Lost Ground, Lingering Gaps: What Math NAEP Scores Tell Us About Equity

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The National Assessment of Educational Progress (NAEP), commonly referred to as "The Nation's Report Card", is a congressionally mandated standardized test administered annually to 4th, 8th, and 12th grade students across the nation. Overseen and administered by the National Center for Education Statistics, NAEP is the only assessment that allows for nationwide comparisons of all students, including both public and private school attendees, in a variety of subjects across demographic groups. Since its first administration in 1969, this test has provided valuable information to educators, policymakers, and stakeholders on student progress, achievement gaps, and changes in educational outcomes.

However, under the current federal administration, the future of NAEP is uncertain. In recent weeks, mass lay-offs have reduced the number of staff working on NAEP testing by 97%, and the 12th grade exam has been cancelled for 2025. These staffing and funding cuts threaten not only the continuation of the NAEP exam, which has been a useful benchmark for education standards for many years, but also the ability to measure educational inequities on a national scale.

This analysis will focus on 8th grade math scores for the years 2019, 2022, and 2024, and will examine trends in performance and disparities in achievement by race, gender, and economic status. Doing so allows for investigation into the lasting impact of COVID-19 on test scores, as well as the deeper systemic inequalities that exist in the American education system.

As a former public school math teacher, I am particularly invested in student achievement in math. Math achievement has been shown to be a strong predictor of future academic and career success (Visser, 2021). Striving to prepare their students for success in and out of the classroom, educators are facing a growing divide in equity across demographic groups, especially in those groups that are historically the most marginalized. This inequity means many students are being left behind in a subject that is critical to their future success. As a result, the math achievement gap is not just an academic issue, but also a social and economic justice issue that must be addressed in policy and in practice.

DATA AND METHODS

This analysis uses publicly available data from NAEP website to examine trends in 8th grade achievement in math scores. Specifically, it seeks to investigate:

-The impact of the COVID-19 pandemic on 8th grade math achievement scores -Nationwide and statewide trends across time -Disparities in scores across gender, race, and economic status

The variables of interest in this analysis are:

-**Year**: 2019, 2022, 2024

-**State**: All 50 states, the District of Columbia, Department of Defense Education Activity (DoDEA)

-**Race/Ethnicity**: White, Black, Hispanic, Asian/Pacific Islander, American Indian/Native American, Two or More Races

-**Gender**: Male, Female

-**Economic Status**: Economically Disadvantaged, Not Economically Disadvantaged

NAEP utilizes a multistage sampling method to create a representative sample of students across the nation. Schools are identified by the US Department of Education (DOE) and then verified for by state departments of education. Schools are then stratified by location type and racial/ethnic demographics, and arranged by achievement

level on state standardized exams. A random sample from each stratum is selected and then confirmed for eligibility from each state department of education. Once a school is selected, a random sample of students within the school are selected for each subject area based on grade (4th, 8th, 12th). Generally, 30 students are selected per grade per subject from each school, with about 95% participation rate for the 4th and 8th grade exams. In 2024, approximately 115,000 8th grade students took the NAEP math exam.

While individual student scores are not available, the aggregated subgroup scores reflect NAEP's internal weighting procedures to ensure the results reflect the national student population. Differences between this analysis and NAEP's overall trends may reflect subgroup-level aggregation rather than total population averages.

This analysis was conducted using two separate data sets and all cleaning, visualization, and statistical analysis was done using R Studio. The first data set contained the variables year, state, race, and aggregated score by gender. The second data set contained the variables year, state, gender, and aggregated score by economic status.

In order to prepare the data for analysis, both data sets were cleaned and converted to long format using the pivot.longer function in tidyverse. The two data sets were then merged by their common variables of year, state, and gender.

Summary statistics were computed for the state, year, and key demographic variables. Tables 1-3 provide an overview of average 8th grade math scores by race and economic

status for the years 2019, 2022, and 2024.

