


**Measuring Public School Enrollment Changes
During COVID-19**

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Abstract

This brief describes two methods for measuring changes to grade level enrollment based on publicly reported aggregate data: the within-grade change and the within-cohort change. The within-grade change directly compares grade level enrollment across years. The within-cohort change measures grade level enrollment change adjusting for differences in cohort size. The two metrics lead to different conclusions about public school enrollment changes during the COVID-19 pandemic. Understanding and reporting both metrics is important for researchers, policymakers, and other audiences studying school enrollment changes.

Introduction

The COVID-19 pandemic affected many families' decisions and choices about enrolling their children in public school, leading to historic changes in public school enrollment. There is considerable interest in quantifying these changes, and in understanding their causes and consequences (e.g., Dee & Murphy, 2021). US public school enrollment declined nearly 3% in 2020-21 relative to 2019-20. Although enrollments declined in all states, the declines were larger in lower grades with kindergarten enrollment declining by more than 10% in 20 states (Pendharkar, 2022).

Tracking changes to public school enrollments is critical to understanding the pandemic's impacts, supporting schools and students, and contextualizing other data such as national and state standardized tests. Comparing enrollment changes across grade levels can be misleading, however, because these statistics confound changes due to pandemic-related factors with pre-existing trends in declining student cohort sizes. Since fall 2013 first grade cohort sizes in the US have declined, as have birth rates (Kearney et al., 2022) and the total US under 18 population (Ogunwole et al., 2021). Measuring public school enrollment changes during the pandemic needs to account for these trends.

This brief describes two ways to measure grade level enrollment changes using aggregate enrollment counts. The first is the within-grade enrollment change, which has been used in most news stories about enrollment declines. The second is the within-cohort enrollment change that adjusts for differences in cohort sizes. This brief also highlights the importance of comparing changes to pre-pandemic trends.

Data & Methods

The within-grade (WG) enrollment change is the percent change in grade level enrollment in the current year (N_{GY}) relative to grade level enrollment in the prior year ($N_{G(Y-1)}$):

$$\Delta_G^{WG} = \frac{N_{GY} - N_{G(Y-1)}}{N_{G(Y-1)}} \times 100. \quad \text{Eq. 1}$$

The within-cohort (WC) enrollment change is the percent change in grade level enrollment in the current year relative to *prior grade* enrollment in the prior year ($N_{(G-1)(Y-1)}$):

$$\Delta_G^{WC} = \frac{N_{GY} - N_{(G-1)(Y-1)}}{N_{(G-1)(Y-1)}} \times 100. \quad \text{Eq. 2}$$

Both metrics rely on aggregate enrollment counts rather than longitudinal student-level data. Neither metric directly quantifies the number of students leaving and entering the public school system because both metrics are affected by students who repeat (or skip) a grade. Each metric adjusts for (and is sensitive to) different regularities and changes over time. The WG metric compares across cohorts and is affected by changes in cohort size. The WC metric adjusts for changes in cohort size over time but is affected by grade-specific changes in enrollment patterns. Below I use fall enrollment counts from the National Center for Education Statistics Common Core of Data to compare changes in national public school enrollment using both metrics.¹ Details are provided in the Supplementary Materials.

Results

Figure 1 shows public school enrollment changes for 2020-21 relative to 2019-20 by grade level. The WG change is calculated for kindergarten through 12th grade and the WC change for first through 12th grade. The WC change is not calculated for kindergarten because

¹ Results are based on state level Common Core of Data (CCD) membership files as of November 3, 2022. Counts for Washington state were imputed in the CCD files for 2021-22. In the analyses reported in this brief, Washington state enrollment counts in 2021-22 were based on data downloaded directly from the Washington state website.

this would require the use of pre-kindergarten enrollment counts, which are systematically lower than enrollments in all other grades.

The largest WG decline was observed in kindergarten (9.1%). WG declines were larger in elementary and middle school grades, with either small declines or increases in high school, but the pattern is not entirely easy to explain. Aside from kindergarten, the largest decline was observed in 5th grade, with smaller declines in other elementary grades. These results occur in part because the WG changes confound year specific enrollment changes with pre-pandemic differences in the size of student cohorts.

The WC changes also show larger enrollment declines in lower grades, but two substantive differences emerge. First, there is a clear trend across the elementary and middle school grades suggesting parents held their youngest children out of school, and the proportion of families doing so shrank from first through eighth grade. Second, the WC changes reveal marked declines in grades 10 and 11.

