
# School Corporation Size & Student Outcomes:

## AN UPDATE & EXTENSIONS

JANUARY 2024

*Sponsored by the*
Indiana Chamber of Commerce Foundation

*Produced by the*
Center for Business and Economic Research,
Ball State University

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*Thank you to Cade Deckard and Madelyn Ponsier for research assistance.*

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## See Also

*This study was prepared for the Indiana Chamber of Commerce Foundation by the Ball State University Center for Business and Economic Research.*

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***Educational performance on standardized tests (e.g. ILEARN, IREAD, and SAT) and graduation outcomes (e.g. diploma type and graduation waivers) are the focus of this analysis on K-12 school corporations.***

# Executive Summary

This study updates and extends our 2017 study examining the relationship between school corporation size and educational outcomes in Indiana that identified differences in student outcomes, such as SAT and AP scores, that were directly attributable to school corporation size. Previous research has shown that the minimum efficient scale of operation for school districts in Indiana is around 2,000 students. At this size, per pupil costs are minimized. Smaller school corporations have higher per unit costs because they are not able to take advantage of the same economies of scale and scope as larger school corporation. As a result, the quality of the educational opportunities available may be affected. Small school corporations face resource constraints that limit student performance as measured by standardized test scores and pass rates.

There are large differences in enrollment among Indiana's traditional public school corporations. According to Indiana Department of Education data, Indiana's smallest school corporation (Medora Community School Corporation) had a K-12 enrollment of 144 students during the 2021-22 school year, and the largest K-12 corporation (Fort Wayne Community Schools) had more than 27,800 students. *We reiterate that we are examining school corporations, not individual schools.*

**Observable data show that many Indiana school corporations are getting smaller.** The data show that 162 of Indiana's 290 (55.8 percent) school corporations had 2022 K-12 enrollment below 2,000 students—roughly the minimum efficient scale as identified by the authors in earlier studies. In addition, 120 of these 162 school corporations experienced decreases in enrollment after 2014. The vast majority of those school corporations' enrollment declines were larger than 5 percent. In addition, eight corporations that in 2014 had enrollment higher than 2,000 students, now in 2022 have enrollment below 2,000 students. Of the 126 school corporations with 2022 enrollment above 2,000 students, 79 (62.7 percent) experienced decreases in enrollment since 2014. Roughly 20 percent (193,000 students) are in districts with less than 2,000 students.

To conduct this study, we use data from the Indiana Department of Education (IDOE) and the Indiana Commission on Higher Education (ICHE). We examine how student outcomes are different among school corporations of differing sizes. We update available measures used in our 2017 study, and we extend the 2017 study by examining post-secondary outcomes using ICHE's College Readiness dataset. We provide a variety of descriptive statistics showing observable differences in student performance, inputs and outcomes by school corporation size.

We examine various factors affecting educational performance, such as COVID learning loss, pre-kindergarten availability through public school corporations, and high school course availability. We also examine college readiness by examining participation in the 21st Century Scholar Success Program, FAFSA filing rates, and post-secondary participation.

We use Indiana school corporation data to test models of student performance and outcomes. Educational performance on standardized tests (e.g. ILEARN, IREAD, SAT, and ACT) and graduation outcomes (e.g. diploma type and graduation waivers) are the focus of this analysis.

As the analysis presented in this report shows, school corporations with enrollments in the 2,000 to 2,999 tend to perform well. Although the ILEARN pass rates are much lower than the ISTEP+ pass rates reported in the 2017 study, the pattern is similar. **Average ILEARN and IREAD pass rates, SAT scores, and the percentage of students graduating with an honors diploma are lowest for the smallest school corporations** and are among the highest for students attending school corporations with enrollment between 2,000 and 2,999.

**The analysis also shows that there are notable differences between the smallest school corporations (K-12 enrollment < 500 students) and larger school corporations in educational outcomes, course offerings, Scholar Success program completion rates, FAFSA filing rates and college attendance rates.** For example, the average ILEARN 8th grade pass rate is 5.8 percent for the smallest school corporations (K-12 enrollment < 500), while the average pass rate for every other size category is over 20 percent. The average AP exam pass rate is 1.7 percent for the smallest school corporations (enrollment < 500). Only two of the eight smallest school corporations (enrollment < 500) have students enrolled in a Calculus class. The smallest school corporations also have among the lowest completion rates for the Scholar Success program, FAFSA filing rates, and college attendance rates. Because of this disparity in outcomes, much of this analysis focuses on the smallest school corporations.

Finally, we estimate a series of models to examine the impact of increasing the size of school corporations. **For small school corporations (K-12 enrollment < 1,000), there are significant benefits from increasing enrollment to 1,000 students.** SAT composite scores would increase more than 90 points on average. Increasing enrollment to 1,000 students is associated with a 13-percentage point increase in the number of students passing the 8th grade ILEARN exam, a 10-percentage point increase in the number of students passing the IREAD exam, a 17-percentage point increase in the number of graduates attending college, and a 12-percentage point decrease in the waiver graduation rate. Increasing enrollment to 2,000 students is associated with a 3.2-percentage point increase in the share of high school graduates passing AP exams.

# Introduction

This study updates and extends our 2017 study examining the relationship between school corporation size and educational outcomes in Indiana.[1] Our previous study identified differences in student outcomes that were directly attributable to school corporation size. Differences in indicators such as SAT and AP scores exist among school districts of different sizes. The smallest and largest school corporations often have the weakest student performance among other indicators in this study. The differences in outcomes is especially stark for the smallest school corporations (enrollment < 500).

These differences in student outcomes matter because performance on college entrance exams, high school upper-level science courses, and mathematics courses have been shown to be closely aligned with post-secondary success. Increasing the likelihood of post-secondary success is important because cumulative employment growth nationwide is clustered among workers with a bachelor's degree or higher. See *Figure 1*.

The literature on economies of scale in education has shown that scale economies vanish at relatively low levels of student enrollment. Previous research has shown that the minimum efficient scale of operation for school districts in Indiana is around 2,000 students.[2] At this size, per pupil costs are minimized. Smaller school corporations have higher per unit costs. Smaller school corporations are not able to take advantage of the same economies of scale and scope as larger school corporation. As a result, the quality of the educational opportunities available may be affected. Small school corporations face resource constraints that limit student performance as measured by standardized test scores and pass rates.

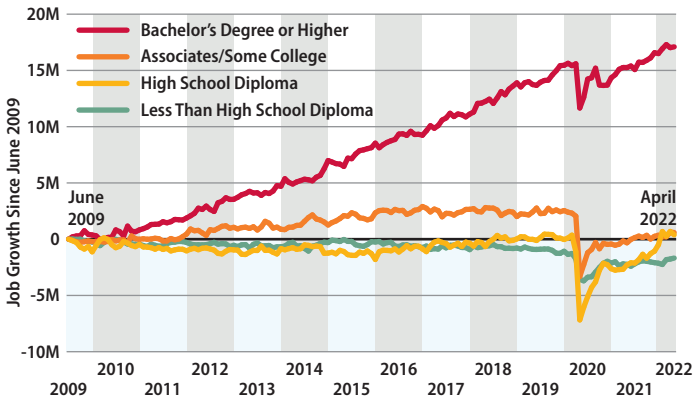
Observable data show that many Indiana school corporations are getting smaller.[3] The data show that 162 of Indiana's 290 (55.8 percent) public school corporations had 2022 K-12 enrollment below 2,000 students—roughly the minimum efficient scale as identified by the authors in earlier studies. In addition, 120 of these 162 school corporations experienced decreases in enrollment after 2014. The vast majority of those school corporations' enrollment declines were larger than 5 percent. In addition, eight corporations that in 2014 had enrollment higher than 2,000 students, now in 2022 have enrollment below 2,000 students. Of the 126 school corporations with 2022 enrollment above 2,000 students, 79 (62.7 percent) experienced decreases in enrollment since 2014.

Basic descriptive analyses show that the majority of Indiana's school corporations are inefficiently small from a pure economic cost perspective and could merge with nearby corporations to reduce costs and/or increase the quality of education provided. The vast majority of small school corporations (K-12 enrollment < 1,000) are adjacent to other small corporations. According to Indiana Department of Education data, Indiana's smallest school corporation (Medora Community School Corporation) had a K-12 enrollment of 144 students during 2021-22 school year, and the largest school corporation (Fort Wayne Community Schools) had more than 27,800 students.

*We reiterate that we are examining Indiana's K-12 school corporations, not individual schools.*

**Figure 1. U.S. Cumulative Employment Growth by Educational Attainment in the United States, June 2009-April 2022**

Source. Author's calculations using data from the Current Population Survey.




| 17.097 MILLION | 595 THOUSAND | 384 THOUSAND | -1.678 MILLION |
|---|---|---|---|
| *New Hires Since June 2009* Bachelor's Degree or Higher | *New Hires Since June 2009* Associates Degree or Some College | *New Hires Since June 2009* High School Diploma | *New Hires Since June 2009* Less Than High School Diploma |

# Method

To conduct this study, we use data from the Indiana Department of Education (IDOE) and the Indiana Commission on Higher Education (ICHE). We examine how student outcomes are different among school corporations of differing sizes. We update available measures used in our 2017 study. We extend the 2017 study by examining post-secondary outcomes using ICHE's College Readiness dataset. We provide a variety of descriptive statistics showing observable differences in student performance, inputs and outcomes by school corporation size. This study primarily focuses on the smallest and largest school corporations

We also use Indiana school corporation data to test models of student performance and outcomes. Educational performance on standardized tests (e.g. ILEARN, IREAD, SAT, and ACT) and graduation outcomes (e.g. diploma type and graduation waivers) are the focus of this analysis. We then examine various inputs affecting educational performance, such as learning loss, pre-kindergarten availability through public school corporations, and high school courses. Finally, we examine college readiness by examining participation in the 21st Century Scholar Success Program, FAFSA filing rates, and post-secondary participation.

1. Devaraj, Faulk and Hicks (2017; 2018) used data from 2011-2014. See https://projects.cberdata.org/124/school-corporation-size-student-performance-evidence-from-indiana/.
2. For studies of Indiana, see Faulk & Hicks, 2011; 2014 and Zimmer, DeBoer, & Hirth, 2009.
3. The terms "school district" and "school corporation" are used interchangeably in this analysis.

# Analysis of Indiana School Corporations

## School-Age Population & Enrollment

*Figure 2* shows the school-age population for Indiana and the U.S. since 1970. Indiana's school age population has been stable at around 1.1 million since 2000. Also, there is a similar trend of stability when comparing Indiana's school age population to that of the U.S. since 2000, which is around 53 million. Before 2000, the school age population trend had dramatic changes in Indiana and the U.S., going from a relatively large population of about 1.4 million and 52 million respectively, in 1970, to rapidly declining to around 1 million and 45 million respectively, in 1990. After 1990, Indiana and the U.S. both experienced a noticeable increase of around 100,000 and 8 million respectively, in their school age population.

*Figure 3* shows the changes in public, charter and private school enrollment from 2006 to 2022, as well as the share of private K-12 enrollment compared to charter and traditional public school enrollment. Since its highest year of enrollment in 2007 (1,021,220), public school enrollment has experienced a steady decline until 2020 and then increasing in 2021 and 2022. Conversely, charter schools have experienced a steady increase in enrollment over the same period, with a slight decline during 2020 and then increasing.

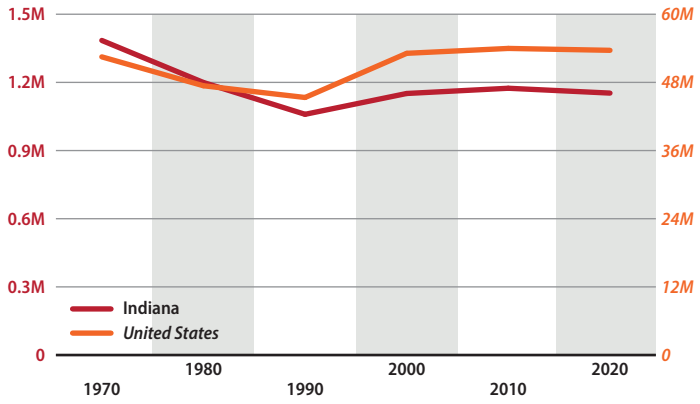
Private school enrollment faced mixed enrollment trends over this period compared to public and charter schools. Enrollment was stable through 2012 and then grew by about 10,000 students in 2013 after the Choice Scholarship program was introduced. Private school enrollment continued to increase until 2015, then faced another decline in enrollment and remained relatively stable until the pandemic when private school enrollment increased dramatically. The Choice Scholarship program also expanded over this period.

