

The State of the New York Teacher Workforce

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Executive Summary

The Rockefeller Institute of Government is conducting a multistate examination of potential supply and demand issues for teachers.¹ In other words, are states facing teaching shortages around the country? This report, the second state-specific review, is an initial overview of the P-12 teacher labor market in New York State (NYS). It examines the question of whether a shortage of elementary and secondary school teachers exists, or is soon to occur, from three perspectives: the balance of current teachers and students; the supply of potential new teachers and how their qualifications fit, or fail to fit, the near-term needs of school districts; and the distribution of challenges in staffing across districts of different economic, racial, and ethnic compositions.

At the statewide level, New York has not experienced a teacher shortage, as there has not been a growing imbalance between the number of teachers and the number of public school students. In fact, in the recent five-year period from 2011 to 2016, student-teacher ratios fell both in New York City, the largest school district in the country, and in the rest of the state. Measures of average class size, too, reveal no sign of a growing imbalance in the number of teachers compared to the number of students.

Near-term aggregate demand for new teachers may also be low. K-12 enrollment in New York State has declined over the last decade and a half and is not expected to grow through 2025. Also, many of the teachers in New York City, the only major region of the state where student enrollment is growing, are relatively young and consequently less likely to generate many retirements over the next several years. Finally, teacher turnovers have declined across the state, a trend that, if it continues, may also moderate demand for new teachers.

While there is no convincing evidence of a current or imminent teacher shortage, however, New York State has seen in recent years one of the largest drops in the nation in the number of individuals enrolled in and graduating from teacher education programs. If that trend persists, the decrease in the supply of teachers could create shortages in future years. Between the 2010-11 and 2015-16 school years, the number of graduates from teacher preparation programs declined by 39 percent. In 2010-11, there was one recent teacher program graduate

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¹ Jim Malatras, Thomas Gais, and Alan Wagner, *A Background on Potential Teacher Shortages in the United States* (Albany: Rockefeller Institute of Government, July 2017), <http://www.rockinst.org/issue-area/background-potential-teacher-shortages-us/>; Thomas Gais, Jim Malatras, Alan Wagner, and Young Joo Park, *By the Numbers: Phase One Analysis of the Teacher Workforce in South Dakota* (Albany: Rockefeller Institute of Government, November 2017), <http://www.rockinst.org/issue-area/phase-one-analysis-teacher-workforce-south-dakota>.

for every 8.8 teachers in the current NYS workforce; in 2015-16, one recent graduate was available for every 14.4 current teachers.

The future effects of the declining supply of prospective teachers may be exacerbated by their specializations. When compared to the current teacher workforce, few recent graduates of teacher education programs are prepared to teach the core subjects of mathematics, science, English, and social studies as well as such subjects as career and technical training, music, and art. In contrast to these areas of concern, larger percentages of recent graduates are prepared to teach special education, bilingual education, elementary school, and prekindergarten classes. To be sure, these latter specializations are areas where student enrollment has been growing, and bilingual and special education in particular have long been reported by education administrators as specializations in short supply in New York. The proportionately greater supply of new teachers preparing to serve these students may thus alleviate some shortages. Nonetheless, the narrow scope of recent teacher preparations, compounded by the overall, steep decline in teacher program graduates and enrollments, may eventually lead to significant shortages in several key subject areas.

However, even with these statewide patterns and trends, some New York school districts face severe problems in teacher staffing. Districts with high child poverty rates and minority student populations (black or Hispanic) are much more likely to face challenges in recruiting and retaining qualified teachers. In such districts, more of their teachers teach out of their certifications, do not yet have permanent certification, have fewer than three years of teaching experience, and generate higher rates of annual turnover. In high poverty districts with many Hispanic students, average class sizes are larger than elsewhere in the state. These equity issues are affecting more and more of New York's children, as student population growth is greater in urban, economically disadvantaged, and racially and ethnically diverse communities.

These findings suggest that while generalized efforts to increase the number of individuals choosing to enter the teaching profession may help prevent a potential future shortage of teachers in New York, such initiatives should be accompanied with targeted efforts to increase preparation in selected program areas and in taking jobs in urban, economically disadvantaged, and racially and ethnically diverse districts. Policymakers have passed some targeted recruitment and retention programs in some cases, and those programs are briefly reviewed below.