Are these changes unique to the pandemic in 2020-21, or do these reflect stable patterns of enrollment dynamics? Figure 2 shows both types of changes for the five most recent years, which helps to understand pandemic-specific changes and further contrast WG and WC changes.² Enrollment declines in the lowest grades in 2020-21 are atypical using either metric. The large grade nine WC increase is consistent across time (although slightly smaller in 2020-21) and may reflect students who enter the public school system for high school. The grade 10 and 11 WC decreases are also consistent over time and may reflect students leaving high school. These grade-specific changes are not apparent using the WG changes because they are consistent

² Similar figures were produced for each state individually. While the general pattern of differences between WG and WC changes were similar across states, there was considerable variability across states, particularly in the pre-pandemic patterns of WC changes. This suggests analyses of enrollment changes for specific states or communities should take into account local pre-pandemic patterns of changes.

across time. In contrast, the WG changes show the smaller cohorts of second and third grade students in 2017-18 as they progress through school, which is not apparent in the WC changes.

The two metrics also tell different stories about re-enrollment in 2021-22. The WG changes suggest a large return to school in kindergarten and ninth grade, small changes in 10th-12th grade, and continued declines in elementary and middle grades. The WC metric suggests there was a return to school among first graders, stabilizing enrollment in elementary and middle school, and high school changes similar to pre-pandemic years. The increase in WC first grade enrollments is noteworthy because this could reflect a larger than usual number of students enrolling in first grade without having attended a public kindergarten program.³

Discussion

Monitoring public school enrollment changes remains important. This brief illustrates the consequence of considering changes in cohort sizes when making inferences about how enrollment is changing over time, particularly with respect to the pandemic. Neither metric is more correct than the other; the two metrics provide different information, suitable for answering different questions. The WG change provides information about total enrollments that are tied to school funding and essential for staffing and programming decisions. The WC change provides information about how enrollments changed relative to expectations based on cohort size and may be more appropriate for understanding families' enrollment decisions. Comparing changes to historical trends is critical for evaluating which changes represent consistent enrollment dynamics versus year-specific factors.

³ The positive WC first grade change in 2021-22 could be caused partly by students attending private kindergarten programs in 2020-21 entering public school for the first time in 2021-22, but not necessarily without having attended any kindergarten. The increase could also be a sign that more first graders from 2020-21 were retained in first grade in 2021-22. Both factors would also tend to increase the WG change, which showed further declines in first grade enrollments in 2021-22.

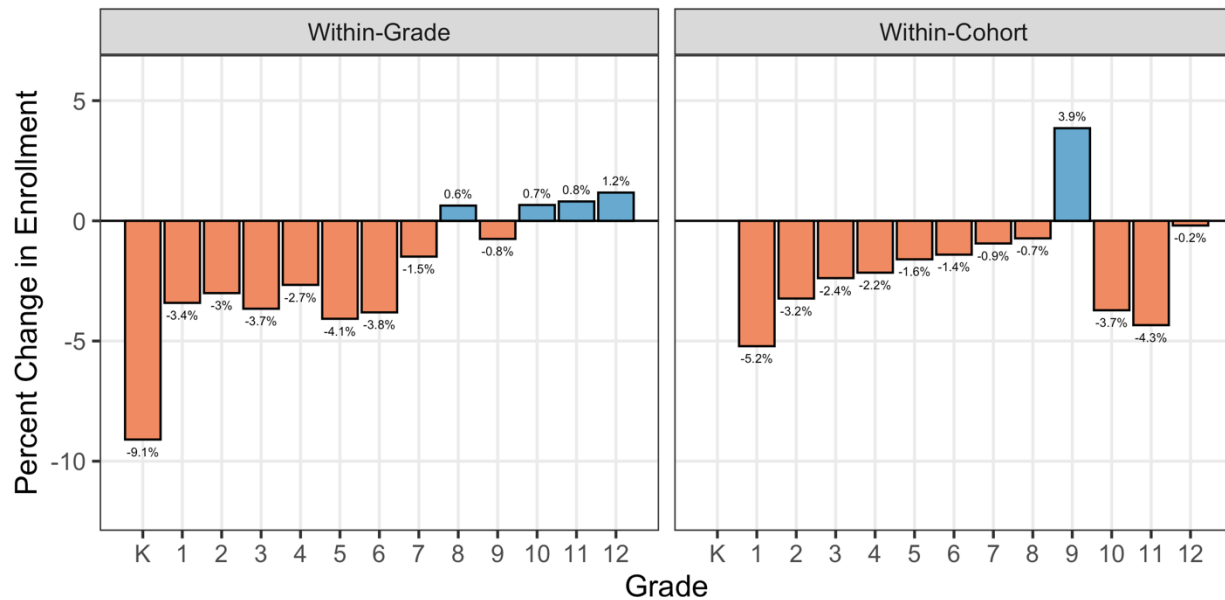
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- Pendharkar, E. (2022, February 1). *More than 1 million students didn't enroll during the pandemic. Will they come back?* <https://www.edweek.org/leadership/more-than-1-million-students-didnt-enroll-during-the-pandemic-will-they-come-back/2021/06>