Public school enrollment has declined steadily through the years with a small increase over the past couple of years. Charter schools exhibited substantial growth from 2006 to 2022, and private schools experienced enrollment fluctuations with changes in the educational landscape with enrollment increasing substantially over the past few years.

### Figure 2. U.S. & Indiana School-Age Population, 1970-2020

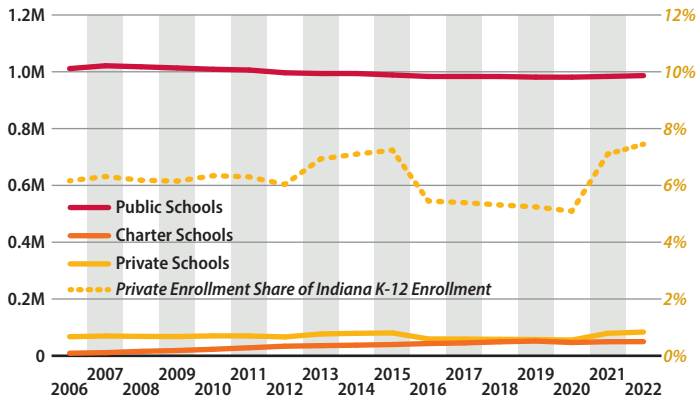
Source: Data from Decennial Census for 1970-2010 and American Community Survey five-year estimate for 2020.

Note: School-age population = Children age 5-7 years old.




### Figure 3. Indiana Enrollment in Traditional Public Schools, Charter Schools, & Private Schools, 2006-2022

Source: STATS Indiana



### Table 2. Indiana K-12 School Corporations by Student Enrollment Size, 2014 & 2022

Source: Authors' calculations using data from the Indiana Department of Education

Note: * For the 2013-14 school year, the lowest enrollment in a school corporation was 226 students.

| 2022 Student Enrollment | 2014 # of Corp. at Size | 2022 # of Corp. at Size | 2014 % of Total | 2022 % of Total | 2014 Enrollment Sum | 2022 Enrollment Sum | 2014 % of Total Enrollment | 2022 % of Total Enrollment |
|---|---|---|---|---|---|---|---|---|
| 144 to 499* | 6 | 8 | 2.08% | 2.76% | 2,040 | 2,761 | 0.21% | 0.29% |
| 500 to 999 | 48 | 50 | 16.61% | 17.24% | 39,572 | 40,203 | 3.99% | 4.18% |
| 1,000 to 1,499 | 59 | 63 | 20.42% | 21.72% | 75,291 | 78,865 | 7.59% | 8.19% |
| 1,500 to 1,999 | 45 | 42 | 15.57% | 14.48% | 78,387 | 72,100 | 7.90% | 7.49% |
| 2,000 to 2,999 | 38 | 41 | 13.15% | 14.14% | 91,687 | 100,976 | 9.24% | 10.49% |
| 3,000 to 4,999 | 36 | 35 | 12.46% | 12.07% | 135,199 | 135,625 | 13.63% | 14.09% |
| 5,000 to 9,999 | 36 | 27 | 12.46% | 9.31% | 246,706 | 192,115 | 24.87% | 19.96% |
| 10,000 to 19,999 | 17 | 20 | 5.88% | 6.90% | 220,481 | 247,955 | 22.23% | 25.76% |
| 20,000+ | 4 | 4 | 1.38% | 1.38% | 102,505 | 91,822 | 10.33% | 9.54% |
| *Indiana Total* | *289* | *290* | *100.00%* | *100.00%* | *991,868* | *962,422* | *100.00%* | *100.00%* |

## Distribution of School Corporations

For the 2021-2022 school year, Indiana had 290 traditional public school corporations, which is an increase of one corporation since the 2017 study—as of July 2020, West Clark Community School Corporation split into two corporations. Between 2014 and 2022, total enrollment in Indiana's traditional public schools decreased from 993,938 to 986,567 (-0.74 percent).

*Table 2* shows the distribution of K-12 enrollment among Indiana school corporations in the state during the 2013-14 and 2021-22 school years. In that time, the corporation with the lowest number of student enrollments changed from Cannelton City Schools with 226 students in 2014 to Medora Community School Corporation with 144 students enrolled in 2022.

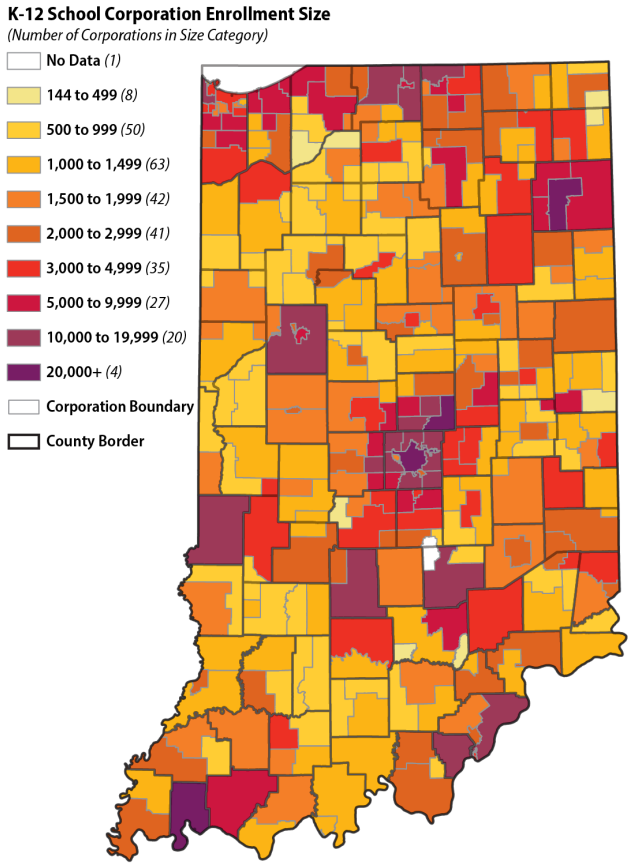
There was a shift in the number of corporations in each enrollment category, with school corporations tending to become smaller except for the 10,000 to 19,999 category, which increased by three corporations and about 27,000 students. The number of corporations with fewer than 2,000 students increased, but the share of enrollment stayed about the same at about 20 percent of total state enrollment.

Of the 162 corporations with enrollment lower than 2,000 students during 2022 for which we can calculate enrollment change, 98 (60 percent) had enrollment declines of 50 or more students between 2014 and 2022. Of the eight corporations with enrollment of less than 500 students during 2022, seven had decreases in enrollment. Approximately 193,000 K-12 students are in school corporations with enrollment below 2,000. Further details are shown in *Appendix Table A1*.

*Figure 4* shows the geographic distribution of Indiana's school corporations by enrollment level. Small school corporations (those with K-12 enrollment less than 1,000) tend to be adjacent to other small corporations. The number of school corporations in a county varies from 1 to 16. See *Table 3*. Only 21 of Indiana's 92 counties contain one school corporation. Lake and Marion counties contain the most school corporations with 16 and 11, respectively.

### Figure 4. Map of Indiana K-12 School Corp. by Enrollment, 2022

Source: Enrollment data for the 2021-22 school year from the Indiana Dept. of Education.




### Table 3. Number of School Corporations in a County, 2022

Source: Author's calculations using data from the Indiana Department of Education.

| # Corporations in County | *# of Counties* | # Corporations in County | *# of Counties* |
|---|---|---|---|
| 1 | *21* | 6 | *4* |
| 2 | *19* | 7 | *3* |
| 3 | *21* | 11 | *1* |
| 4 | *14* | 16 | *1* |
| 5 | *8* | Indiana Total 290 | *92 Counties* |

### Table 4. Student Performance on Standardized Tests by School Corporation Size, Various Years

Source: Authors' calculations using data from the Indiana Department of Education and Indiana Commission for Higher Education.

* Average percent of 11th-grade students passing SAT benchmarks for Evidence-Based Reading & Writing (EBRW, score 460 of 800) and Math (score 510 of 800) sections.

*** Category data suppressed due to small sample sizes.

| 2022 Student Enrollment | # of School Corp | 2022 Avg % Passing 4th Grade ILEARN | 2022 Avg % Passing 8th Grade ILEARN | 2022 Avg % Passing 3rd Grade IREAD | 2019 Avg % Passing AP Exam | 2022 Avg SAT Score (Max 1600) | 2022 Avg ACT Score (Max 36) | 2022 Avg % Passing SAT Benchmark* | 2021 Avg % w/ Honors Diploma |
|---|---|---|---|---|---|---|---|---|---|
| 144 to 499 | 8 | 28.1% | 5.8% | 77.7% | 1.70% | 931.9 | *** | 13.9% | 34.16% |
| 500 to 999 | 50 | 30.0% | 20.6% | 86.9% | 9.89% | 1063.4 | 21.4 | 24.2% | 40.71% |
| 1,000 to 1,499 | 63 | 33.7% | 22.7% | 86.6% | 11.58% | 1067.0 | 21.7 | 24.6% | 39.16% |
| 1,500 to 1,999 | 42 | 34.1% | 24.2% | 85.9% | 11.53% | 1060.1 | 21.9 | 26.6% | 36.47% |
| 2,000 to 2,999 | 41 | 38.2% | 29.6% | 87.1% | 14.41% | 1079.9 | 23.1 | 28.7% | 39.28% |
| 3,000 to 4,999 | 35 | 32.0% | 23.2% | 81.8% | 18.30% | 1070.4 | 23.4 | 26.2% | 37.05% |
| 5,000 to 9,999 | 27 | 38.3% | 29.2% | 82.1% | 22.39% | 1097.9 | 24.0 | 30.5% | 40.62% |
| 10,000 to 19,999 | 20 | 30.6% | 23.9% | 77.3% | 23.30% | 1091.4 | 22.7 | 28.6% | 36.97% |
| 20,000+ | 4 | 31.4% | 22.6% | 75.0% | 21.18% | 1054.4 | 21.5 | 25.1% | 34.52% |
| *Indiana Total* | *290* | *33.6%* | *23.8%* | *84.6%* | *14.5%* | *1071.5* | *22.82* | *26.1%* | *38.06%* |

# Student Performance & Outcomes

## *Standardized Testing*

*Table 4* shows descriptive statistics for student performance on standardized tests by school corporation size from the 2021-22 school year unless otherwise noted. The passing rates for 3rd, 4th, and 8th graders on the state's standardized tests (IREAD and ILEARN) decreased after the pandemic, but the ILEARN pattern remains the same as our 2014 study, with the smallest and largest school corporations having the lowest ILEARN average pass rates, and districts with student enrollment between 2,000 and 2,999 having the highest. The IREAD results show a different pattern. The average pass rates of the smallest districts are among the lowest, but the largest districts have the lowest average pass rates.

The Advanced Placement (AP), Scholastic Aptitude Test (SAT), and American College Testing (ACT) exams are nationally normed. AP average pass rates were lowest for the smallest districts, and larger districts consistently outperform the smallest districts. The average SAT score, along with the percentage of students passing the SAT benchmark, is consistently lower for the smallest districts. ACT scores were not available for the smallest districts due to fewer than 10 students taking this exam at each of the smallest school corporations. Finally, the smallest and largest school corporations have the lowest share of students earning an honors diploma at 34.16 percent and 34.52 percent, respectively.