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Introduction

Enrollment in teacher preparation programs in the United States has fallen quickly and consistently in recent years — from nearly 684,000 students in school year 2010-11 to nearly 419,000 in 2014-15, a 39 percent decline in just four years. The number of people completing such programs has plummeted as well: from around 217,000 in 2010-11 to approximately 172,000 completers reported by the nation’s 2,140 teacher preparation providers in 2014-15, a 21 percent drop.²

These rapid declines in potential teachers diverge sharply from the slow yet persistent growth in the number of K-12 students in public schools, from 49.4 million in the fall of 2009, to an estimated 50.5 million in 2017 (a 0.3 percent annual increase).³ Based in part on these trends, many have warned of a current and pending national teacher shortage.⁴

But teacher labor markets are not national with respect to demand and supply. States regulate preparation programs, employment, and many other aspects of the education system; state and local governments provide most of the financing that factors into school district decisions about teacher employment; and teachers completing preparation programs tend to seek jobs within those programs’ local markets. Although national drivers may affect some states, it is also possible that their effects differ in magnitude or are absent in other states, or that very different variables are at work, or that there are extreme differences in local teacher labor markets within states.

For example, New York State has seen even greater declines in participation in its teacher preparation programs than national trends. New York’s student population has decreased gradually, not increased as it has at the national level. Most of the teachers in the one area of the state, New York City, where student enrollment is increasing are younger and likely not to cause sizable vacancies due to retirements. And teacher turnover rates, a significant factor in the labor market, have fallen in New York, not risen as they have nationally.

2 Data from United States Department of Education, Title II Reports, National Teacher Preparation Data, at <https://title2.ed.gov/Public/Home.aspx>.

3 Table 105.30. Enrollment in elementary, secondary, and degree-granting postsecondary institutions, by level and control of institution: Selected years, 1869-70 through fall 2025, Digest of Education Statistics, February 2016, https://nces.ed.gov/programs/digest/d15/tables/dt15_105.30.asp?current=yes.

4 See, for example: Leib Sutchter, Linda Darling-Hammond, and Desiree Carver-Thomas, *A Coming Crisis in Teaching? Teacher Supply, Demand, and Shortages in the U.S.* (Palo Alto: Learning Policy Institute, September 2016), https://learningpolicyinstitute.org/sites/default/files/product-files/A_Coming_Crisis_in_Teaching_REPORT.pdf.

So when we look within New York, we see current or potential imbalances in the teacher labor market that are more specific, localized, dynamic, and, in some cases, greater in magnitude than those revealed by general analyses of national teacher shortages or surpluses. Such findings have policy implications. Rather than relying exclusively on efforts aimed at generating larger national pools of teacher candidates, targeted policy changes and incentives may be needed, and effective initiatives may differ from state to state. Efforts that focus on particular teaching specializations, on specific regions of the state, and in communities with targeted racial or economic characteristics, informed by proper data analyses, should be more effective at meeting diverse educational needs. We review some of New York's recent effort of targeted policy solutions in order to address potential local and subject matter shortage areas.

This brief seeks to answer questions about New York State's teacher labor market. Direct measures of teacher shortages and surpluses are hard to find. Most assessments of shortages and surpluses use surveys of state and local education administrators, but it is unclear what evidence lies behind those judgments. Counting the number of qualified applicants per open position is another approach, but few states either collect or make such data available. Instead, this brief approaches the issue by asking three basic questions:

1. Is there a changing imbalance between teachers, on the one hand, and factors associated with the demand for teachers, on the other?
2. Are teacher candidates in New York prepared in terms of numbers and specialized preparations to fill the kinds of positions needed in the state?
3. Are school districts equally able to recruit and retain the teachers they need, or are some struggling to staff their schools appropriately, while others are not?