Table 1: Table 1: Average NAEP Math Score by Year

Year	Mean Score	SD	N
2019	278.6	17.8	864
2022	270.5	17.7	864
2024	269.9	19.0	864

Table 2: Table 2: Average NAEP Math Score by Race and Year

Race	Year	Mean Score	SD	N
American Indian/Alaska Native	2019	258.8	6.8	108
American Indian/Alaska Native	2022	253.4	7.0	108
American Indian/Alaska Native	2024	249.5	9.8	108
Asian/Pacific Islander	2019	306.7	16.3	108
Asian/Pacific Islander	2022	300.4	15.0	108
Asian/Pacific Islander	2024	300.7	16.8	108
Black	2019	258.4	7.0	108
Black	2022	250.9	6.2	108
Black	2024	250.5	7.0	108
Hispanic	2019	267.7	9.1	108
Hispanic	2022	259.5	8.9	108
Hispanic	2024	257.2	9.1	108
Two or more races	2019	285.1	7.5	108
Two or more races	2022	276.4	8.6	108
Two or more races	2024	275.7	10.2	108
White	2019	291.0	7.3	108
White	2022	283.5	7.8	108
White	2024	284.4	9.2	108

Table 3: Table 3: Average NAEP Math Score by Economic Status and Year

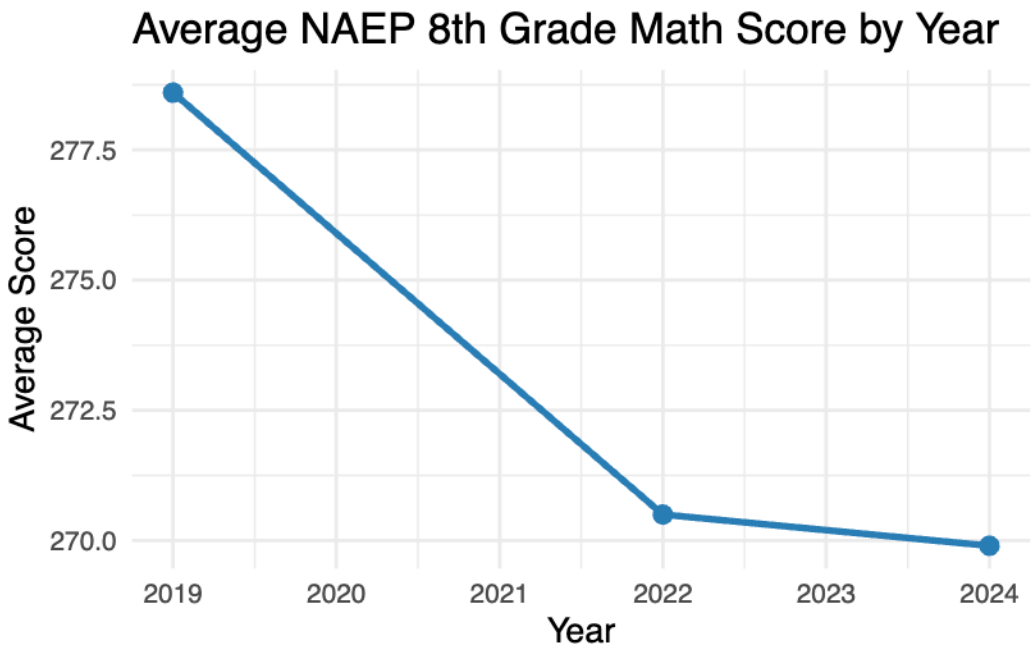
Economic Status	Year	Mean Score	SD	N
Disadvantaged	2019	265.2	7.5	108
Disadvantaged	2022	258.0	8.2	108
Disadvantaged	2024	256.5	8.3	108
NotDisadvantaged	2019	294.4	5.2	108
NotDisadvantaged	2022	284.3	10.0	108
NotDisadvantaged	2024	285.0	10.7	108