***School corporations with higher student enrollment (especially 2,000-2,999) experienced higher average pass rates on standardized tests. However, student performance lagged in the smallest (< 500 students) and largest corporations (20,000+ students).***

## Table 5. Percent of High School Graduates by Diploma Type & School Corporation Size, 2022

Source: Authors' calculations using data from the Indiana Department of Education

| 2022 Student Enrollment | # of School Corp at Size | Core 40 Diploma | General Diploma | Core 40 w/ Academic Honors | Core 40 w/ Technical Honors | Core 40 w/ Academic & Technical Honors | Honors Total, Any Type | International Baccalaureate |
|---|---|---|---|---|---|---|---|---|
| 144 to 499 | 8 | 58.42% | 7.43% | 31.19% | 0.00% | 2.97% | 34.16% | 0.00% |
| 500 to 999 | 50 | 49.08% | 10.21% | 21.08% | 7.29% | 12.33% | 40.71% | 0.00% |
| 1,000 to 1,499 | 63 | 50.33% | 10.51% | 28.28% | 5.40% | 5.48% | 39.16% | 0.00% |
| 1,500 to 1,999 | 42 | 50.55% | 12.98% | 25.23% | 4.09% | 7.16% | 36.47% | 0.00% |
| 2,000 to 2,999 | 41 | 47.70% | 13.01% | 29.39% | 4.04% | 5.86% | 39.28% | 0.00% |
| 3,000 to 4,999 | 35 | 51.74% | 11.12% | 28.30% | 3.20% | 5.55% | 37.05% | 0.10% |
| 5,000 to 9,999 | 27 | 51.83% | 7.53% | 33.58% | 2.23% | 4.81% | 40.62% | 0.02% |
| 10,000 to 19,999 | 20 | 53.92% | 8.88% | 28.10% | 3.32% | 5.55% | 36.97% | 0.23% |
| 20,000+ | 4 | 57.82% | 7.42% | 30.52% | 1.95% | 2.05% | 34.52% | 0.24% |
| *Indiana Total* | 290 | 52.09% | 9.74% | 29.09% | 3.44% | 5.53% | 38.06% | 0.10% |

## *High School Diploma Types*

The Indiana State Board of Education adopts course and credit requirements that students meet to earn a high school diploma. Current course and credit requirements have been in effect since 2012, beginning with the Class of 2016.[4] Indiana students can earn a high school diploma with the following designations: General, Core 40, Core 40 with Academic Honors or Core 40 with Technical Honors. There is also a Core 40 with Academic and Technical Honors for students who meet both requirements. A Core-40 diploma is a minimum admission requirement for Indiana's public four-year universities. A limited number of schools are authorized to offer the International Baccalaureate program, which also meets the requirements of Indiana's Core 40 diploma.

Between 2015 and 2022, the percentage of students earning a general diploma has decreased and the share earning Core 40 diplomas has increased. *Table 5* shows descriptive statistics for diplomas earned by 2022 graduates. The smallest and largest school corporations have the highest share of graduates with Core 40 diplomas, the lowest share of graduates with General diplomas and the lowest share of honors diploma graduates overall. Both the smallest and largest school corporations had low shares of graduates earning the Core 40 Technical Honors diploma, which suggests there may be access issues, although there were graduates in these corporations that earned the combined academic and technical honors diploma. Career and Technical Education course offerings are discussed in a following section.

## *Graduation Qualifying Exam Waiver*

In this report we use the waiver requirements in place for the 2019 through 2022 cohorts of graduates. In Indiana students graduating in the 2019 to 2022 cohorts needed to satisfy graduation requirements in one of four ways: **1)** Passing the graduation qualifying exam (ISTEP+ 10); **2)** Not passing the GQE but receiving a waiver from the GQE requirement; **3)** Successfully completing a graduation pathway; or **4)** Unsuccessfully completing a graduation pathway but receiving a waiver from the pathway requirement.[5] The waiver allows students to use other criteria to complete graduation requirements. These other requirements include demonstrating post-secondary readiness or employability skills including the completion of at least one industry certification.

*Table 6* shows more detailed information about the 2022 distribution of graduation waivers by corporation size. The percentage of students that graduated high school with a waiver varied from 0 to 60 percent. Corporations with 5,000 to 9,999 students and 500 to 999 students had the lowest percentages (average) of students graduating with waivers. Whereas the smallest (144 to 499 enrollment) and large corporations (10,000 to 19,999 enrollment) had the highest percentages (average) of students graduating with waivers.

## Table 6. Students Graduating with a Waiver, 2022

Source: Authors' calculations using data from the Indiana Department of Education

Note: Calculated from school-level data. The waiver graduation rate was calculated using the number of graduates minus the number of non-waiver graduates.

| 2022 Student Enrollment | # of School Corp at Size | Waiver Graduation Rate | | |
|---|---|---|---|---|
| | | Average | Min | Max |
| 144 to 499 | 8 | 23.9% | 2.6% | 60.0% |
| 500 to 999 | 50 | 11.9% | 0.0% | 30.3% |
| 1,000 to 1,499 | 63 | 13.1% | 1.3% | 45.7% |
| 1,500 to 1,999 | 42 | 15.4% | 1.4% | 34.1% |
| 2,000 to 2,999 | 41 | 15.5% | 1.6% | 55.8% |
| 3,000 to 4,999 | 35 | 17.2% | 3.6% | 44.4% |
| 5,000 to 9,999 | 27 | 11.9% | 2.0% | 32.7% |
| 10,000 to 19,999 | 20 | 19.0% | 3.9% | 46.6% |
| 20,000+ | 4 | 17.8% | 7.5% | 30.0% |
| Indiana Total | 290 | 14.7% | 0.0% | 60.0% |

4. For details on Indiana diploma types and requirements, see https://www.in.gov/doe/students/graduation-pathways/diploma-requirements/. Details on the international baccalaureate program are available at https://www.in.gov/doe/students/advanced-placement-ap/.

5. For details on graduation requirements and pathways, see https://www.in.gov/doe/files/grad-reqs-2019-2022-cohorts-final.pdf and https://www.in.gov/doe/files/ways-meet-gqe-or-grad-pathways-req-2018-19-final.pdf.

# Factors Affecting Educational Performance

## *Learning Loss*

We extend the tests of threshold effects reported in Devaraj, Faulk and Hicks (2017), Faulk and Hicks (2014), and Zimmer, DeBoer and Hirth (2009) to examine if school corporation size affects COVID-related learning loss. To do so, we estimate learning loss in different size cohorts for school corporations. This work extends analysis reported in a statewide analysis of learning loss (Hicks and Faulk, 2023). The large number of smaller school corporations permit several narrower thresholds, while fewer large corporations require wider size categories. Our focus is on corporations below, and immediately above the minimum efficient scale of roughly 2,000 students reported in earlier studies.

By testing our learning lost models by size category, we find that smaller school corporations exhibit a negative, and statistically significant relationship between size and learning loss: smaller corporations have higher learning loss. Two categories exhibit very high levels of statistical significance (500 to 1,000 students and 1,500 to 1,750 students) despite having small sample sizes of 54 and 59 schools, respectively. See *Figure 5*.

The entire range of schools in corporations with enrollment lower than 2,000 students exhibit a size effect on learning loss. For the smallest school corporations, a 10 percent increase in size would improve learning loss by 2.2 percent. The entire range of schools in corporations of fewer than 2,000 students would see a pass rate improvement of 0.3 percent with a 10 percent increase in students.

We emphasize that these results are tentative. Sample sizes are small, and we have only three years of post-COVID testing from which to observe learning loss. However, these results suggest that very small school corporations perform less well in measures of academic performance which can be attributed to high scale economies in education. Given the demands of the COVID pandemic on instructional technology, it would be surprising if there was not a scale effect apparent in these data.

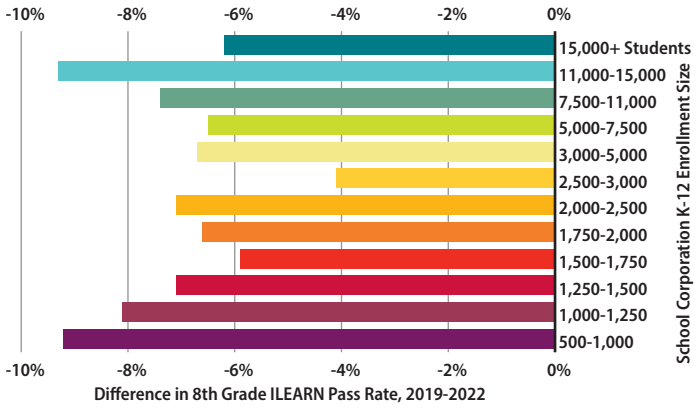
## *Impact of School Corporation Size*

It is important to understand that overall school performance as measured by pass rates of students is affected by the size of their school corporation. As Devaraj, Faulk and Hicks (2017) argue, scale economies restrict the ability of smaller schools to affect learning. The overall 2023 pass rates of both ELA and Math offer a clear example of this effect. By estimating the pass rate on increasingly larger sets of schools, we measure the rate of change in the size of school corporations, or *log(enrollment)*, on pass rates.

As depicted in *Figure 6*, larger school corporations have increasing effects on performance, with school corporations smaller than 2,000 at a performance disadvantage.[6] Increasing the size of school corporations with less than 1,000 students by 10 percent is projected to increase pass rates by about 11 percent, while increasing the size of school corporations with less than 8,000 students by 10 percent would yeild a 4-percent increase in pass rates.

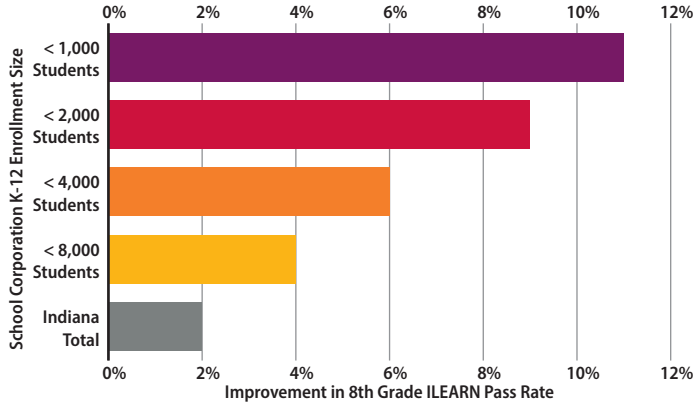
### Figure 5. COVID-Related Learning Loss & School Corporation Size, 2019–2022

Note: The size categories denote student enrollment in corporations of this size: 500 to 1,000 students; 1,000 to 1,250 students; etc.




### Figure 6. Effect of Increasing Enrollment by 10 Percent on 8th Grade Pass Rates by Corporation Size

Source: Authors' calculations using data from the Indiana Department of Education.




6. See also Devaraj, Faulk and Hicks, 2017; Faulk and Hicks, 2014; and Zimmer, DeBoer and Hirth, 2009.

## *Early Childhood Education*

After increasing for two decades, Indiana's pre-school population (age 3-4 years) decreased by about 2 percent (3,500 children) over the last decade. Nationally, the pre-school population has been flat, increasing 0.1 percent (5,300 children) between 2010 and 2020.

There is a large amount of literature on the benefits of early childhood education (ECE). "Decades of research show that access to high quality ECEC (Early Childhood Education and Care) provides children with significant short-term and long-term educational and social benefits and is a very effective long-term social investment" (Yavorsky & Ruppanner, 2022, 922.) Other studies have shown how children living in poverty, who do not have access to high quality ECE programs, can become developmentally delayed in multiple aspects (academically, emotionally, socially, etc.) (Nold, 2021; Hahn & Barnett, 2023).

To better prepare Indiana's children for school, Indiana implemented the On My Way Pre-K program beginning in 2015. The program, "awards grants to 4-year-olds from low-income families so that they may have access to a high-quality pre-K program the year before they begin kindergarten" (FSSA Website).[7] Since the formation of the program, On My Way Pre-K has provided education grants to more than 21,000 Indiana children.

The On My Way Pre-K program bridges the socioeconomic gap preventing children from having access to high quality ECE programs. For the 2023-2024 school year, there are 7,248 children who received pre-K education grants. As of July 1, 2023, OMWPK updated their program eligibility requirements making education grants accessible to more Indiana families. Previously, to be eligible for the program, a child had to live in a household with an income below 127 percent of the poverty line, which is an annual income of $33,060 in a household of four people. Currently, requirements have shifted to below 150 percent the federal poverty line, meaning a household of four can earn an annual income of $45,000 and maintain program eligibility.[8]

Indiana's public school corporations are increasingly involved in the provision of pre-kindergarten programs in the state. Between 2014 and 2022, the number of kids enrolled in pre-kindergarten programs offered through school corporations increased from 14,761 to 21,147 (a 43 percent increase). The number of school corporations offering pre-K programs increased from 107 to 248, with 42 of Indiana's 290 public school corporations not offering pre-K programs during 2022. School corporations with enrollment less than 1,000 and those with enrollment between 5,000 and 9,999 have the lowest share of corporations offering pre-K programs. See *Table 7*.

