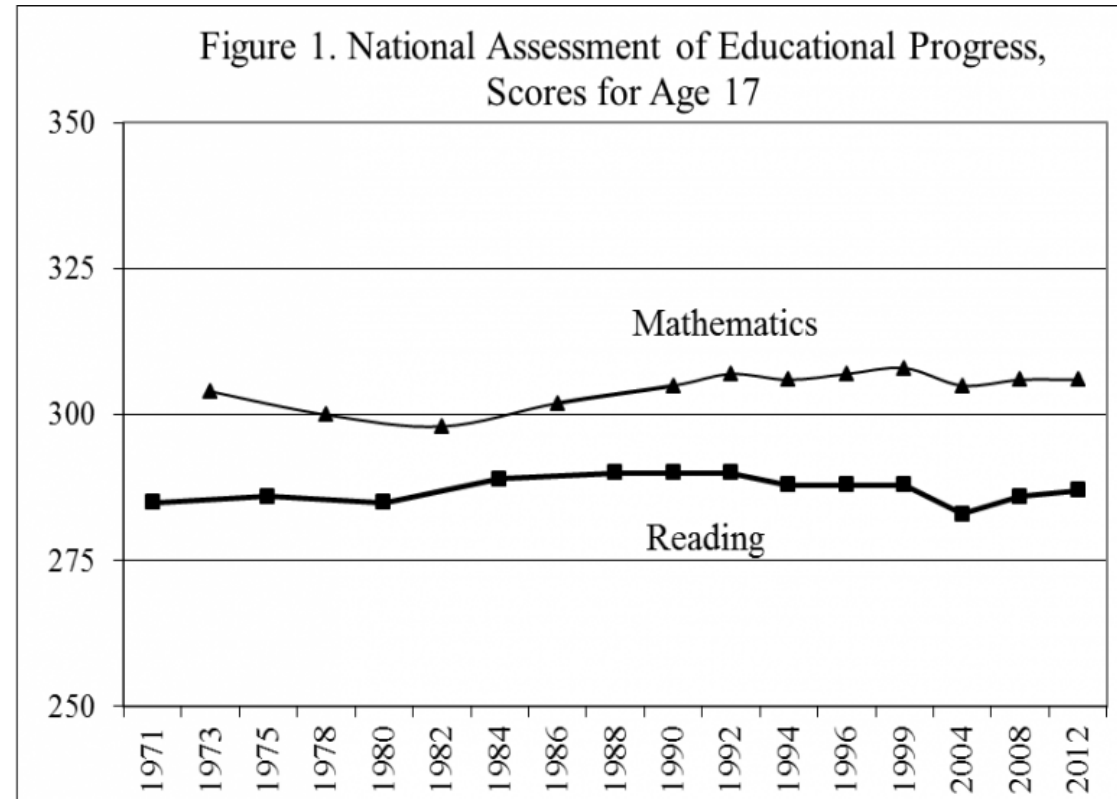
1. What is being measured?
2. Who (or what) is in the dataset?
3. How big are the differences?

Application 1: long-term math learning trends

- In-class activity/discussion

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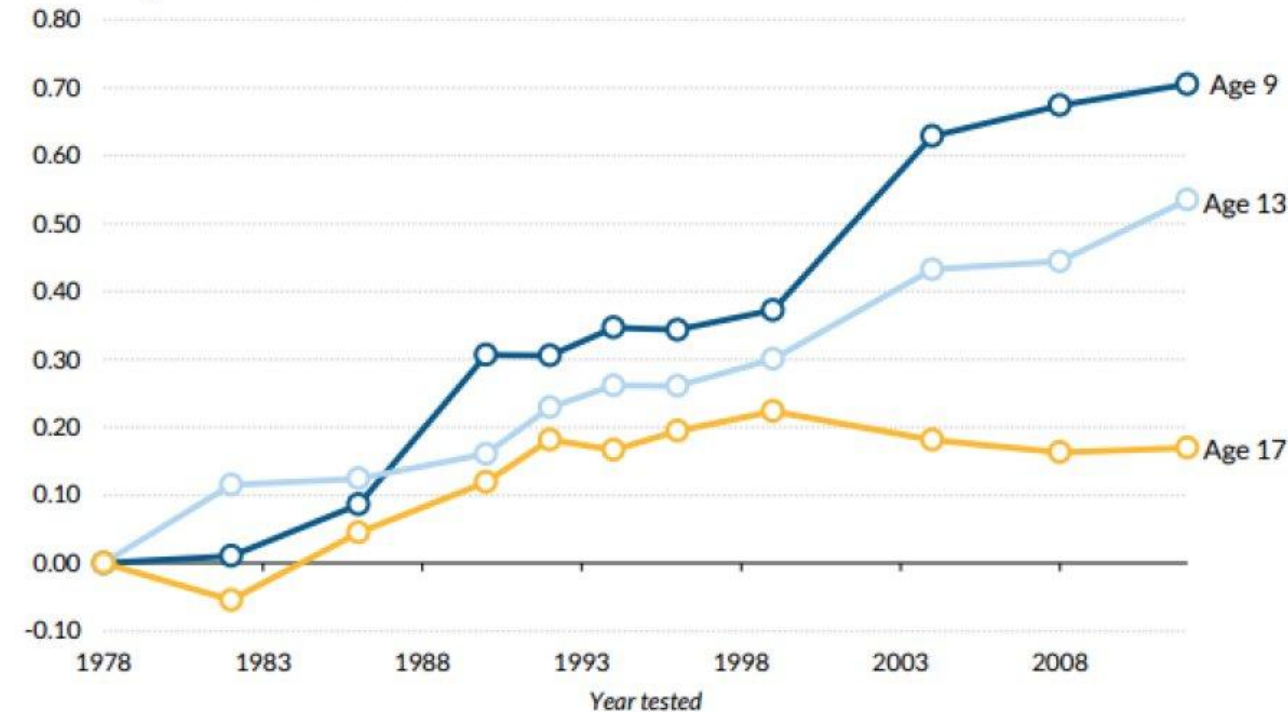
<https://www.downsizinggovernment.org/education/k-12-education-subsidies>