Results

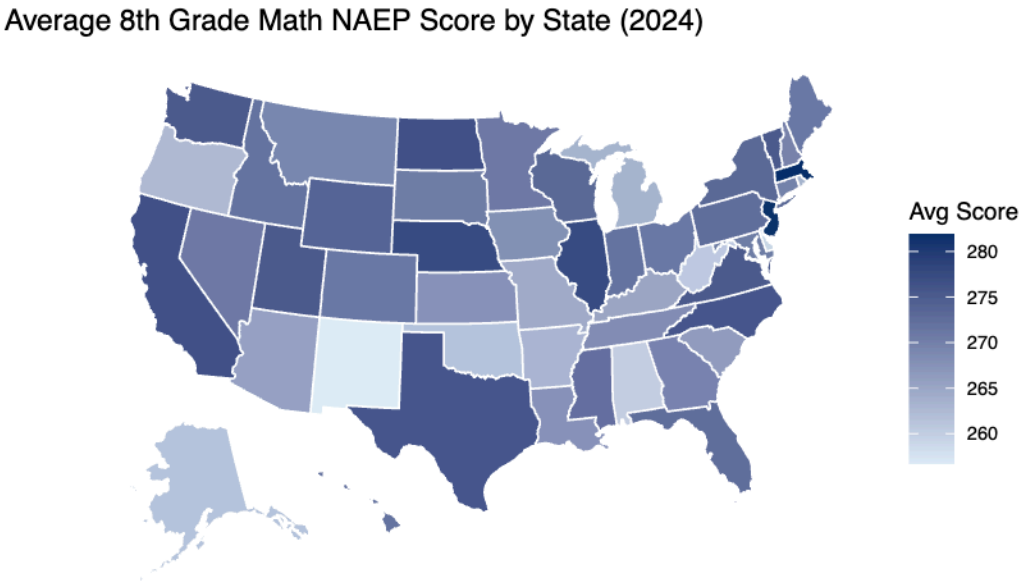
The impact of the COVID-19 pandemic on education in the US is widely known and well-documented, (Pinto, 2023). Test scores dropped, student anxiety and depression increased, school enrollment was down, and chronic absenteeism was up. But even before the nationwide school shut down, scores were showing a concerning downward trend (**axios2025scores?**), with a widening gap between the highest performing and lowest performing students.

Figure 1 shows a clear downward trend in national average math scores among 8th graders for the years 2019, 2022, and 2024. A sharp drop of over 8 points coincides with the academic disruptions caused by the COVID-19 pandemic. The continued decline

into 2024 suggests that post-pandemic remediation efforts have not fully offset earlier learning losses. This trend aligns with national concerns about persistent achievement gaps and long-term impacts on student preparedness.