Figures

Figure 1

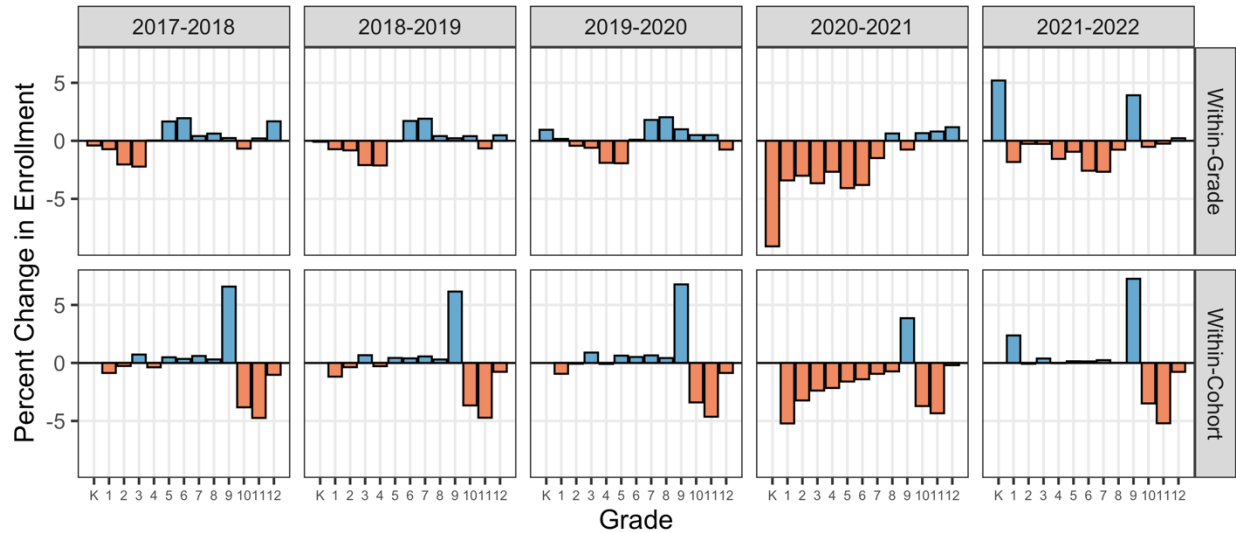
Changes in Public School K-12 Enrollment in 2020-21 relative to 2019-20



Note. Within-cohort enrollment changes are not calculated for kindergarten. Changes are based on fall enrollment data reported in the National Center for Education Statistics Common Core of Data. Details are provided in the Supplementary Materials.

Figure 2

Changes in Public School K-12 Enrollment from 2017-18 to 2021-22



Note. Within-cohort enrollment changes are not calculated for kindergarten. Changes are based on fall enrollment data reported in the National Center for Education Statistics Common Core of Data. In 2021-22 enrollment counts for Washington state were obtained directly from the Washington state website. Details are provided in the Supplementary Materials.

Supplementary Material

Data

The data used in this brief were obtained from two sources. First, fall US public school enrollment counts reported at the grade by state level were downloaded from the National Center for Education Statistics (NCES) Common Core of Data (CCD) for the years 2013-14 through 2021-22.⁴ Second, as of November 3, 2022, Washington state had not submitted enrollment counts to NCES for the 2021-22 academic year; NCES reported imputed counts for Washington state for 2021-22. For the analyses in this brief, Washington state enrollment data for 2021-22 were downloaded directly from the state website and these counts were used in place of the NCES imputed enrollment counts for Washington state for 2021-22.⁵ Washington state counts for all other years were based on the values in the CCD files.

Enrollment counts are recorded in the fall of each academic year. Thus, the enrollment counts for 2019-20, for example, reflect enrollments in the fall of 2019 and would not yet have been impacted by the COVID-19 pandemic, which began in the early spring of 2020.