### Table 7. Pre-K Enrollment in Indiana's Public School Corporations by Enrollment Level, 2022

Source: FSSA data for OMWPK, https://www.in.gov/fssa/carefinder/on-my-way-pre-k/

| 2022 Student Enroll (K-12) | K-12 School Corporations | | | Pre-K Enrollment | | | |
|---|---|---|---|---|---|---|---|
| | # Corp at Size | # Offering Pre-K | % Offering Pre-K | Avg | Min | Max | Total |
| 144 to 499 | 8 | 6 | 75% | 15.50 | 0 | 44 | 124 |
| 500 to 999 | 50 | 37 | 74% | 22.80 | 0 | 72 | 1,140 |
| 1,000 to 1,499 | 63 | 56 | 89% | 34.54 | 0 | 130 | 2,176 |
| 1,500 to 1,999 | 42 | 37 | 88% | 39.67 | 0 | 109 | 1,666 |
| 2,000 to 2,999 | 41 | 36 | 88% | 48.20 | 0 | 166 | 1,976 |
| 3,000 to 4,999 | 35 | 32 | 91% | 102.20 | 0 | 400 | 3,577 |
| 5,000 to 9,999 | 27 | 21 | 78% | 95.41 | 0 | 390 | 2,576 |
| 10,000 to 19,999 | 20 | 19 | 95% | 266.45 | 0 | 841 | 5,329 |
| 20,000+ | 4 | 4 | 100% | 645.75 | 350 | 908 | 2,583 |
| *Indiana Total* | *290* | *248* | *86%* | *141.17* | *0* | *907* | *21,147* |

7. The State of Indiana has an ECE ranking system called "Paths to Quality". For a program to be eligible to accept an On My Way Pre-K education grant, they must have received a Level 3 or Level 4 rating.

8. The FSSA has all current eligibility requirements listed on their website, https://www.in.gov/fssa/carefinder/on-my-way-pre-k/. Contingent on funding, OMWPK expands the eligibility requirements and offers a limited number of vouchers to children who live in a household with incomes up to 185% of the federal poverty level ($55,000 for a four-person household).

# High School Course Offerings

Next, we examine differences in high school course offerings for school corporations of different sizes. Course offerings included in this analysis are Advanced Placement courses, Advanced Courses for College Credit, and Dual Credit courses from the state's Priority Course List—both Liberal Arts and Career and Technical Education Courses. We also examine Calculus course offerings because taking Calculus in high school has been shown to be highly correlated with success for STEM majors during college.

## *Advanced Placement Course Offerings*

Advanced Placement (AP) courses are based on university-level content and are copyrighted by the College Board. AP courses are not dual-credit courses. Students may receive college credit by passing a nationally-normed standardized test at the end of the course.

Academic studies have demonstrated positive outcomes associated with taking high school AP courses, including: higher SAT scores (McKillip & Rawls, 2013); higher first-year grades in college (Shaw et al., 2012; Wyatt et al., 2015); higher grades in college courses related to AP exam subjects (Godfrey et al., 2014; Kaliski & Godfrey, 2014; Patterson & Ewing, 2013; Patterson et al., 2011); somewhat higher college science grades (Sadler & Tai, 2017); higher likelihood of enrollment in four-year colleges (Chajewski et al., 2011); higher first-year college retention rates (Mattern et al., 2009); and higher four-year college graduation rates, including on-time graduation rates (Smith et al., 2017; Mattern et al., 2013; Ackerman et al., 2013). Additionally, AP math courses have been shown to influence college admission decisions (Mo et al., 2011).

In a recent study, Beard et al. (2019) showed that the number of AP exams passed with a score of 3 or higher was positively related first-year GPA and the likelihood of graduating with a bachelor's degree in four years. The largest effects occurred from passing the first and second AP exam, but the positive effect persisted through passing six AP exams. There was no incremental benefit to students passing more than six AP exams. This study also showed that students with lower levels of academic readiness (measured with SAT scores) experiences larger incremental gains in first-year college GPA and four-year graduation rates from passing AP exams.

The Indiana Department of Education includes 38 Advanced Placement courses on its high school course list, which is available online.[9] Two courses have been added since 2015—AP Pre-Calculus and AP Computer Science.

### Table 8. AP Course Enrollment by School Corp Size, 2022

Source: Author's calculations from Indiana Department of Education data

| 2022 School Corporation Enrollment | # Corp at Size | # Advanced Placement Courses w/ Enrollment | | | | # Corp w/ No AP Enroll | AP Enroll as a % of Corp Enroll (Mean) |
|---|---|---|---|---|---|---|---|
| | | Mean | Min | Max | Sum | | |
| 144 to 499 | 8 | 1.75 | 0 | 7 | 14 | 4 | 3.14 |
| 500 to 999 | 50 | 2.76 | 0 | 9 | 138 | 6 | 3.83 |
| 1,000 to 1,499 | 63 | 4.57 | 0 | 12 | 288 | 5 | 5.37 |
| 1,500 to 1,999 | 42 | 6.14 | 0 | 18 | 258 | 4 | 7.29 |
| 2,000 to 2,999 | 41 | 7.59 | 0 | 20 | 311 | 4 | 6.63 |
| 3,000 to 4,999 | 35 | 10.57 | 1 | 19 | 370 | 0 | 7.18 |
| 5,000 to 9,999 | 27 | 15.04 | 1 | 25 | 406 | 0 | 9.80 |
| 10,000 to 19,999 | 20 | 20.50 | 14 | 32 | 410 | 0 | 10.69 |
| 20,000+ | 4 | 21.75 | 16 | 31 | 87 | 0 | 9.70 |
| *Indiana Total* | *290* | *7.87* | *0* | *32* | *2,282* | *23* | *6.56* |

AP Pre-Calc and AP Italian Language and Culture did not have enrollment during 2021-22. The most frequently offered AP course is Calculus AB, with almost 70 percent of Indiana's school corporations offering this course and almost 5,700 students taking this course during the 2021-22 school year. See *Appendix Table C1* for a list of the 10 most-frequently offered AP courses in Indiana school corporations.

As *Table 8* shows, the average number of AP courses offered in Indiana's smallest school corporations is 1.75 with four of the eight corporations in this size category offering no AP courses, and a total of 14 AP courses offered in these eight school corporations. In contrast, school corporations with enrollment of 2,000 to 2,999 offer an average of 7.59 AP classes among the 41 school corporations in this category. Across all 290 corporations, 23 offer no AP courses and 29 corporations offer only one AP course. When scaled for school corporation enrollment (last column), 3.14 percent of students take AP courses in the smallest corporations, while 6.64 percent of students take AP courses in corporations with 2,000 to 2,999 students. This percentage is at or approaching an average of 10 percent in the largest corporations.

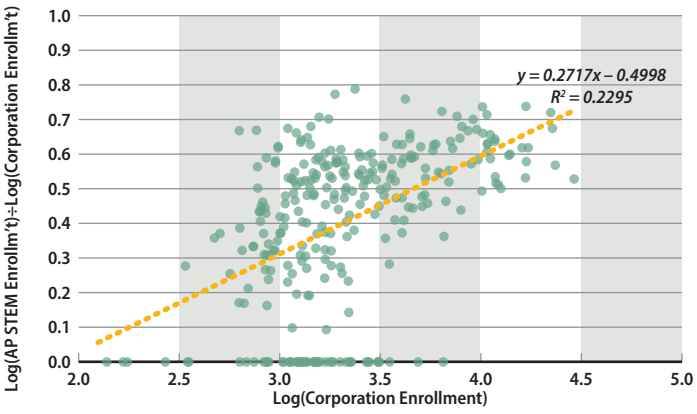
*Figure 7* illustrates selected AP enrollment by corporation size. We include STEM-related AP courses (two courses each in Calculus, Biology, Chemistry, and Computer Science), and graph enrollment share by corporation size. Here, enrollment share is total enrollment in AP STEM divided by school corporation enrollment. These figures are in percentage (logarithm) terms.

Enrollment in AP STEM courses rises as school corporation size grows. Unfortunately, roughly 10 percent of schools offer none of these courses. The lack of opportunity for AP STEM courses affects post-secondary attendance

9. Titles and descriptions for high school courses, including Advanced Placement Courses, are available online from the Indiana Department of Education's Office of Teaching at https://www.in.gov/doe/students/indiana-academic-standards/course-titles-and-descriptions/.

### Figure 7. AP STEM Course Enrollment & Corporation Size, 2022

Source: Author's calculations from Indiana Department of Education data



in many ways. Exposure to more rigorous STEM courses increases the probability of college acceptance and increases scholarship opportunities. It influences students towards STEM majors, and it prepares students for more-rigorous college coursework. School corporations that cannot broadly offer these STEM courses reduce the likelihood of post-secondary attendance among students, and they likely increase the cost of attendance and reduce the readiness of students who attend.

## Dual Credit Courses

Dual credit courses offer high school students the opportunity to earn credits for both high school and college concurrently. Indiana high school students can earn dual credit by taking dual credit courses taught at high school by high school teachers in partnership with a post-secondary institutions. Dual credit courses cover traditional college core courses as well as career and technical education courses. Students can also take advanced college courses, with content more advanced than state-approved high school courses, through a post-secondary institution.[10]

Forty-one million Americans live in "higher education deserts," meaning that they are at least a 30-minute drive away from the nearest college or university (Templin, 2020). Roughly 29 percent of Hoosiers live in a higher education desert (Wiley Report, 2022). Indiana public high schools are required to offer a minimum of two dual credit courses, as well as two AP courses (Indiana Early College Credit Report, 2021). Dual credit courses that are offered at high schools and are taught by high school faculty offer students the opportunity to take college courses without having to travel. Due to the state mandate of a minimum of two dual credit courses per school, this ensures that rural high school students have the opportunity to earn college credit.

Benefits associated with dual credit courses include expanding rural access and availability, financial cost-savings, post-secondary exposure, and retention. Studies have shown that there are positive impacts on students enrolled in dual credit courses during high school. Those students are more likely to enroll in college/university, complete their degree, and have a smoother collegiate transition (Burton et al., 2023; Hemelt et al., 2019; Struhl & Vargas, 2012). Additionally, a study conducted in Texas found that students who completed at least one dual credit course during high school were 2.21 times more likely to enroll at a college/university. If the student had completed an ELA course, they were 2.75 times more likely to enroll. (Struhl & Vargas, 2012).

*Table 9* shows the number of dual credit classes offered by school corporations of different sizes. The number of dual credit courses offered tends to increase with school corporation size, although there is much variability in the number of enrolled courses among school corporations. Of the eight school corporations with enrollment between 144 and 499 students during 2022, an average of 8.75 dual enrollment courses were offered. The number of dual credit courses offered at these corporations was between five and 11 dual credit courses offered in these eight corporations and a total of 70 courses offered. Enrollment in these courses scaled by school corporation size is high (last column) suggests that students are taking the available courses.

*See Appendix Table C2* for a list of the most-frequently offered dual credit courses in Indiana. All the courses included in this analysis are within the Core Transfer Library (CTL) and are Priority Liberal Arts courses. The CTL is a collection of courses that are transferrable to any public college or university in the state, as well as to five independent universities. Students earn college credit while in high school for a discounted price compared to the cost of standard enrollment in college.[11] U.S. Government and U.S. History are the two most commonly enrolled dual credit courses, with students at 286 of Indiana's 290 school corporations enrolled in each of these courses.

***Indiana's state mandate of a minimum of two dual credit courses per school ensures that rural high school students have the opportunity to earn college credit, regardless of how far they may live from an institution of higher education.***

**Table 9. Dual Credit Course Enrollment, 2022**

Source: Author's calculations using data from the Indiana Department of Education.

| 2022 Student Enrollment | # of School Corp at Size | # Dual Credit Priority Liberal Arts Courses w/ Enrollment | | | | Course Enrollment as a % of School Corp Enrollment (Mean) |
|---|---|---|---|---|---|---|
| | | Mean | Min | Max | Sum | |
| 144 to 499 | 8 | 8.75 | 5 | 11 | 70 | 51.3% |
| 500 to 999 | 50 | 10.58 | 5 | 16 | 529 | 43.0% |
| 1,000 to 1,499 | 63 | 11.57 | 7 | 16 | 729 | 44.2% |
| 1,500 to 1,999 | 42 | 12.17 | 9 | 17 | 511 | 43.9% |
| 2,000 to 2,999 | 41 | 12.93 | 7 | 19 | 530 | 42.9% |
| 3,000 to 4,999 | 35 | 14.83 | 7 | 22 | 519 | 45.6% |
| 5,000 to 9,999 | 27 | 16.30 | 11 | 23 | 440 | 45.6% |
| 10,000 to 19,999 | 20 | 18.75 | 13 | 24 | 375 | 45.1% |
| 20,000+ | 4 | 17.75 | 15 | 20 | 71 | 39.2% |
| *Indiana Total* | *290* | *13.01* | *5* | *24* | *3,774* | *44.3%* |

## Advanced Courses for College Credit

According to the Indiana state-approved course list published by the Indiana Department of Education, Advanced Courses for College Credit (ACCC) are college-level courses offered for credit by an accredited post-secondary institution with content more advanced than state-approved high school courses.[12] The student receives both high school and college credit for these courses, but ACCC should not be confused with dual credit courses. ACCC offerings are most often taught through the post-secondary campus with in-person, online, or hybrid instruction led by higher education faculty. This format differs from dual credit courses, which are taught by high school faculty in the high school or an associated CTE career center.