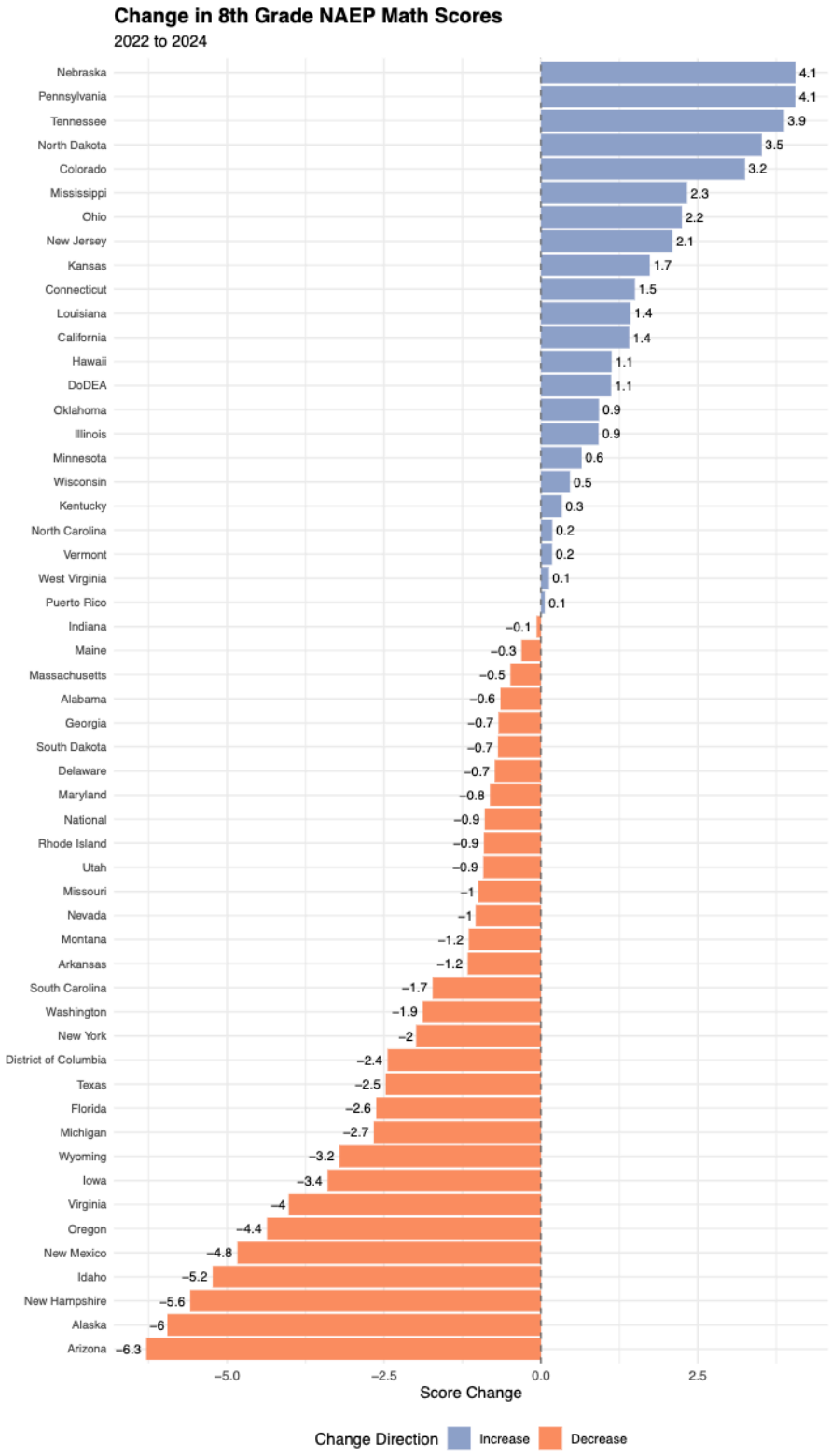


The 2024 heat map shows significant regional differences in student performance. States in the Northeast and Upper Midwest, such as Massachusetts and New Jersey, tend to report higher average scores, shown in darker blue shades. In contrast, Southern states like Arkansas and Alabama generally report lower average scores. This reflects existing gaps in educational opportunity that are often a function of funding metrics, local economies, and access to academic resources. The south's history of segregation is not to be overlooked in examining trends in scores across the nation.



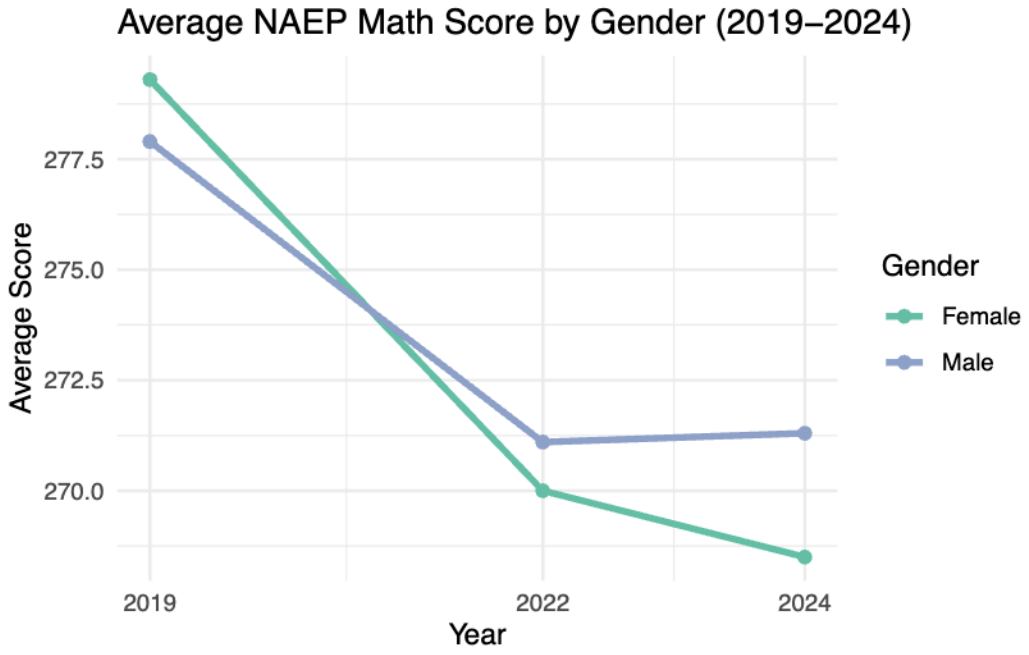
When comparing the change in average score from 2022 to 2024, most states continued to experience a decline. While some states did see a slight increase, none were statistically significant from their 2022 scores.