National enrollment was calculated by summing the number of students across all 50 states plus the District of Columbia at each grade level from kindergarten through 12th grade. Counts of students recorded in other grades (e.g., pre-kindergarten or ungraded) or in other territories (e.g., Puerto Rico) were not included in the totals. Table S1 reports total grade level enrollment and enrollment changes for 2019-20 through 2021-22.

⁴ Data from NCES were downloaded between October 17th and November 3rd, 2022 at: <https://nces.ed.gov/ccd/files.asp>.

⁵ Data for Washington state were downloaded on October 17th, 2022 at: <https://data.wa.gov/education/Report-Card-Enrollment-2021-22-School-Year/ymi4-syiv>.

Table S1*Total K-12 Enrollments and Changes for 2019-20, 2020-21, and 2021-22*

Grade	Total Enrollment			Within-Grade Change			Within-Cohort Change		
	2019-20	2020-21	2021-22	2019-20	2020-21	2021-22	2019-20	2020-21	2021-22
K	3716023	3377905	3553493	0.9%	-9.1%	5.2%	--	--	--
1	3646681	3522206	3457972	0.2%	-3.4%	-1.8%	-0.9%	-5.2%	2.4%
2	3638255	3528803	3519686	-0.4%	-3.0%	-0.3%	-0.1%	-3.2%	-0.1%
3	3686365	3551530	3542200	-0.6%	-3.7%	-0.3%	0.9%	-2.4%	0.4%
4	3705645	3606865	3550706	-1.9%	-2.7%	-1.6%	-0.1%	-2.2%	0.0%
5	3801185	3646292	3611958	-1.9%	-4.1%	-0.9%	0.6%	-1.6%	0.1%
6	3896129	3747686	3651107	0.1%	-3.8%	-2.6%	0.5%	-1.4%	0.1%
7	3917816	3859504	3756625	1.8%	-1.5%	-2.7%	0.7%	-0.9%	0.2%
8	3864740	3889225	3859541	2.0%	0.6%	-0.8%	0.4%	-0.7%	0.0%
9	4044227	4013728	4171297	1.0%	-0.8%	3.9%	6.8%	3.9%	7.3%
10	3868246	3893789	3873566	0.5%	0.7%	-0.5%	-3.4%	-3.7%	-3.5%
11	3670812	3700389	3691284	0.5%	0.8%	-0.2%	-4.6%	-4.3%	-5.2%
12	3621156	3663692	3671875	-0.8%	1.2%	0.2%	-0.9%	-0.2%	-0.8%
Total	49077280	48001614	47911310	0.1%	-2.2%	-0.2%			

Note. Values based on CCD K-12 state education agency (SEA) membership counts for all 50 states plus the District of Columbia. The 2021-22 counts for Washington state were downloaded directly from the Washington state website.

Contrasting Within-Grade and Within-Cohort Change

To illustrate the difference between within-grade and within-cohort enrollment changes, consider 2020-21 fifth grade enrollments as an example. The within-grade enrollment change for fifth grade in 2020-21 was

$$\Delta^{WG} = \frac{3646292 - 3801185}{3801185} \times 100 = -4.1\%.$$

This indicates there were about 4.1% fewer fifth grade students in 2020-21 relative to 2019-20. This was the second-largest within-grade decline observed. However, as Table S1 shows, the cohort of students entering fifth grade in 2020-21 was already smaller than the cohort leaving fifth grade before the pandemic. The 2019-20 fourth grade cohort was 3,705,645 students. Even if each of these students had enrolled in fifth grade in 2020-21 (and if each 2019-20 fifth grader enrolled in sixth grade) there would have been a within-grade decline of

$$\frac{3705645 - 3801185}{3801185} \times 100 = -2.5\%.$$

This suggests that over half of the within-grade decline observed for fifth grade in 2020-21 could have been due to a smaller cohort of students rather than pandemic-specific factors.

The within-cohort change adjusts for this difference by comparing fifth grade enrollment in 2020-21 to the number of fourth graders in 2019-20, thus making a within-cohort comparison. The within-cohort change was

$$\Delta^{WG} = \frac{3646292 - 3705645}{3705645} \times 100 = -1.6\%.$$

This indicates that although there were fewer fifth graders in 2020-21 than we would have expected based on fourth grade enrollments in 2019-20, the change was substantially smaller than the across cohort within-grade comparison would suggest. In absolute terms rather than percentages, the within-grade change assumes an enrollment decline of 154,893 students

whereas the within-cohort change assumes an enrollment decline of 59,353, which is about 60% smaller.