Differences in the number of enrolled courses taken by students by school corporation size are shown in *Table 10*. Five of the eight smallest school corporations (144-499 students) do not have any students enrolled in Advanced Courses for College Credit, while all of the largest school corporations (20,000+ students) and all but one of the next largest (10,000 to 19,999 students) have students enrolled in this type of course. With the exception of the largest school corporations, all the other size categories have school cor-

**10 & 12.** For a list of Indiana high school course titles and descriptions, see **https://www.in.gov/doe/students/indiana-academic-standards/course-titles-and-descriptions/**.

**11.** The Indiana Commission on Higher Education's Early College Credit Report provides more details about dual credit programs in the state. See **https://www.in.gov/che/data-and-research/reports-and-analyses/early-college-credit-report/**.

## Table 10. Advanced Courses for College Credit Enrollment, 2022

Source: Author's calculations using data from the Indiana Department of Education.

Note: North Vermillion Community School Corporation, Lake Ridge New Tech Schools and Spencer-Owen Community Schools are not included in this analysis because no course information was available.

| 2022 Student Enroll | # of Corp at Size | # of Advanced Courses for College Credit w/ Enrollment | | | | # Corp w/ No ACCC Enroll-ment | % of Corp Enroll (Mean) |
|---|---|---|---|---|---|---|---|
| | | Mean | Min | Max | Sum | | |
| 144 to 499 | 8 | 0.750 | 0 | 4 | 6 | 5 | 1.96% |
| 500 to 999 | 50 | 1.340 | 0 | 6 | 67 | 15 | 3.51% |
| 1,000 to 1,499 | 63 | 1.714 | 0 | 5 | 108 | 18 | 3.27% |
| 1,500 to 1,999 | 42 | 1.262 | 0 | 4 | 53 | 13 | 2.07% |
| 2,000 to 2,999 | 41 | 2.049 | 0 | 5 | 84 | 5 | 4.02% |
| 3,000 to 4,999 | 35 | 2.143 | 0 | 5 | 75 | 7 | 2.92% |
| 5,000 to 9,999 | 27 | 2.074 | 0 | 6 | 56 | 5 | 2.43% |
| 10,000 to 19,999 | 20 | 2.900 | 0 | 6 | 58 | 1 | 3.26% |
| 20,000+ | 4 | 4.250 | 2 | 5 | 17 | 0 | 3.04% |
| *Indiana Total* | *290* | *1.807* | *0* | *6* | *524* | *69* | *3.08%* |

porations with no students enrolled in this type of course. The last column of *Table 13* shows ACCC enrollment scaled by school corporation size. The smallest corporations have the lowest scaled enrollment while corporations with 2000 to 2,999 students have the highest scaled enrollment.

*See Appendix Table C3* for the distribution of Advanced Courses for College Credit taken by Indiana high school students. While these are liberal arts courses, we do not know the specific focus or through which colleges or universities they are offered. *Table C3* shows that 172 school corporations had students taking a college English class during 2021-22, followed by 107 school corporations with students taking science courses. Enrollment topped 11,000 students for Advanced English classes, and more than 5,700 enrolled in Advanced Math classes.

## Career & Technical Education (CTE) Courses

There is a lack of consensus among researchers and policy makers about the role of high school career and technical education (LaForest, 2023). CTE is often viewed as an alternative to college that helps students find well-paying careers. CTE is also viewed as limiting students' future postsecondary education and labor market outcomes. Others view CTE as a way to prepare students to pursue postsecondary education as well as pursue well-paying jobs. The outcomes likely differ by the focus of the CTE program, credentials that are earned as part of the program and student attributes.

Career and Technical Education opportunities and program structure differ among states and among school districts within the same state. Academic studies have shown that participation in high school CTE programs has a positive effect on graduation rates, industry certifications and earnings after high school relative to students who do not participate, and stronger effects for males than female students (Bruner et al. 2019).

Here we summarize the findings of a few recent, rigorous academic studies. In their analysis of CTE training offered through a career academy focusing on information technology in North Carolina that admits students via a lottery, Hemelt et al. (2019) found that student enrolled in the career academy had higher high school attendance, higher graduation rates and were more likely to earn an IT industry certification and attend college within one year of graduation but had little impact on overall academic performance or the likelihood of enrolling in AP courses. In his analysis of comparing outcomes of students who attend regional vocational and technical high schools in Massachusetts relative to students who apply but are not accepted, Doughtery (2018) found that attending a technical high school increased the likelihood of graduating from high school, passing required exams and receiving industry certificates and that these effects are larger for lower-income students on average. Using data from a longitudinal survey, LaForest (2023) found that CTE in the trades increases high school graduation rates, employment opportunities, and wages, and decreases university completion relative to general education students or students participating in business CTE courses.

Indiana CTE coursework is offered for the following industry sectors: Advanced manufacturing; Agriculture; Architecture & construction; Arts, AV tech, & communication; Business, marketing, finance & entrepreneurship; Education & training; Health sciences; Hospitality & human services; Information technology; Languages, Public safety; STEM; Transportation & logistics; and Work-based learning. With the exception of the introductory courses in each area and most of the work-based learning courses, CTE courses are dual credit courses, so students can earn both high school credit and college credit for the course. Multiple industry certifications are offered in each sector, with more than 200 available.[13]

In Indiana, high school career and technical education is offered through 49 CTE districts with funding from state and federal sources. In most cases, school corporations jointly offer CTE courses through career centers associated with a CTE district. There is no standard model. While specialized coursework is often offered through a career center, some CTE coursework is offered at high schools. A few of the larger school corporations have their own stand-alone CTE programs, and the largest CTE district provides coursework for students from 13 school corporations. The large capital investment needed to offer CTE courses makes joint provisions necessary for most school corporations in the state. The economies of scale available through these sort of cooperative arrangements allow for much broader access to CTE programs. KSM Consulting (2018) provides an overview of how CTE is funded and operates in the state.

We are interested in access to CTE coursework and how that might differ among school corporations of different sizes. The most frequently enrolled dual enrollment CTE courses are shown in *Appendix Table C4*. More than 100 of Indiana's 290 public school corporations have students enrolled in each of these courses. Anatomy and Physiology has a total of 11,179 students enrolled from 228 school corporations.

**13.** Industry-recognized certifications eligible for graduation pathways available at **https://www.in.gov/doe/files/22-23-Industry-Certifications-Eligible-for-Graduation-Pathways.pdf**.

## Table 11. CTE Dual Credit Course Enrollment, 2022

Source. Author's calculations using data from the Indiana Department of Education.

Note: Includes all dual credit CTE Next Level Courses and Perkins Courses on the Priority Course List.

North Vermillion Community School Corporation, Lake Ridge New Tech Schools and Spencer-Owen Community Schools are not included in this analysis because no course information was available.

| 2022 Student Enrollment | # of Corp at Size | # CTE Dual Credit Courses w/ Enrollment | | | | Course Enrollment as a % of School Corp Enrollment (Mean) |
|---|---|---|---|---|---|---|
| | | Mean | Min | Max | Sum | |
| 144 to 499 | 8 | 11.50 | 4 | 36 | 92 | 28.57% |
| 500 to 999 | 50 | 20.72 | 3 | 44 | 974 | 27.78% |
| 1,000 to 1,499 | 63 | 22.32 | 3 | 59 | 1,406 | 27.34% |
| 1,500 to 1,999 | 42 | 23.85 | 3 | 51 | 978 | 21.68% |
| 2,000 to 2,999 | 41 | 29.88 | 10 | 72 | 1,195 | 23.24% |
| 3,000 to 4,999 | 35 | 33.83 | 12 | 76 | 1,184 | 21.38% |
| 5,000 to 9,999 | 27 | 39.56 | 9 | 77 | 1,068 | 20.25% |
| 10,000 to 19,999 | 20 | 50.15 | 22 | 85 | 1,003 | 18.62% |
| 20,000+ | 4 | 66.25 | 46 | 91 | 265 | 17.06% |
| *Indiana Total* | *290* | *28.65* | *3* | *91* | *8,165* | - |

*Table 11* provides the number of dual enrollment CTE courses by school corporation size. The eight smallest corporations have students enrolled in an average of 11.5 CTE courses during the 2021-22 school year. One of these corporations had students enrolled in four CTE courses, while another had students enrolled in 36 courses. Corporations of this size had students enrolled in a total of 92 different CTE courses. The data in the table shows that as the size of school corporation increases students are enrolled in more CTE courses. This occurs because there are more high school students as the size of the school corporation increases, so more students will be enrolled in more CTE classes. In the last column of *Table 11*, we scale CTE enrollment by school corporation K-12 enrollment and find that the share of students enrolled in CTE courses is higher (28.57 percent) for smaller corporations, which suggests that students of small corporations don't face impediments to enrolling in CTE courses. However, the data shown previously in *Table 5 (page 7)* suggests students from small corporation are less likely to earn technical honors diplomas from their CTE coursework.

## *Calculus Courses*

Finally, we examine access to calculus courses. Calculus is the most advanced math course offered in high schools. High school calculus has been shown to be an important predictor of success in college STEM courses. College calculus is a prerequisite for most upper-level college STEM courses. Outcomes associated with taking advanced high school math include: Increased retention in undergraduate engineering programs (Moses et al., 2011; Robinson 2003); Choosing to major in a STEM field (Robinson 2003); Completing a STEM major if student had AP calculus (Ackerman et al., 2013); Higher grades in college physics and calculus courses (Tyson, 2011); and Higher grades in economics principles courses (Ballard and Johnson, 2004). In a recent study, Chen et al. (2021) found that regular or AP calculus or AP computer science in high school has a positive effect on final grades in college introductory computer science courses.

The Indiana High School College and Career Readiness Course List includes three calculus courses: General Calculus, AP Calculus AB (equivalent to one semester of college calculus), and AP Calculus BC (equivalent to a full year of college calculus).[14] Most school corporations offer calculus through the AP track, with the AP Calculus AB offered most frequently. See *Table 12*.

Of the 290 school corporations, 81 (28 percent) offer a general calculus course, 199 (69 percent) offer Calculus AB and 73 (25 percent) offer Calculus BC. The number of school corporations offering general calculus (+57) and Calculus BC (+18) has increased since 2015 (the last report), while the number of corporations offering Calculus BC (-24) has decreased. Only two of the eight corporations with enrollment below 500 offer calculus. The percentage of corporations offering calculus steadily increases until enrollment approaches 2000 and then is more variable with the largest corporations (enrollment of 10,000 and higher) more likely to offer each of the three calculus courses.

**14.** For a full list of high school courses and descriptions, see **https://www.in.gov/doe/students/indiana-academic-standards/course-titles-and-descriptions/**.

## Table 12. General & AP Calculus Course Enrollment, 2022

Source: Author's calculations using data from the Indiana Department of Education.

Note: North Vermillion Community School Corporation, Lake Ridge New Tech Schools and Spencer-Owen Community Schools are not included in this analysis because no course information was available.

| 2022 Student Enrollment | # of School Corp at Size | # School Corporations Offering Course | | | *Total # Offering Calculus Course* | % School Corporations Offering Course | | |
|---|---|---|---|---|---|---|---|---|
| | | General Calculus | AP Calculus AB | AP Calculus BC | | General Calculus % | AP Calculus AB % | AP Calculus BC % |
| 144 to 499 | 8 | 0 | 2 | 0 | *2* | 0% | 25% | 0% |
| 500 to 999 | 50 | 7 | 31 | 1 | *39* | 14% | 62% | 2% |
| 1,000 to 1,499 | 63 | 19 | 37 | 6 | *62* | 30% | 59% | 10% |
| 1,500 to 1,999 | 42 | 17 | 25 | 9 | *51* | 40% | 60% | 21% |
| 2,000 to 2,999 | 41 | 12 | 30 | 5 | *47* | 29% | 73% | 12% |
| 3,000 to 4,999 | 35 | 11 | 28 | 14 | *53* | 31% | 80% | 40% |
| 5,000 to 9,999 | 27 | 5 | 23 | 18 | *46* | 19% | 85% | 67% |
| 10,000 to 19,999 | 20 | 8 | 19 | 17 | *44* | 40% | 95% | 85% |
| 20,000+ | 4 | 2 | 4 | 3 | *9* | 50% | 100% | 75% |
| *Indiana Total* | *290* | *81* | *199* | *73* | *353* | *28%* | *69%* | *25%* |

# Successful Transition to College

## College-Age Population & Enrollment

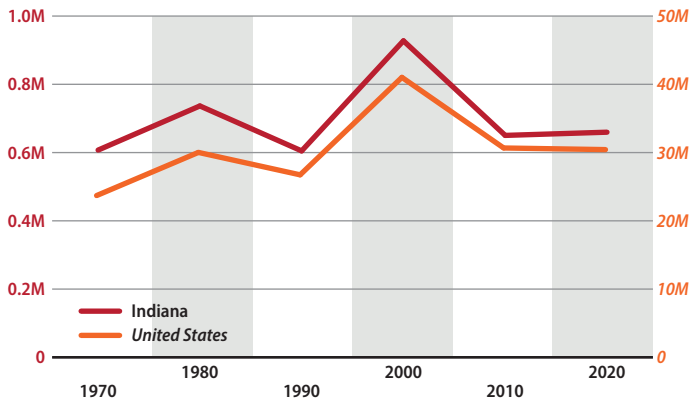
Enrollment in college is fundamentally affected by the overall size of the college-age population, ages 18-24. Indiana's trend in college-age population closely reflects the national trend. After a peak in 2000, both geographies experienced a decade of dramatic decline in the number of 18-to-24-year-olds—25 percent nationally and 30 percent in Indiana, then experienced stagnant growth as adults aged into and out of the cohort. See *Figure 8*.