Arizona and Alaska saw the biggest decline in scores. Cuts in funding and an increase in student-teacher ratio could be contributing factors to Alaska's large average decrease in scores (Forum, 2024). Arizona ranks at the bottom in the nation for funding per pupil and faces a teacher shortage crisis, which may explain the significant decline in math scores (Affairs, 2025).


Change in 8th Grade NAEP Math Scores
2022 to 2024
Nebraska 4.1
Pennsylvania 4.1
Tennessee 3.9
North Dakota 3.5
Colorado 3.2
Mississippi 2.3
Ohio 2.2
New Jersey 2.1
Kansas 1.7
Connecticut 1.5
Louisiana 1.4
California 1.4
Hawaii 1.1
DoDEA 1.1
Oklahoma 0.9
Illinois 0.9
Minnesota 0.6
Wisconsin 0.5
Kentucky 0.3
North Carolina 0.2
Vermont 0.2
West Virginia 0.1
Puerto Rico 0.1
Indiana −0.1
Maine −0.3
Massachusetts −0.5
Alabama −0.6
Georgia −0.7
South Dakota −0.7
Delaware −0.7
Maryland −0.8
National −0.9
Rhode Island −0.9
Utah −0.9
Missouri −1
Nevada −1
Montana −1.2
Arkansas −1.2
South Carolina −1.7
Washington −1.9
New York −2
District of Columbia −2.4
Texas −2.5
Florida −2.6
Michigan −2.7
Wyoming −3.2
Iowa −3.4
Virginia −4
Oregon −4.4
New Mexico −4.8
Idaho −5.2
New Hampshire −5.6
Alaska −6
Arizona −6.3
−5.0
−2.5
0.0
2.5
Score Change
Change Direction
Increase
Decrease

While the pandemic certainly disrupted learning for all students, those effects were not proportionally distributed. Gender, race, and economic disparities that already existed were amplified in the wake of the pandemic.

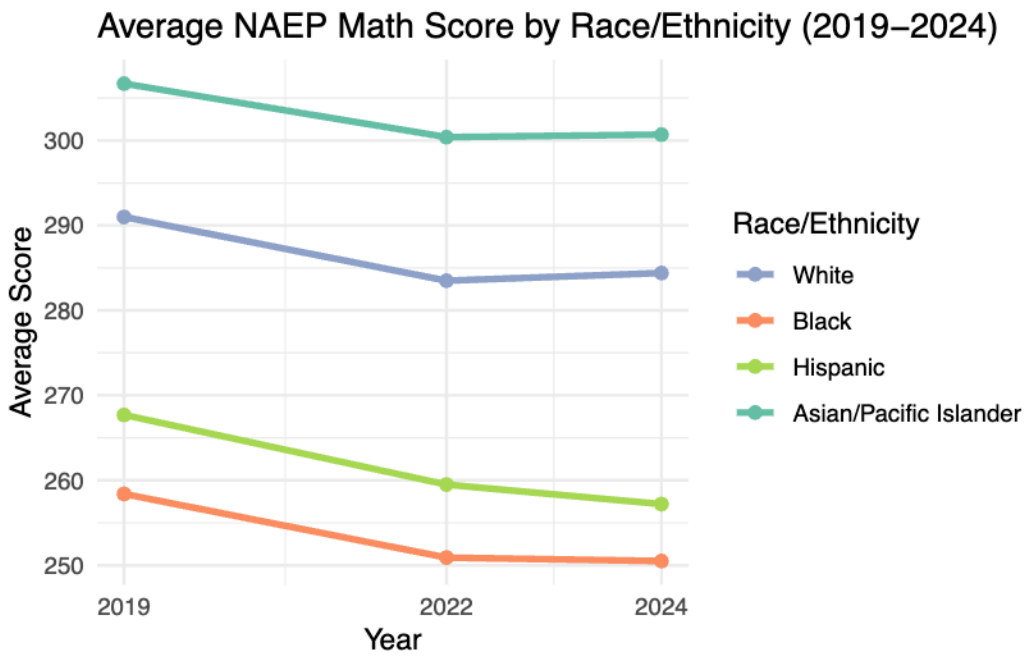
Prior to the pandemic, the national average 8th grade math scores for males and females were roughly the same. Post-pandemic, an achievement gap between genders appears to have widened and worsened into 2024. While the scores seem to be diverging, a t-test for mean differences by gender did not yield a statistically significant result, $t(355) = -1.203$, $p = .223$. This suggests that although there may be a slight widening of the gender gap in math performance, the difference may not be big enough to conclude that a true gender-based difference exists in the overall population.