The within-cohort change is not calculated for kindergarten, because this would require comparing enrollments in pre-kindergarten to enrollments in kindergarten. Pre-kindergarten enrollments in public programs (as reported in the CCD) are systematically lower than enrollments at all other grade levels, making it difficult to directly compare the within-cohort change across these two grades with other grades. In 2019-20 for example, pre-kindergarten enrollment was approximately 42% of kindergarten enrollment, while enrollments from first through 12th grade in 2019-20 were all within +/-10% of kindergarten enrollment.

Declining Cohorts Over Time

To better understand pre-pandemic enrollment declines, particularly among the cohorts of students in fifth and sixth grade during 2020-21, Figure S1 plots the total US first grade enrollments from 1990-91 through 2021-22 as reported by the NCES.⁶ First grade enrollment reached its peak in 2013-14 and enrollments have declined since then with one small increase in 2019-20. The peak enrollment in 2013-14 was 3,884,820 and three years later in 2016-17 it was almost 5% smaller at 3,693,847.

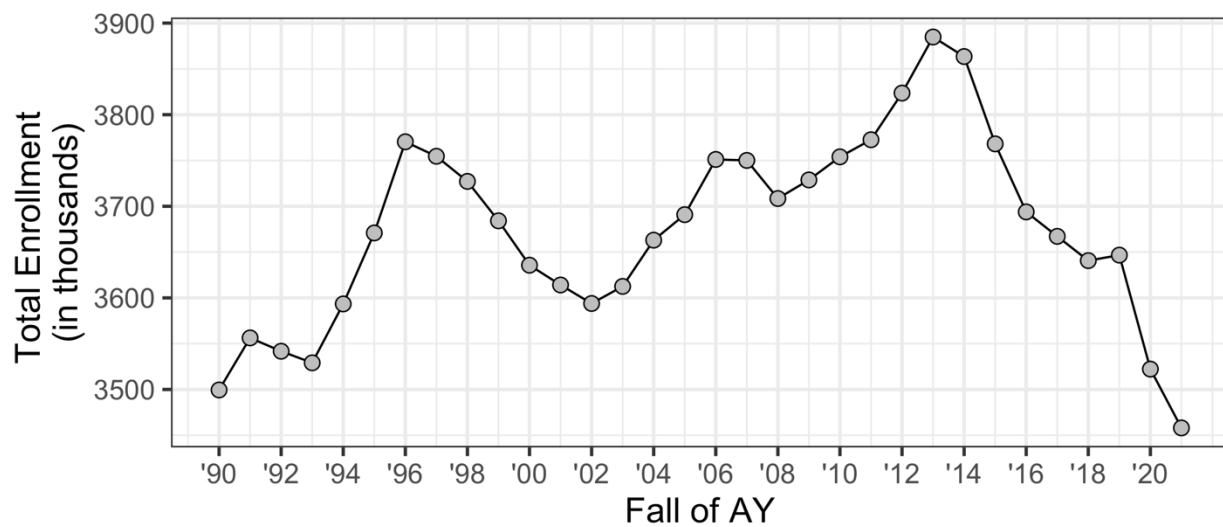
There were particularly large declines among the cohorts of students beginning first grade in 2015-16 and 2016-17. Students beginning first grade in 2015-16 or 2016-17 are cohorts of students who would have been enrolled in fifth and sixth grade in 2020-21 if they had followed a standard grade progression; these were the two grades with the largest within-grade enrollment changes in 2020-21. Students entering first grade in 2015-16 or 2016-17 would primarily be

⁶ The counts are from the NCES Table 203.10 at https://nces.ed.gov/programs/digest/d22/tables/dt22_203.10.asp. For the years 2013-14 to 2020-21 the values in this table exactly match those used throughout this brief. The count for 2021-22 differs slightly because NCES uses imputed values for Washington state.

children born in 2008 or 2009, immediately after the Great Recession. One possible explanation for the larger decline in cohort size for these two cohorts could be that while birth rates (and subsequent school enrollments) have declined since 2007, the declines were larger in the immediate aftermath of the Great Recession. Regardless of the explanation, these differences in cohort sizes needs to be considered when comparing enrollment changes across grades.

Figure S1

First Grade Enrollment by Year, 1990-2021



Note. Values based figures reported in Table 203.10 from the National Center for Education Statistics on November 3, 2022.