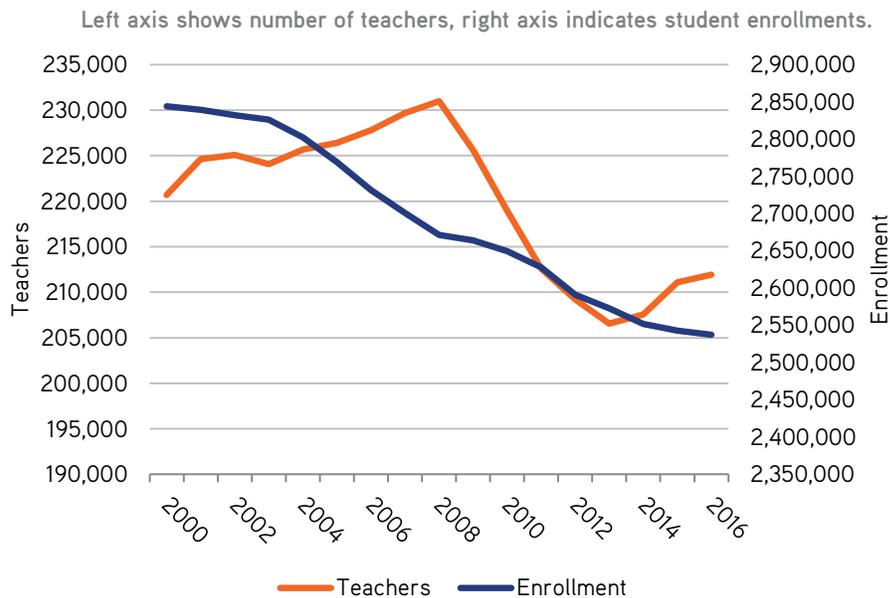
These are hard questions, and while this brief only begins to answer them, it helps clarify in what respects the teacher labor market is working well in New York and how and where it is not.

State-Level Changes in the Balance between Enrollments and Teachers in New York

At the state level, New York has not yet seen a growing imbalance between teachers and public school students. Enrollment in New York public schools fell steadily between 2000 and 2016, from 2.84 to 2.54 million, a 10.7 percent decline.⁵ The number of

⁵ Enrollment declined in most grades between 2000 and 2016, except for modest increases in grades 11 and 12 and large, recent increases in public prekindergarten classes. The state and other local governments, like New York City, have greatly expanding pre-K in the state in recent years. For example, in 2014 the adopted state budget included an additional \$1.5 billion over five years to expand universal access to pre-K. See New York State Division of the Budget, "Governor Cuomo and Legislative Leaders Announce Passage of 2014-15 Budget," Press Release, March 31, 2014, https://www.budget.ny.gov/pubs/press/2014/pressRelease14_enactedBudgetReleased.html. Prekindergarten enrollment increased by over 18 percent between 2014 and 2016 (NYSED Report Card Data; see the Appendix for primary data sources and abbreviations). Policymakers not only expanded access but invested in expanding half-day programs to full-day programs in low-income communities. See *2013-14 Executive Budget Briefing Book* (Albany: New York State Division of

FIGURE 1. Total Teachers and Enrollments in New York State Public Schools, 2000-16



SOURCE: Tables J-3 and J-8 (including updates from publisher), 2015 New York State Statistical Yearbook (Albany: Rockefeller Institute of Government, 2016), <http://www.rockinst.org/data-hub/new-york-data-sets>.

teachers over the same period has been more volatile, rising between 2000 and 2008, falling in the aftermath of the recession until 2013, then resuming growth through 2016 (Figure 1).

This rough correspondence between teachers and enrollments is reflected in district-level student-teacher ratios. Based on data from the New York State Education Department (NYSED), average district student-teacher ratios fell between 2011 and 2016. In New York City (NYC), the average student-teacher ratio dropped from 14.4 in 2011 to 13.9 in 2016; in districts outside of NYC, the ratios were lower and declined only slightly, from an average of 11.3 in 2011 to 11.2 in 2016.⁶

TABLE 1. Average (Mean) of Districts' Class Sizes, by Grade Level and Subject, 2010-11 and 2015-16

Grade/Subject	2010-11	2015-16	Percent Change
Elementary	19.6	19.7	0.0
Grade 8 English	19.9	19.8	-0.1
Grade 8 Social Studies	20.5	20.8	0.2
Grade 8 Math	19.2	19.3	0.1
Grade 8 Science	20.2	20.2	-0.0
Grade 10 English	20.6	19.7	-0.9
Grade 10 Social Studies	20.5	19.8	-0.7
Grade 10 Math	18.7	17.5	-1.2
Grade 10 Science	20.1	19.0	-1.1

SOURCE: NYSED, Personnel Master File (PMF) Data.