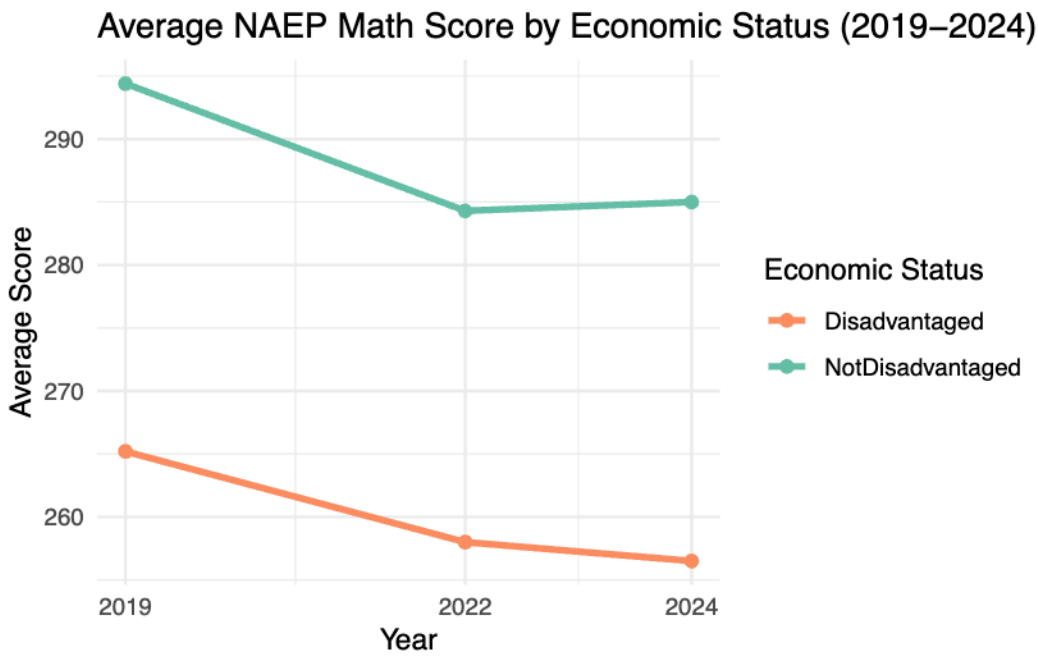
In 2024, Asian/Pacific Islander students had the highest average score (300.7) while

Black students had the lowest average score (250.5), a difference of 50.2 points, likely indicating that Asian/Pacific Islander students are significantly more proficient in basic mathematical and problem-solving skills. While all races saw a large drop in average scores from 2019 to 2022, White and Asian/Pacific Islander students showed improvement in 2024 scores while Black and Hispanic student scores continued to decline.