Application 1: long-term math learning trends

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LTT NAEP Mathematics Score Changes, in 1978 Standard Deviations

Score change on LTT NAEP since 1978



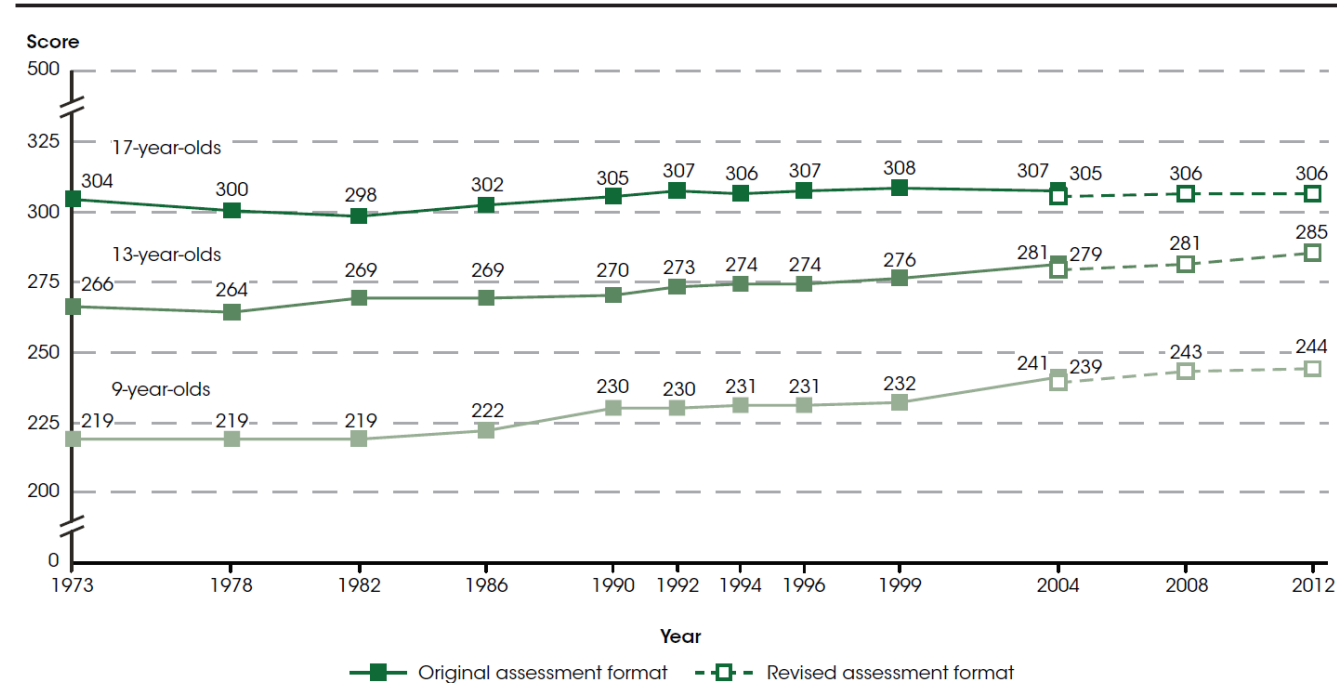
Source: Urban Institute

<https://www.urban.org/research/publication/varsity-blues-are-high-school-students-being-left-behind>

Application 1: long-term math learning trends

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Figure 2. Average mathematics scale scores on the long-term trend National Assessment of Educational Progress (NAEP), by age: Selected years, 1973 through 2012