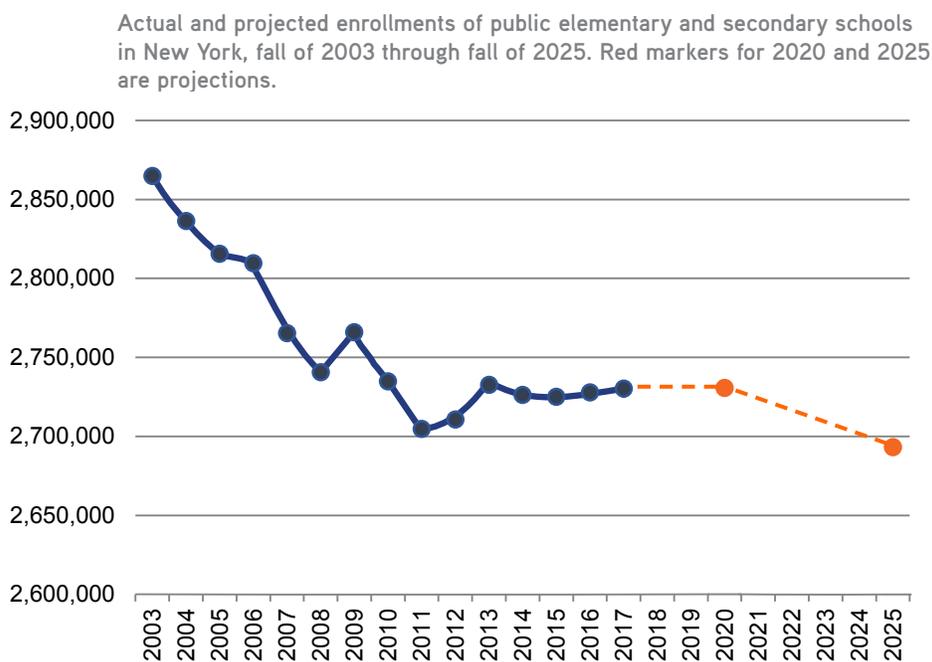
the Budget, January 22, 2013): 27, <https://www.ny.gov/sites/ny.gov/files/atoms/files/2013-14-Briefing-Book.pdf>. Finally, policymakers expanded the eligibility from four year olds to three year olds. See 2015-16 Executive Budget (Albany: New York State Division of the Budget, January 21, 2015): 77, <https://www.budget.ny.gov/pubs/archive/fy1516archive/eBudget1516/fy1516littlebook/BriefingBook.pdf>. For local efforts see Kate Taylor, "New York City Will Offer Free Preschool for All 3-Year-Olds," New York Times, April 24, 2017, <https://www.nytimes.com/2017/04/24/nyregion/de-blasio-pre-k-expansion.html>.

6 NYSED Personnel Master File (PMF) Data, 2010-11, 2015-16. See the Appendix for primary data sources and abbreviations.

NYSED also tracks class sizes, and here, too, the averages reveal few signs of a growing imbalance between teachers and students. [Table 1](#) shows statewide averages in class sizes in four core subjects for 8th and 10th grades in the 2010-11 and 2015-16 school years. The 8th-grade classes show little change over these five years, while 10th-grade math and science classes indicate notable declines.

The declining teacher-student ratios and class sizes are in part a consequence of a long-term decline in student enrollments, a decline not likely to be reversed in the near future. The U.S. Census Bureau projects that New York will see no growth in elementary and secondary enrollments through the 2020-21 school year, after which it is expected to see a small decline until 2025-26 ([Figure 2](#)). As suggested by the most recent enrollment numbers, these projections should be qualified by policy changes that expand education access, such as New York’s pre-K programs. Nonetheless, if student enrollments are a core indicator of the demand for teachers, recent trends and forecasts indicate little need for an increase in the total number of New York teachers.

