

Lingering Effects of the Pandemic on Student Performance in Massachusetts, USA

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ABSTRACT

This study examines the impact of the COVID-19 disruption on student performance across socioeconomics, gender, and race using six years (2017-2023) of Massachusetts standardized test data from grade 3 through 8 in Mathematics and English Language Arts (ELA). Findings reveal a significant rise in the percentage of students Not Meeting (grade-level) Expectations (NME) in post-2020 years, with math exhibiting a higher immediate increase compared to ELA. Notably, the ELA NME rate is continuously rising for post-2020 years. Moreover, the surge in NME rate is disproportionately greater for high needs, female (math only), Hispanic, and Black students, suggesting an exacerbation of pre-existing inequities.

Keywords: COVID-19, Equity, Policy, Secondary data analysis, Student performance, USA

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I. Introduction

The COVID-19 pandemic left an immediate and lingering negative impact on schools, teachers, and students globally. Research has shown that many aspects of student performance, such as test scores [4] and high school completion rates [5] were affected by the pandemic. Estimates indicate a learning loss equivalent to seven months of schooling [3]. In the United States, this unprecedented disruption in schooling led to declines in student achievement in math and reading, and exacerbated pre-existing inequities, with projected ongoing learning losses [4].

Although many past studies have reported the initial learning losses immediately following the pandemic, new research to investigate the legacy effect of COVID-19 is essential. It is important to examine the latest data regarding student performance to understand the ongoing trends [6]. Many studies have taken socioeconomic and racial demographics into account; however, few have examined the effect of the pandemic on gender inequality [1]. Furthermore, many studies have compared reading and math, neglecting other aspects of English such as writing. Thus, in this brief, we sought to understand the lingering effect of the pandemic by including the latest 2023 data, comparing math with English Language Arts (ELA), and evaluating performance across socioeconomics, race, and gender demographics.

We investigated the impact of the COVID-19 pandemic on student performance in Massachusetts, a demographically diverse state in the United States with one of the best¹ public-school systems with more than half of the students reported as “high needs”. We assessed performance by comparing the average of three years of pre-2020 (2017-2019) and three years of post-2020 (2021-2023) Massachusetts Comprehensive Assessment System (MCAS) test data². Using data from approximately 400,000 grade 3 through 8 students, we sought to answer the following two research questions:

Research Question 1: How does the Not Meeting (grade-level) Expectations (NME) rate of students in post-2020 years compare to pre-2020 years for math and ELA?

Research Question 2: How is the average NME rate between pre-and post-2020 years related to the characteristics of student demographics?

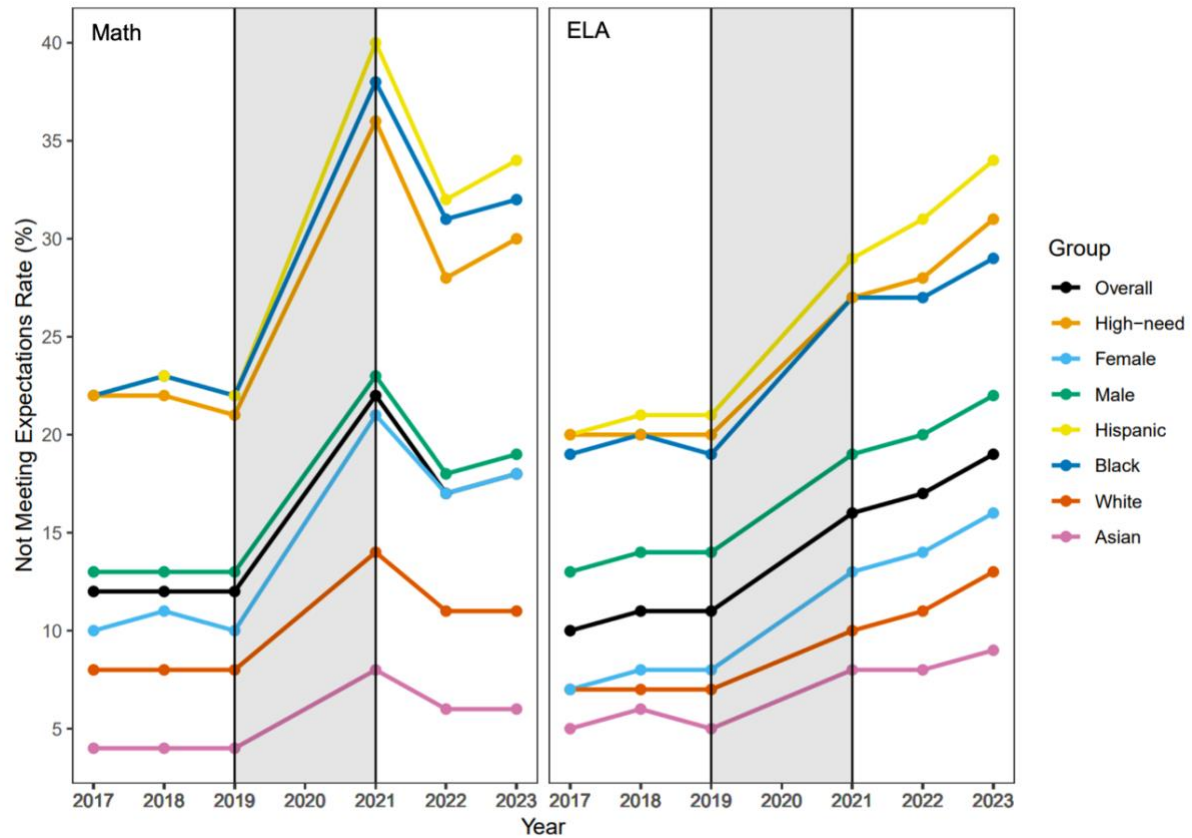
II. How does the Not Meeting (grade-level) Expectations (NME) rate of students in post-2020 years compare to pre-2020 years for math and ELA?