The percentage of high school graduates attending college has also decreased. During 2021, only 53 percent of Indiana high school graduates attended college. This is more than a 10-percentage point decrease from 2012. See *Figure 9*. Nationally, the percentage of high school graduates enrolled in college peaked in 2011 at 49.4 percent and has decreased steadily over the past decade, coming in at 43.7 percent in 2021. See *Figure 10*.

### Figure 8. U.S. & Indiana College-Age Population, 1970-2020

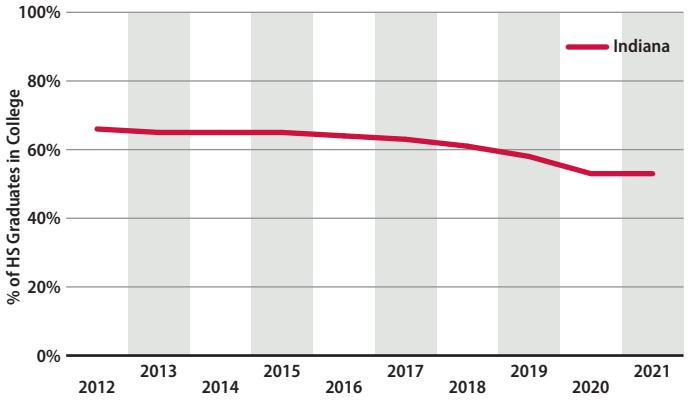
Source: Data from Decennial Census for 1970-2010 and American Community Survey five-year estimate for 2020.

Note: College-age population = Adults age 18-24 years old.



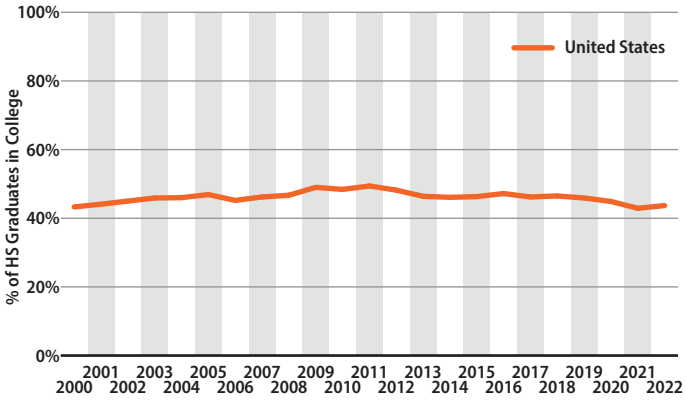

### Figure 9. Indiana High School Grads Enrolled in College, 2012-2021

Source: Indiana Commission for Higher Education, College Readiness Report.




### Figure 10. U.S. College-Age Pop. Enrolled in College, 2000-2022

Source: US Census Bureau, Current Population Survey.



# Access to College

The previous section showed that students in small school corporations have less access to rigorous college prepatory coursework. Next we examine a couple of programs that were developed to increase post-secondary enrollment: Indiana's 21st Century Scholars Program and the Free Application for Federal Student Aid (FAFSA).

## *21st Century Scholars & Scholar Success Program*

Indiana's 21st Century Scholars program is designed to make college more affordable for students from low-income families. Eligible students receive a two- or four-year scholarship that pays up to 100 percent tuition at eligible Indiana colleges or universities.[15] The Indiana Commission on Higher Education provides information on the history and outcomes associated with this program (ICHE 2021).

The Scholar Success Program provides a framework for students enrolled in the 21st Century Scholars program to prepare for and apply to college. Students should earn at least a Core 40 high school diploma, maintain a 2.5 high school GPA and complete a set of 12 required activities to qualify for 21st Century Scholars funding.[16] *Table 13* shows the completion rates for the 12 requirements set forth in the Scholar Success Program by school corporation size. The smallest corporations (144-499 enrollment) had the lowest average completion rate at 24.3 percent and the lowest maximum completion rate. These districts also had among the highest poverty rates. Average completion rates for other size categories ranged from 40 to almost 60 percent. School districts with enrollment of 1,000 to 1,499 had the highest average completion rate at 56.7 percent. Some districts had completion rates of 100 percent. In total, around 46 percent of students enrolled in 21st Century Scholars program completed all requirements for the Scholar Success Program in 2023.

**15.** For information about this this program, see **https://learnmoreindiana.org/scholars/**.

**16.** The 12 required activities (three per year of high school) are: 1. Create a graduation plan; 2. Participate in an extracurricular or service activity; 3. Watch "Paying for College 101;" 4. Take a career interests assessment; 5. Get workplace experience; 6. Watch "Estimate Your College Costs;" 7. Visit a college campus; 8. Take a college entrance exam (SAT or ACT); 9. Search for scholarships; 10. Submit a college application; 11. Watch "College Success 101;" and 12. File the FAFSA.

### Table 13. Scholar Success Program Completion Rates, 2023

Source: Authors' calculations using data from the Indiana Commission for Higher Education. Poverty rate for ages 5 to 17 from the US Census Bureau's Small Area Income and Poverty Statistics (school districts).

Note: *Tri-Township Consolidated School Corporation is not included in these calculations because 2023 data was not available.

| 2022 School Corp Enrollment Size | # Corp at Size | 21st Century Scholars % Completing All Scholar Success Program Requirements | | | 2021 Avg. Poverty Rate |
|---|---|---|---|---|---|
| | | Avg. % | Min. % | Max. % | |
| 144 to 499 | 8* | 24.3% | 0.0% | 50.0% | 18.5 |
| 500 to 999 | 50 | 54.2% | 0.0% | 100.0% | 13.7 |
| 1,000 to 1,499 | 63 | 56.7% | 0.0% | 100.0% | 14.0 |
| 1,500 to 1,999 | 42 | 52.4% | 0.0% | 91.7% | 13.3 |
| 2,000 to 2,999 | 41 | 45.7% | 0.0% | 100.0% | 11.8 |
| 3,000 to 4,999 | 35 | 41.1% | 0.0% | 73.1% | 14.0 |
| 5,000 to 9,999 | 27 | 45.2% | 0.0% | 78.0% | 12.3 |
| 10,000 to 19,999 | 20 | 44.6% | 0.0% | 96.4% | 15.8 |
| 20,000+ | 4 | 49.4% | 0.0% | 80.0% | 19.8 |
| *Indiana Total* | *290* | *45.9%* | *0.0%* | *100.0%* | *14.8* |

### Table 14A. FAFSA Filing Rates by School Corporation Size, 2022

Source: Author's calculations using school-level data from the Indiana Commission on Higher Education. There were a few schools within corporations where no high school graduates filed the FAFSA.

Note: * In 2019, the lowest school corporation K-12 enrollment was 162 students.

| 2022 School Corp Enroll Size | Avg. % Filing 2022 FAFSA | Min. % Filing 2022 FAFSA | Max. % Filing 2022 FAFSA | Avg. % Filing 2019 FAFSA |
|---|---|---|---|---|
| 144 to 499 | 38.0% | 18.2% | 57.7% | 72.8%* |
| 500 to 999 | 48.7% | 32.8% | 72.4% | 77.4% |
| 1,000 to 1,499 | 51.0% | 17.2% | 77.4% | 77.6% |
| 1,500 to 1,999 | 46.4% | 29.4% | 70.7% | 76.3% |
| 2,000 to 2,999 | 45.6% | 0.0% | 65.0% | 74.1% |
| 3,000 to 4,999 | 45.7% | 0.0% | 59.8% | 75.4% |
| 5,000 to 9,999 | 48.7% | 9.3% | 75.0% | 79.1% |
| 10,000 to 19,999 | 44.9% | 2.8% | 82.3% | 77.2% |
| 20,000+ | 51.7% | 9.0% | 69.6% | 78.1% |
| *Indiana Total* | *47.2%* | *0.0%* | *82.3%* | *76.9%* |

### Table 14B. 21st Century Scholars' FAFSA Filing Rates Compared to Non-Scholars, 2022

Source: Authors' calculations using school-level data from the Indiana Commission for Higher Education.

Note: * In 2019, the lowest school corporation K-12 enrollment was 162 students.

| 2022 School Corp Enrollment Size | 21st Century Scholars Filing a FAFSA | | | | Non-Scholars Filing a FAFSA | | | |
|---|---|---|---|---|---|---|---|---|
| | Avg. % Filing 2022 FAFSA | Min. % Filing 2022 FAFSA | Max. % Filing 2022 FAFSA | Avg. % Filing 2019 FAFSA | Avg. % Filing 2022 FAFSA | Min. % Filing 2022 FAFSA | Max. % Filing 2022 FAFSA | Avg. % Filing 2019 FAFSA |
| 144 to 499 | 46.7% | 0.0% | 80.0% | 63.5%* | 36.0% | 21.9% | 56.5% | 78.6%* |
| 500 to 999 | 64.5% | 29.4% | 100.0% | 78.7% | 45.8% | 26.1% | 69.4% | 77.0% |
| 1,000 to 1,499 | 64.1% | 16.7% | 100.0% | 75.9% | 48.6% | 11.0% | 75.9% | 78.2% |
| 1,500 to 1,999 | 57.9% | 20.0% | 100.0% | 74.6% | 44.2% | 18.3% | 68.1% | 76.8% |
| 2,000 to 2,999 | 53.8% | 0.0% | 100.0% | 73.2% | 44.1% | 0.0% | 64.7% | 74.4% |
| 3,000 to 4,999 | 54.7% | 0.0% | 92.9% | 72.7% | 44.1% | 0.0% | 58.7% | 76.2% |
| 5,000 to 9,999 | 61.0% | 0.0% | 80.4% | 77.6% | 47.0% | 8.1% | 73.2% | 79.4% |
| 10,000 to 19,999 | 56.3% | 0.0% | 91.7% | 74.9% | 42.3% | 0.0% | 73.6% | 78.0% |
| 20,000+ | 58.1% | 0.0% | 100.0% | 77.6% | 49.6% | 0.0% | 65.3% | 78.2% |
| *Indiana Total* | *57.8%* | *0.0%* | *100.0%* | *75.3%* | *45.1%* | *0.0%* | *75.9%* | *77.5%* |

## *FAFSA Filing Rates*

To access U.S. federal aid, along with state and institutional aid, college-seeking students must complete the Free Application for Federal Student Aid (FAFSA). Filing the FAFSA is a critical first step for students to receive financial assistance to enroll, persist and ultimately graduate from college. Numerous studies have shown that each year a large number of students who would be eligible for aid either do not file the FAFSA or file late (McKinney & Novak, 2015).

*Table 14A* shows overall FAFSA filing rates by school corporation size for 2022 and 2019. FAFSA filing rates declined dramatically post COVID-19. The percentage of graduates who filed FAFSA dropped around 30 percentage points overall and for most school corporation sizes between 2019 to 2022. School corporations with the lowest enrollment (144 to 400 students) had the lowest FAFSA filing rates. The average filing rate was 7 to more than 20 percentage points lower than that of other size categories, and the maximum filing rate was 2 to more than 20 percentage points lower.