FIGURE 2. New York State Projected Student Enrollment Will Continue to Decline



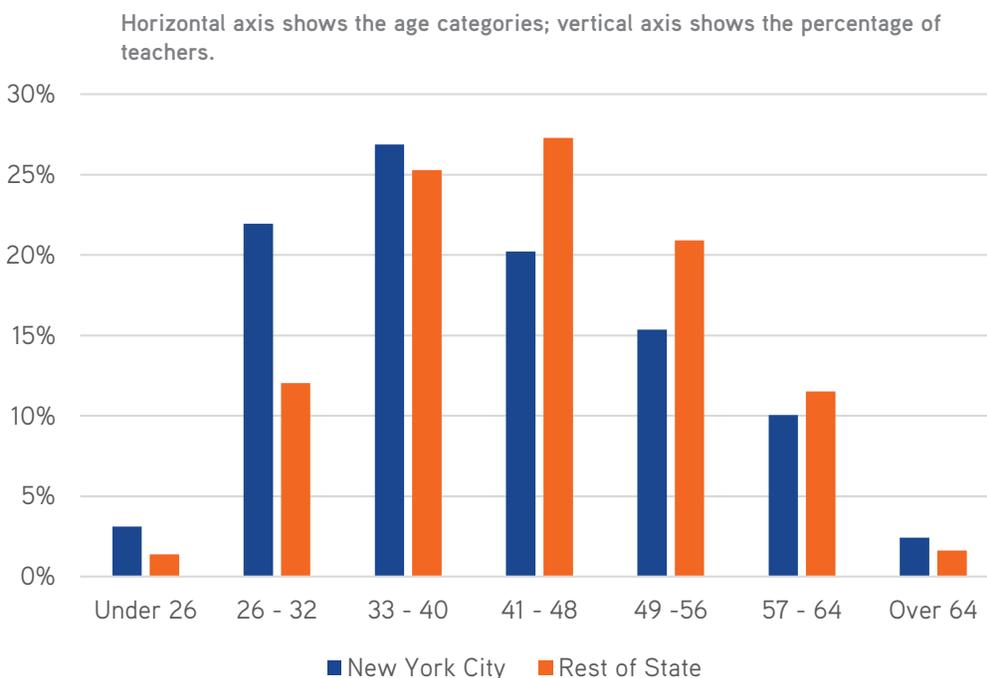
SOURCE: William J. Hussar and Tabitha M. Bailey, *Projections of Education Statistics to 2025*, Forty-fourth Edition, NCES 2017-019 (Washington, DC: National Center for Education Statistics, U.S. Department of Education, September 2017), Appendix Table 3, <https://nces.ed.gov/pubs2017/2017019.pdf>.

The demand for teachers is affected by other factors, such as retirements and other permanent departures from teaching. Direct measures of the reasons for exits are not available, but indirect indicators are. First, turnover in New York State teaching positions has declined in recent years. In 2010-11, the district median for teacher turnover was 8.1 percent; about eight positions in every 100 within a district underwent a change in incumbents. By 2015-16, the turnover rate dropped to 5.1 percent.⁷

⁷ From NYSED Report Card Data, “Staff” file.

Second, retirements leading to new teaching hires may be less frequent in the near future. That is in part because in New York City, where 35 percent of all teachers in the state work, teachers are relatively young (Figure 3). In 2015-16, 52 percent of the teachers in NYC were under the age of forty, and only 27 percent were forty-nine years or older. Younger teachers may still leave the profession, but full retirements are unlikely to be frequent.⁸ In the rest of the state, only 38 percent of teachers were under forty in 2015-16, and 35 percent were forty-nine years or older. These districts may see more frequent retirements. However, as we show below, because enrollments and teaching positions are declining in the state outside of New York City, many of the retired teachers in those districts may not be replaced.

FIGURE 3. Distribution of Teacher Ages, New York City and Rest of the State Compared, 2015-16



SOURCE: NYSED PMF Data.

In sum, falling enrollments, student-teacher ratios, class size, teacher turnover rates, and teacher ages all suggest that there is little evidence of a current or imminent statewide teacher shortage. These indicators do not reveal a growing disparity between the number of teachers in New York and the number of students they teach, and there is reason to believe that this situation will continue in the near future. These trends, however, do not mean that there are not targeted areas where we may see shortages.

⁸ In subsequent analyses, we will study the exit rates of teachers in greater detail. Many younger and untenured teachers do leave for many reasons, including the tendency in some places for untenured faculty to be given more nonteaching duties. See, for example, Dan Hunting et al., *Finding & Keeping Educators for Arizona's Classrooms* (Phoenix: Morrison Institute for Public Policy, Arizona State University, May 2017), https://morrisoninstitute.asu.edu/sites/default/files/content/products/AZ%20TEACHERS%20REPORT%202017_0.pdf.