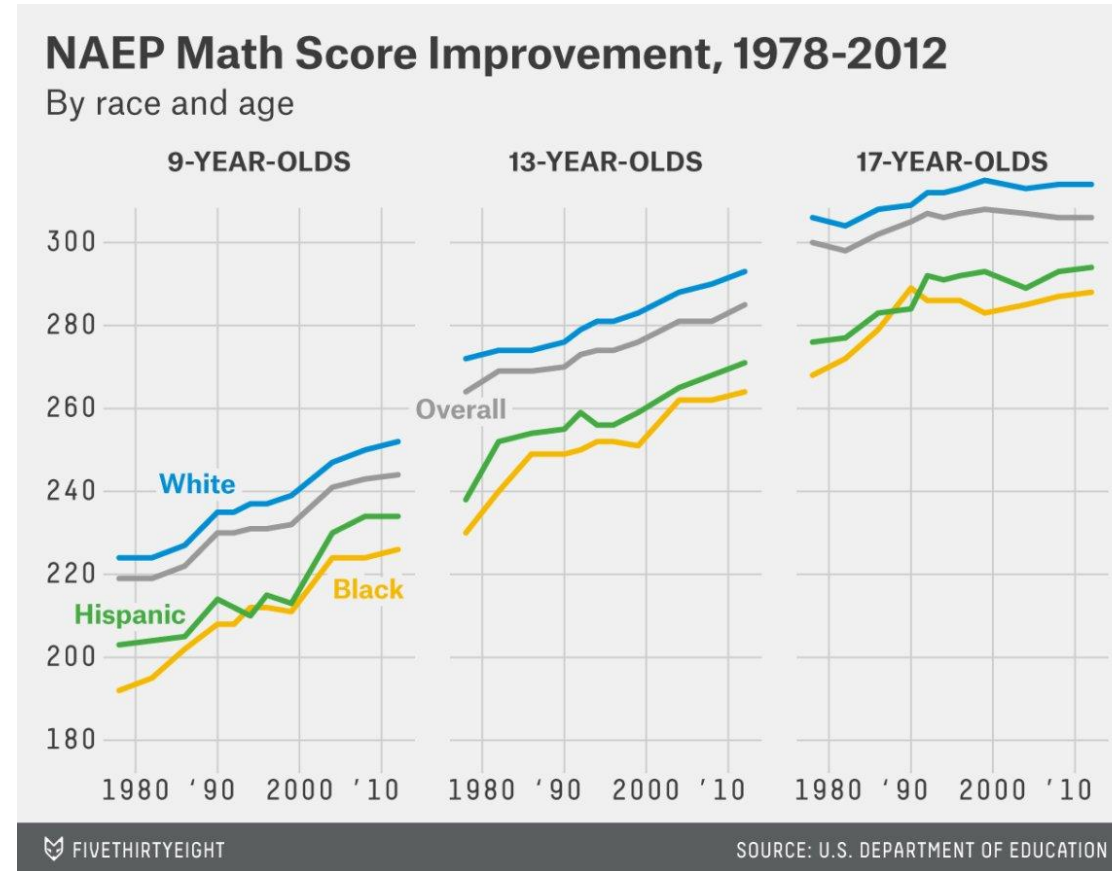


NOTE: Includes public and private schools. NAEP scores range from 0 to 500. Several administrative changes were initiated beginning with the 2004 assessment, including allowing accommodations for students with disabilities and for English language learners. To assess the impact of these revisions, two assessments were conducted in 2004, one based on the original assessment and one based on the revised assessment. In 2008 and 2012, only the revised assessment was used.
SOURCE: National Center for Education Statistics (2013). *The Nation's Report Card: Trends in Academic Progress 2012* (NCES 2013-456). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, Washington, D.C. See *Digest of Education Statistics 2013*, table 222.85.

https://nces.ed.gov/programs/coe/pdf/coe_cnj.pdf

Application 1: long-term math learning trends

1. What is being measured?
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<https://fivethirtyeight.com/features/black-and-hispanic-students-are-making-meaningful-gains-but-its-hard-to-tell/>

Application 2: Student presentations

Option 1: Present a source providing statistical claims that you then critically examine

- Provide your own reflections on the source's statistical claims (including your best judgments about the strengths and weaknesses of the analysis/claims by the source)
- I recommend addressing all 3 *Questions to Always Ask about Data*
 - What is being measured? (Are there valid and consistent measures of key variables?)
 - Who (or what) is in the sample?
 - How big are the differences?

Final thoughts

- Informally, I observed better analysis in presentations, compared to prior semesters (which lacked this framework)
- Now, I'm incorporating into 2nd edition of my open access textbook: minusthemath.com
- Please feel free to reach out: favero@american.edu