*Table 14B* shows FAFSA filing rates for 21st Century Scholars and non-21st Century Scholars. There are notable disparities in FAFSA filing rates between these two groups. Similarly, both experienced a decline in students who filed the FAFSA from 2019 to 2022. Although, 21st Century Scholars did not decline to the degree that non-21st Century Scholars did, dropping by only around 10-20 percent among all corporation sizes. Whereas non-21st Century Scholars fell by around 30-35 percent across all corporation sizes from 2019 to 2022. This highlights the importance of the 21st Century Scholars program and its ability to encourage students to apply for federal aid for college compared to non-21st Century Scholars students.

# Post-Secondary Participation

In this section we examine post-secondary participation rates for 2019 high school graduates.[17]

*Table 15* shows the college attendance rates of 2019 high school graduates. Across all corporation sizes, between 50 and 60 percent of graduates enrolled in college. The exception is the smallest corporations, which had an average college attendance share of 38 percent—nearly 20 percentage points lower than other corporation sizes. Overall, across all corporations there were more students who graduated high school pursuing college enrollment than not, with an overall average of 56 percent.

Next, we examine college enrollment rates for 21st Century Scholars and non-Scholars. *Tables 16A and 16B* show the share of 2019 high school graduates involved in the 21st Century Scholars program who enrolled in college, as well as the graduates not involved in the program who enrolled in college. The tables do not capture the total number of students enrolled in college due to data not being available for some school corporations because of data suppression. Nevertheless, a comparison of the two tables shows that 21st Century Scholars enrolled in college at greater rates than non-21st Century Scholars. School corporations had a relatively similar average share of 21st Century Scholars enrolling in college at between 86 and 90 percent in contrast with non Scholars with an average share between 34 and 56 percent. Considering the minimum and maximum values, college enrollment ranged from 61.7 to 100 percent among corporation sizes for Scholars and 21.2 to 83.5 percent for non Scholars among corporation sizes. This data shows that students who apply for the 21st Century Scholars program and persevere through the Scholar Success Program enroll in colleges at high rates.

### Table 15. Share of High School Graduates Enrolled in College, 2019

Source: Authors' calculations using the Indiana Commission on Higher Education's College Readiness Dataset 2021 (2019 Cohort).

| 2019 School Corp Enrollment Size | Avg. % HS Grads Attending College | Min % HS Grads Attending College | Max % HS Grads Attending College |
|---|---|---|---|
| 144 to 499 | 38.19 | 26.92 | 60.00 |
| 500 to 999 | 57.10 | 38.98 | 75.76 |
| 1,000 to 1,499 | 55.79 | 29.90 | 78.26 |
| 1,500 to 1,999 | 56.86 | 36.36 | 75.00 |
| 2,000 to 2,999 | 57.31 | 36.25 | 91.19 |
| 3,000 to 4,999 | 55.60 | 35.23 | 85.79 |
| 5,000 to 9,999 | 57.84 | 25.00 | 77.54 |
| 10,000 to 19,999 | 59.37 | 43.25 | 83.99 |
| 20,000+ | 53.50 | 29.85 | 78.77 |
| *Indiana Total* | *56.28* | *25.00* | *91.19* |

### Table 16A. Share of 21st Century Scholars Enrolled in College, 2019

Source: Authors' calculations using the Indiana Commission on Higher Education, College Readiness Dataset 2021 (2019 Cohort).

Note: ***Data not available due to data suppression if number of students is below 10.

| 2019 Corp Enrollment Size | Avg. % of Scholars Attending | Min % of Scholars Attending | Max % of Scholars Attending | # Corp w/ Data Available | # Corp at Enroll Size |
|---|---|---|---|---|---|
| 144 to 499 | *** | *** | *** | 0 | 8 |
| 500 to 999 | 87.47 | 75.00 | 100.00 | 12 | 50 |
| 1,000 to 1,499 | 86.14 | 63.64 | 100.00 | 39 | 63 |
| 1,500 to 1,999 | 87.64 | 66.67 | 100.00 | 27 | 42 |
| 2,000 to 2,999 | 86.40 | 61.70 | 100.00 | 30 | 40 |
| 3,000 to 4,999 | 87.66 | 71.43 | 100.00 | 31 | 35 |
| 5,000 to 9,999 | 90.68 | 77.59 | 100.00 | 26 | 27 |
| 10,000 to 19,999 | 89.17 | 70.43 | 96.77 | 20 | 20 |
| 20,000+ | 89.72 | 81.01 | 98.04 | 4 | 4 |
| *Indiana Total* | *87.75* | *61.70* | *100.00* | *189* | *289* |

### Table 16B. Share of Non-Scholars Enrolled in College, 2019

Source: Authors' calculations using the Indiana Commission on Higher Education, College Readiness Dataset 2021 (2019 Cohort).

| 2019 Corp Enrollment Size | Avg. % Non-Scholars Attending | Min % Non-Scholars Attending | Max % Non-Scholars Attending | # Corp w/ Data Available | # Corp at Enroll Size |
|---|---|---|---|---|---|
| 144 to 499 | 34.62 | 34.62 | 34.62 | 1 | 8 |
| 500 to 999 | 51.21 | 35.29 | 64.86 | 12 | 50 |
| 1,000 to 1,499 | 50.86 | 22.99 | 75.31 | 39 | 63 |
| 1,500 to 1,999 | 51.73 | 27.96 | 69.61 | 27 | 42 |
| 2,000 to 2,999 | 50.91 | 27.27 | 74.87 | 30 | 40 |
| 3,000 to 4,999 | 49.72 | 28.38 | 75.52 | 31 | 35 |
| 5,000 to 9,999 | 56.30 | 31.72 | 76.65 | 26 | 27 |
| 10,000 to 19,999 | 55.26 | 37.42 | 83.53 | 20 | 20 |
| 20,000+ | 48.25 | 21.22 | 78.11 | 4 | 4 |
| *Indiana Total* | *51.89* | *21.22* | *83.53* | *190* | *289* |

17. The 2021 cohort of the ICHE College Readiness dataset had not been released at the time this analysis was conducted, so the 2019 cohort is used in this analysis. We plan to update this analysis when the 2021 dataset is available.

## Table 17A. College Enrollment as Share of High School Graduates in Free/Reduced Price Lunch Program, 2019

Source: Indiana Commission on Higher Education, College Readiness Dataset 2021 (2019 Cohort).

| 2019 School Corp Enrollment Size | 2019 HS Grads in Free/Reduced Price Lunch Program | | | # Corp w/ Data Available |
|---|---|---|---|---|
| | Avg. % in College | Min. % in College | Max. % in College | |
| 144 to 499 | 37.97 | 18.18 | 52.94 | 4 of 8 |
| 500 to 999 | 47.41 | 25 | 83.33 | 47 of 50 |
| 1,000 to 1,499 | 44.63 | 19.05 | 72 | 63 of 63 |
| 1,500 to 1,999 | 43 | 25 | 65.14 | 42 of 42 |
| 2,000 to 2,999 | 43.55 | 25 | 80 | 40 of 40 |
| 3,000 to 4,999 | 45.97 | 30 | 75 | 34 of 35 |
| 5,000 to 9,999 | 47.26 | 21.43 | 60.8 | 27 of 27 |
| 10,000 to 19,999 | 50.7 | 41.1 | 65.38 | 20 of 20 |
| 20,000+ | 48.17 | 31.98 | 69.12 | 4 of 4 |
| *Indiana Total* | *45.5* | *18.18* | *83.33* | *281 of 289* |

## Table 17B. College Enrollment as Share of High School Graduates Not in Free/Reduced Price Lunch Program, 2019

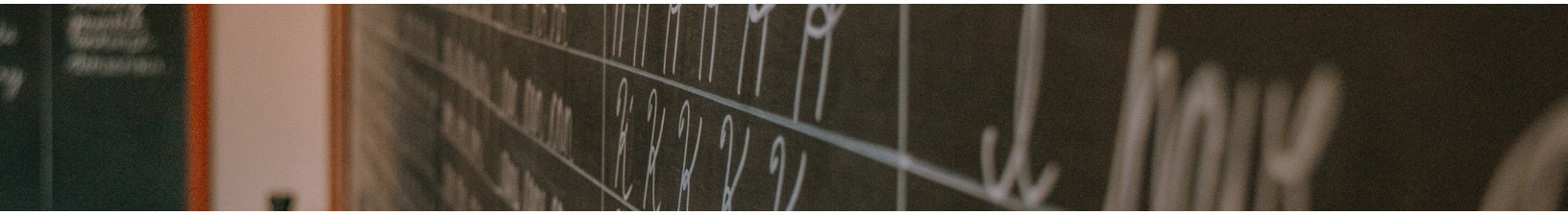
Source: Indiana Commission on Higher Education, College Readiness Dataset 2021 (2019 Cohort).

| 2019 School Corp Enrollment Size | 2019 HS Grads Not in Free/Reduced Price Lunch Program | | | # Corp w/ Data Available |
|---|---|---|---|---|
| | Avg. % in College | Min. % in College | Max. % in College | |
| 144 to 499 | 43.79 | 31.25 | 64.29 | 4 of 8 |
| 500 to 999 | 62.06 | 44.12 | 86.05 | 47 of 50 |
| 1,000 to 1,499 | 61.35 | 36.36 | 83.33 | 63 of 63 |
| 1,500 to 1,999 | 63.28 | 31.71 | 86.67 | 42 of 42 |
| 2,000 to 2,999 | 63.87 | 43.24 | 92.49 | 40 of 40 |
| 3,000 to 4,999 | 60.6 | 37.14 | 87.79 | 33 of 35 |
| 5,000 to 9,999 | 62.74 | 30 | 80.45 | 27 of 27 |
| 10,000 to 19,999 | 63.59 | 44.88 | 85.66 | 20 of 20 |
| 20,000+ | 55.57 | 25.87 | 80.37 | 4 of 4 |
| *Indiana Total* | *61.99* | *25.87* | *92.49* | *280 of 289* |

## *Post-Secondary Participation by Free & Reduced Price Lunch Program Status*

Finally, we examine the relationship between college enrollment rates and free/reduced price lunch status. College enrollment of high school graduates by free/reduced price lunch status is shown in *Tables 17A and 17B*.

Overall, high school graduates getting assistance through a free/reduced price lunch program enrolled in college at lower rates than graduates who did not receive free/reduced price lunch in 2019. The average share of students who enrolled in college that were in a FRPL program was near 45 percent across all corporation sizes, whereas an average of 62 percent of students who were not involved in a FRPL program in high school enrolled in college among all corporation sizes in 2019. The college enrollment rate is lowest for the smallest school corporations with FRPL program students, having enrollment rates 5 to 10 percentage points lower on average than larger corporations. The gap is even larger for average college enrollment rates among non-FRPL program students.



# Recent Research

## Relationship between School Corporation Size and Student Performance

The analysis of education economies of scale, school corporation size, and student outcomes is part of a broader literature evaluating the efficiency and quality of public services. We reviewed the pertinent literature available up to that point in our 2017 study. Here we review relevant, recent studies that focused on school size and student outcomes.

McGee et al. (2023) used student level data and a regression discontinuity model to examine the impact of district mergers on math and English Language Arts standardized test scores during third through eighth grades, following consolidation-affected students over the four years immediately following consolidation. They did not examine outcomes for high school students. Arkansas Act 60 was enacted in 2004 and required that districts with enrollment lower than 350 students for two consecutive years consolidate with another district. They found small positive-to-null effects for language arts and mostly null effects for math depending on which specification was used: The consolidation did not decrease student test scores.

Chin (2023) used district level data and difference-in-difference and event study models to examine the impact of school district consolidations in North Carolina on district finances and student educational outcomes. He found evidence of economies of scale in action through a decrease in operational costs as per-student expenditures on support services (administrative overhead) decreased immediately and per-pupil expenditures on instruction decreased over time (after an adjustment period). He found no differences in capital spending, the number of operational schools, school size, or class size after consolidation. He found that high school diploma rates did not change, indicating that consolidation does not lead to a decrease in graduation rates. The available data did not include information on test scores, so the impact on test scores was not evaluated.