The Supply of Teachers: Specializations and Demographics

A different picture, however, emerges when we consider the supply process for teachers in New York. Nearly all teachers in New York must graduate from one of 1,925 programs at 135 college or university “providers.” Programs range from popular ones like “Childhood Education (Grades 1-6)” to those with smaller enrollments, such as “Cantonese (Grades 5-9).” In addition to coursework, prospective teachers for New York’s district public schools must apply for and secure a New York State certificate, which is issued by the NYSED’s Office of Teaching Initiatives. Successful applicants must satisfy degree, coursework, assessment, and classroom experience requirements. Like the education programs, certifications are specialized with respect to subject matter, grade level, and preparation to teach disabled students, though individuals may, and often do, seek and receive multiple certifications.

Persons enrolled in alternative teaching programs may apply for three-year transitional teaching certificates, which permit the individual to teach while they complete their coursework and other parts of their programs. In 2014-15, 2,657 persons were enrolled in twenty alternative programs, about 6 percent of the total number of individuals in all preparation programs. Still other pathways into teaching include alternative teacher certifications, designed to expedite teacher certification for college graduates with subject matter expertise; and processes by which graduates of preparation programs in other states may secure certification in New York.

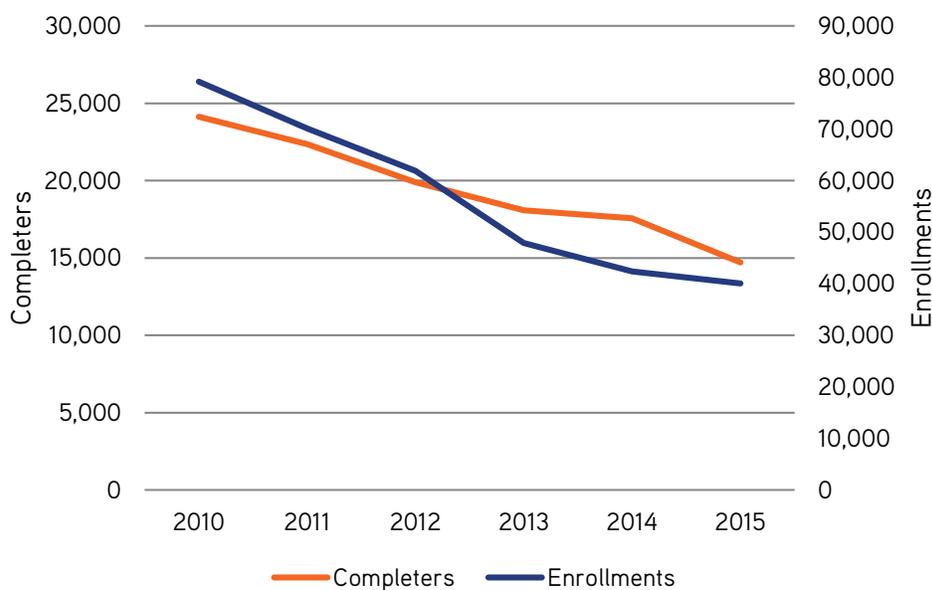
While these multiple pathways provide some flexibility for prospective teachers, the primary routes to teaching are still through traditional and alternative teacher education programs in New York — and recent trends in those programs raise concerns about the future staffing of teaching positions in the state. Even more than most other states, New York’s teacher education programs have seen steep declines in recent years in the number of students enrolled in and teachers graduating from these programs.⁹ [Figure 4](#) shows the changes in enrollments in the state’s 135 provider institutions (traditional and alternative) between the 2009-10 and 2014-15 academic years (that is, the years just prior to the school years, 2010-11 and 2015-16, the years when graduates are likely to take their first jobs as teachers).

⁹ New York had the tenth largest declines among states in both enrollment in and graduates from teacher preparation programs between 2009-10 and 2014-15. U.S. Department of Education, Title II Reports, Data Tools, <https://title2.ed.gov/Public/DataTools/Tables.aspx>.