Figure 1 displays the NME rate of students between 2017 to 2023 for eight student groups-Overall, High needs, Female, Male, Hispanic, Black, White, and Asian. There was no MCAS assessment in 2020 due to the COVID-19 lockdown. MCAS results categorize students into three main expectations groups:

Meeting+Exceeding, Partially Meeting, and Not Meeting Expectations. We focus on the percentage of students Not Meeting (grade-level) Expectations to better highlight the demographic disparities.

The overall NME rates (Figure 1) of students remained relatively stable for both math and ELA before the pandemic at 12% and 11% respectively. Additionally, differences between the eight groups were small. Compared to the overall population, female, White and Asian students had lower NME rates. Between 2019 and 2021 there was a sharp increase in the overall NME rate of students, from 12% to 22% in math and 11% to 16% in ELA. The differences between the groups were exacerbated. This spike is particularly noteworthy for historically marginalized groups, including Hispanic, Black, high needs, and female (in math only), who exhibited a steeper rise in NME rates compared to White, Asian, and male students.

Figure 1. Students Not Meeting (grade-level) Expectations (NME) rates in Massachusetts Public Schools for math and English Language Arts (ELA)—2017 to 2023.



Note. This figure displays NME rate of students in eight different groups— overall, high needs, female, male, Hispanic, Black, White, and Asian for the years 2017 to 2023. High needs are designated as students who are low income, or are current or former English language learners, or are on an individualized education plan². There was no MCAS in 2020 due to the pandemic (shaded gray region).

In 2022, math NME rates decreased for each group with a more substantial decline observed for Hispanic, Black, and high needs students. However, ELA NME rates continued to increase, except for Black and Asian student groups, which remained the same as in 2021. Notably, in 2022, the overall NME rate was same at 17% for both subjects, still significantly higher than the pre-pandemic average. In 2023, both subjects saw an increase in the overall rate of students not meeting grade-level expectations; however, the increase was less severe for math (+1%) than ELA (+2%). The most affected groups were Hispanic and high needs students, with each category experiencing an increase of +2% in math and +3% in ELA, both surpassing the overall increase. In contrast, White and Asian groups did not see any increase in math, and the Asian group exhibited the smallest increase in ELA (+1%).

III. How is the average NME rate between pre- and post-2020 years related to the characteristics of student demographics?

Table 1: Demographics of Students Not Meeting Expectations for Massachusetts Public Schools

Categories	Math			English Language Arts (ELA)		
	Pre-2020	Post-2020	Change	Pre-2020	Post-2020	Change
Overall	12.00	19.00**	7.00	10.67	17.33**	6.67
High needs	21.67	31.33**	9.67	20.00	28.67**	8.67
Female	10.33	18.67**	8.33	7.67	14.33**	6.67
Male	13.00	20.00**	7.00	13.67	20.33**	6.67
Hispanic	22.33	35.33**	13.00	20.67	31.33**	10.67
Black	22.33	33.67**	11.33	19.33	27.67**	8.33
White	8.00	12.00**	4.00	7.00	11.33**	4.33
Asian	4.00	6.67**	2.67	5.33	8.33**	3.00

Note. For students in different demographic categories, this table displays the average Not Meeting (grade-level) Expectations (NME) rates for students in three pre-2020 (2017-2019) years and three post-2020 (2021-2023) years. Change is calculated by the difference in NME rates. To compare pre- and post-2020 NME rates and check for significance, given our large sample (approximately 400,000 students), we utilized a Z-test for proportions. ** indicates statistically significant differences in average NME rates in the pre- versus post-2020 period at the 0.01 level.

Table 1 presents average NME rates data for three pre-2020 years (2017-2019) and three post-2020 years (2021-2023), along with tests for statistically significant differences and changes between the pre- and post-2020 data. Every student group exhibits a significant increase in average NME rates for the post-2020 years, with a more pronounced increase observed for math than ELA across all groups (except White and Asian students). High needs students experienced an increase of 9.67% for math and 8.67% for ELA, exceeding the overall group increase of 7% and 6.67% respectively. While female students saw a similar increase in ELA post-2020 as male students, the increase math was 1.33% higher. Hispanic students experienced the highest increase in NME rates, followed by Black students, while White and Asian students saw smaller increases for both subjects.

IV. Conclusion

COVID-19 has significantly impacted student learning worldwide, particularly affecting historically disadvantaged groups. This study identifies three key findings regarding post-2020 student performance in Massachusetts public schools. Firstly, although math suffered a higher immediate impact as suggested by previous research [4], our analysis reveals a continuous rise in ELA NME rates, indicating a lack of recovery and the need for immediate support in ELA classrooms. Secondly, although female students experienced a lower NME rate than male students in pre-pandemic years, they suffered a higher immediate impact in math, reducing the gender gap. It adds nuance to recent research based on PISA data for 15-year-old students which suggested that male students were more impacted in math than female students for prolonged closures [3]. Further research is necessary to comprehend the pandemic's impact on gender inequality. Lastly, our findings, consistent with other past studies, suggest that students identifying as high needs, Hispanic and Black were more severely impacted due to the pandemic [2, 4].

To summarize, the lingering effect of the pandemic are still evident, with student performance lagging significantly behind the pre-pandemic averages. Sustained support is crucial, especially for historically marginalized groups.

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Notes

¹ <https://www.usnews.com/education/best-high-schools/articles/how-states-compare>

² <https://profiles.doe.mass.edu/statereport/nextgenmcas.aspx>

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