A one-way ANOVA was conducted to examine differences in 2024 math scores by race, and results showed a statistically significant difference in at least one group mean, $F(5, 325) = 217.3$, $p < .001$. A follow-up Tukey's HSD test confirmed that the mean scores for each racial group were significantly different from one another. While disparities in NAEP math scores by race are not new, the pandemic appears to have escalated the existing achievement gap. Though COVID-19 wasn't the root cause of these differences, it acted as a catalyst that magnified long-standing inequities in access to quality instruction, academic resources, and educational support systems.



The achievement gap in test scores between economically disadvantaged students and their more affluent peers remained fairly steady at about 30 points for the years 2019, 2022, and 2024. As in the case of racial disparity, the COVID-19 pandemic did not cause this gap in achievement, but rather it further deepened a disparity that already existed due to socioeconomic factors.



To examine how equity factors might effect 8th grade math scores, a linear regression model was conducted using year, gender, race, and economic status as predictors of average math score. To compare all students to the most historically marginalized groups, the reference group was set as Black, Disadvantaged, Female students.

The regression model predicting average math score from year, gender, race, economic status was statistically significant $F(6, 1853) = 1065$, $p<.001$ with about 78% of the variation in math scores being explained by the model (R-squared = .775).

After controlling for gender, race, and economic status, the regression model showed a significant decline in NAEP math scores over time. The "year" coefficient of -1.77 indicates the significant decline in achievement scores over the three years reported in

this analysis. This persistent decline highlights the need for continued remediation and interventions in the post-COVID years.

After controlling for year, race, and economic status, male students typically score about 1.2 points higher than female students. This gap, though small, is statistically significant and may indicate a developing disparity between male and female students.

The model shows a significant achievement gap due to race. Controlling for year, gender, and economic status, a large disparity in average math scores can be seen. Hispanic students typically score about 8.2 points higher than Black students. White and Asian/Pacific Islander students score about 33 and 49 points higher, respectively. Given that 10 points is roughly one school year, this huge gap highlights a significant problem facing educators.

Surprisingly, once the other factors are accounted for, economic status was not a significant predictor of math scores. This seems to indicate that race, gender, and year account for more of the variance in scores. Race may be a stronger predictor of achievement disparities than economic status, although socioeconomic and racial disparities are known to be closely related in educational outcomes (American Psychological Association, 2023)

Discussion

Education in the United States is in a state of flux. Achievement scores continue to de-

cline despite widespread interventions and remediation. This persistent decline indicates that recovery from the COVID-19 pandemic has not been fully realized and perhaps the long-term effects of the pandemic on student learning require a fundamentally different approach. Addressing learning loss on its own is not enough. Educators and policymakers are also faced with confronting systemic barriers in the American education system that existed long before COVID-19 ever did.

The persistent disparity in math scores between black students and their peers is not a new a problem, but it is one that urgently needs to be solved. There is still a great need for targeted academic recovery efforts, especially for historically marginalized groups, but equity-focused education policy should be at the forefront of all reform efforts.

Declining achievement scores are the symptom, not the problem. The problem, put simply, is an imperfect education system that is underfunded and undervalued, serving students who are often underrepresented and under-served. Solving this problem is not just a matter of more instructional minutes, more testing, more tutoring, more programs, although those are still needed. Solving this problem will require meeting students where they are with a strong commitment to justice and equity for all students.

Limitations

This analysis was conducted using publicly available, aggregated subgroup scores from the NAEP website. Due to the aggregated nature of the data, some results may differ from those reported on NAEP website using raw, individualized student data. During

the data cleaning step, missing data were removed from the analysis. This may have introduced a source of bias if the removal of missing data was not random (e.g., removing "Two or more races" from the race group due to missing 2019 data).

Future Analysis

This analysis provides a broad overview of trends and disparities in 8th grade NAEP math achievement, but additional research is needed to further understand the changes in achievement. Testing for interaction effects between key demographic variables and year could provide important information on how the achievement gaps are changing over time.

Additionally, future analysis using individual student and district data would allow for more robust and nuanced interpretations. This would help isolate the effects of demographic variables from those related to public funding, resources, geographic differences, or policy interventions.

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