***K-12 school corporations with larger enrollment have capacity to reduce overhead costs while increasing per-student expenditures in meaningful ways, such as greater allocation of resources that improve performance/outcomes or facilitate innovation.***

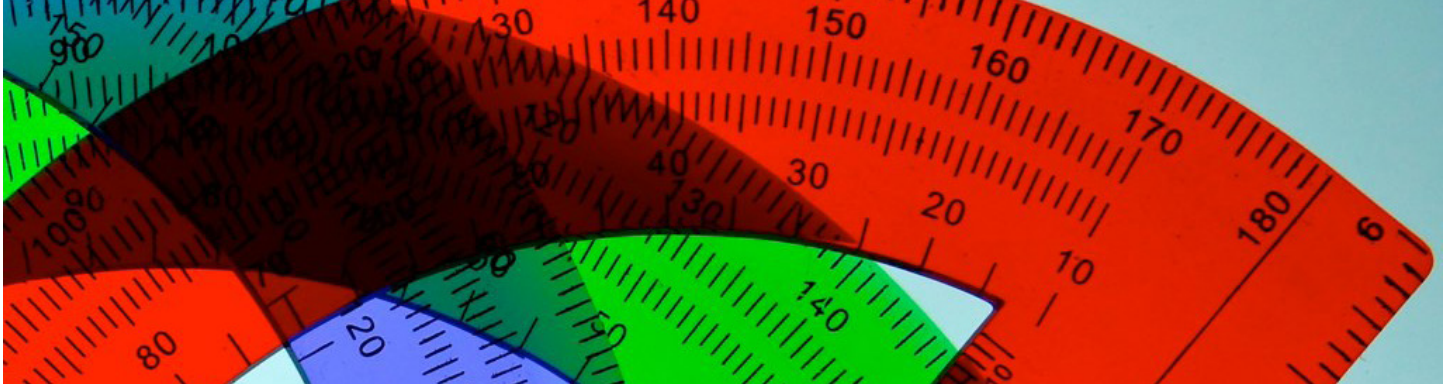
## Economies of Scale, Scope, and Density

Economies of *scale* occur when unit costs decrease with the volume of output. Economies of *scope* are present when the costs of producing at least two different outputs together is less than producing each separately. Economies of *density* are present if unit costs decline in serving more spatially concentrated users, as in dense urban environments (Gomez-Reino et al., 2023).

A body of research has examined the transmission mechanisms underpinning economies of scale for school corporations. Dunscombe and Yinger (2007) have identified five consequential effects of scale in this context:

1. It has been observed that the quality of certain educational services remains consistent across a broad spectrum of enrollments. For instance, central administrative functions, including superintendents, school boards, and associated support staff, can efficiently serve a large student population.
2. Larger school corporations have the capacity to provide specialized services, such as science laboratories, computer facilities, and athletic amenities, at a reduced average cost, as they extend these services to a larger student body.
3. Larger school corporations are better positioned to employ specialized services and personnel, such as labs and athletic facilities and educators in the fields of science, mathematics, and technology; offer a more extensive array of specialized courses; and implement curriculum and management innovations at lower cost.
4. These larger educational entities can leverage their size to negotiate reduced prices for supplies and equipment by procuring them in bulk.

Each of these channels through which cost savings are realized simultaneously exerts a dual influence on performance. Reduced overhead costs lead to an increase in per-student expenditures for other activities, thereby enabling larger educational institutions to offer superior facilities and equipment, as a result of their lower per-student expenditures. Specialization and the utilization of shared personnel are attainable within larger school corporations, whereas smaller ones encounter distinctive challenges in this regard. Per-unit cost savings in contracted services, spanning from healthcare to office supplies, are more likely to be achieved in larger school corporations, which additionally benefit from diminished per-unit overhead costs. These cost savings allow larger school corporations to allocate greater resources to the pursuit of innovative initiatives.



# Empirical Modeling of Educational Outcomes

Differences in student outcomes may be attributed to demographic and socio-economic differences among school corporations which are not considered in the descriptive statistics shown in previous analysis. To account for this, we turn to a more rigorous statistical analysis of the relationship between school corporation size and educational outcomes controlling to demographic and socio-economic differences among school corporations.

We examine the effect of school corporation size on educational outcomes in Indiana using cross-sectional data for 2022 unless otherwise noted.[18] We construct these models using data available from the Indiana Department of Education and the Indiana Commission on Higher Education. In each model we use the natural logarithm of school corporation total enrollment as the size measure and include demographic measures and the share of students receiving free or reduced lunch as control variables. We first measure the overall marginal impact across all school corporations, and then measure the marginal effect of increasingly larger enrollment sizes (under 1,000 students, under 2,000 students, under 4,000 students, and under 8,000 students).

Model results are summarized in *Table 18*. Descriptive statics and the full regression results are available in *Appendix D*. Estimates not meeting the 10 percent level of statistical significance are denoted by zero, while all reported values are statistically significant at the 10 percent level or better.

These results suggest that there are potential benefits from increasing the size of small school corporations. The specification of the model allows us to interpret these results as the numeric change on a measure (test scores or share or students) as the size of a school corporation increases. The results of *Table 22* should be interpreted as the impact of increasing the size of the school corporation from the minimum observed level (144 students) to the enrollment level noted in the top row.

*For the smallest schools (enrollment < 1000), there are significant impacts from increasing enrollment to 1,000 students:*

- A 1 percent increase in enrollment is associated with an almost 9 percent increase in SAT composite scores or an increase of over 90 points on average.
- Increasing enrollment to 1,000 students is associated with a 13 percentage point increase in the number of students passing the 8th grade ILEARN exam, a 10 percentage point increase in the number of students passing the IREAD exam, a 17 percentage point increase in the number of graduates attending college, and a 12 percentage point decrease in the waiver graduation rate.
- Increasing enrollment to 2,000 students is associated with a 3.2 percent increase in the share of high school graduates passing AP exams.

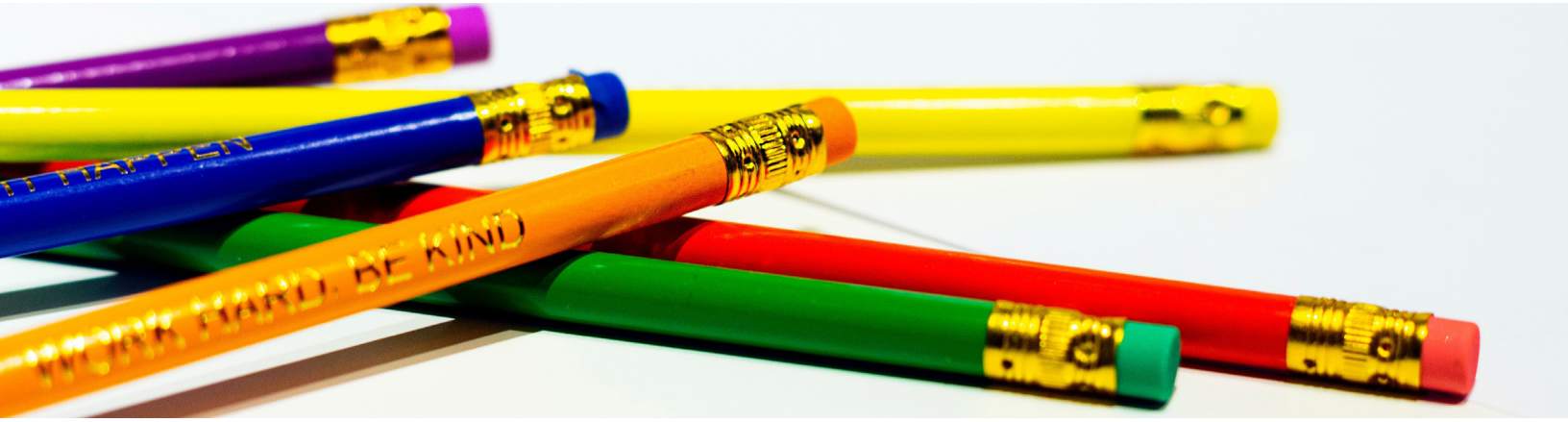
Other outcome measures are significant for larger school corporations. The overall ILEARN pass rate for 4th grade students increases by 4.5 percentage points, and FAFSA filing rates decrease by 2.5 percentage points as school corporation enrollment approaches 4,000 students.

18. We used panel models for the analysis included in our 2017 study. Data disruptions resulting from the COVID pandemic prevented the construction of panel models for this study, so we use cross section models. The results are similar.

**Table 18. Model Results – Impact of Increasing School Corporation Enrollment on Educational Outcomes**

Source: Author's calculations using data from the Indiana Department of Education and the Indiana Commission on Higher Education.

| Metric | Overall | School Corp Enrollment <1,000 Students | School Corp Enrollment <2,000 Students | School Corp Enrollment <4,000 Students | School Corp Enrollment <8,000 Students |
|---|---|---|---|---|---|
| SAT Composite Score (2021) using level/ log specification | 9.405* | 90.76*** | 0 | 0 | 11.385* |
| Share passing the AP exam (2019) | 0.028*** | 0 | 0.032** | 0.031*** | 0.033*** |
| Overall ILEARN pass rate 4th grade (2022) | 0.035*** | 0 | 0 | 0.045*** | 0.037*** |
| Overall ILEARN pass rate 8th grade (2022) | 0.035*** | 0.136*** | 0.065*** | 0.051*** | 0.038*** |
| IREAD pass rate 3rd grade (2022) | 0 | 0.100* | 0 | 0 | 0 |
| Waiver graduates (2022) | 0 | -0.121** | 0 | 0 | 0 |
| FAFSA filing rate (2022) | 0 | 0 | 0 | -0.025* | -0.019* |
| College attendance rate (2019) | 0 | 0.178*** | 0.045** | 0 | 0 |




# Summary and Conclusions

Small school corporations often perform worse on a variety of measures. The findings of this report provide additional support for this conclusion.

Previous studies showed that around 2,000 students is the minimum efficient scale for school corporations in Indiana. More than half of Indiana's school corporation had 2022 K-12 enrollment lower than 2,000. Increasing school corporation size to around 2,000 students has the potential to reduce per pupil cost and free up funds for classroom instruction of other purposes which could improve the educational outcomes of students.

The statistics and regression model results used in this report to examine how student performance differs among school corporations of different sizes show stark differences in outcomes. Standardized test scores and pass rates tend to be lower for the smallest school corporations in the state. A lower share of students graduate with technical honors diplomas in both the smallest and largest districts. A higher share of students graduate with a waiver in the smallest school corporations.

We examine a variety of factors that affect educational outcomes and found that small school corporations exhibited high levels of learning loss due to the pandemic. We also found that there are differences in the number of school corporations offering pre-kindergarten programs. School corporations with enrollment lower than 1,000 students and those with enrollment between 5,000 and 9,999 the least likely to offer pre-K programs.

Course offerings also differ substantially among school corporations. Only two of the smallest school corporations (enrollment < 500) have students enrolled in a calculus class. Taking high school calculus has a high association with college success, particularly in STEM fields. Students in the smallest corporations are also less likely to enroll in Advanced College Credit Courses—five of the eight corporations at this size have zero students enrolled in these courses. The smallest corporations also have a low number of dual credit liberal arts courses with enrollment but the share of enrollment in these courses in quite high suggesting that students are taking the courses that are available.

In the high school course enrollment data provided by the Indiana Department of Education, there are school corporations that show no enrollment in any AP courses. This includes four of the eight smallest school corporations. A closer look at AP STEM courses shows that many corporations don't offer any of these courses. Together these findings suggest that students attending small school corporations have less access to rigorous coursework, which may affect post-secondary outcomes.

Next, we examine two programs that affect college access and college attendance rates: the Scholar Success Program and FAFSA filing rates. We find that the smallest school corporations (enrollment < 500) have the lowest percentage 21st Century Scholar enrollees who complete the Scholar Success Program and the lowest percentage of high school graduates who compete the FAFSA form. Finally, we examine college attendance rates by school corporation size and find that the smallest school corporations have the lowest college attendance rates.

**These results show that school corporation size affects student outcomes not only during primary and secondary school, but also post-secondary outcomes.**

The last section of the report provides results from regression models examining the impact of increasing school corporation size on student outcomes. We find that increasing the size of school corporations with enrollment below 1,000 students to have 1,000 students would...

- increase SAT composite scores by 90 points,
- increase the overall ILEARN 8th grade pass rate by 13.6 percent,
- increase the 3rd grade IREAD pass rate by 10 percent,
- reduce the share of waiver graduates by 12 percent, and
- increase college attendance by 17.8 percent.

Also, increasing the size of small corporations to 2,000 students would increase the AP exam pass rate by 3.2 percent.

There are several topics that we were not able to examine in this report. We would like to know about employment outcomes for high school graduates who do not attend college and if there are differences among school corporations of different sizes. We would like to know more about the use of online learning to expand high school course offerings and any associated impacts on student outcomes. This is one of the strategies often suggested to increase course availability in small school corporations, but data was not available to examine this. We would like to know more about CTE industry certifications earned by high school graduates. Finally, we used data for 2019 graduates to examine post-secondary outcomes. Data for 2021 graduates has since become available. We plan to analyze this data in future studies.

# Credits

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# See Also

## Appendix

https://projects.cberdata.org/194/school-corporation-size-and-student-outcomes/