Graduates from teaching programs in the state fell steadily over this five-year period, from 24,135 in 2010 to 14,716 in 2015, a 39 percent decline.¹⁰ Enrollments in teacher education programs dropped even more, by 49 percent, from 79,214 in 2010 to 40,048 in 2015. Because enrollments in teacher preparation programs fell faster than the number of graduates, program graduations may continue to decline for several years. To put these figures in perspective, at the start of the 2010-11 school year, there was one 2009-10 graduate from a New York teacher education program for every 8.8 teachers in the workforce. In the fall of the 2015-16 school year, one graduate was available for every 14.4 teachers in New York.

To the extent that replacements are needed for teachers leaving the workforce, there are far fewer candidates able to take their places. As we'll see, the prospective balance between the supply and demand in the teaching profession becomes even more complicated when we consider teacher specializations.

FIGURE 4. Number of Persons Enrolled in Teacher Education Programs in New York State, and Number of Those Who Complete the Programs, 2009-10 to 2014-15



SOURCE: U.S. Department of Education (USDOE) Title II Reports.

Specializations

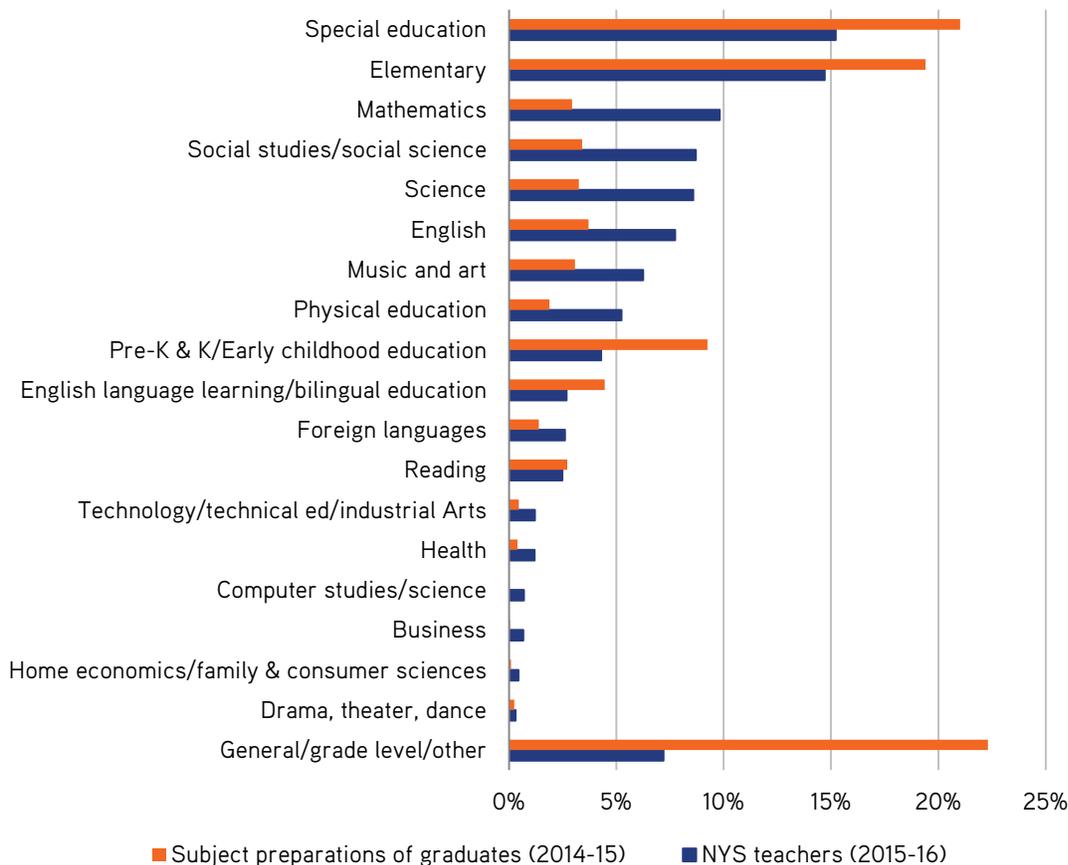
Although overall numbers of teachers and students say something about the changing balance in the workforce, teachers are educated to teach specific subjects, grade levels, and types of students. Shortages in some types of teaching positions may thus occur while surpluses exist in others. Based on surveys of state education agencies, many states report shortages in such areas as special education, science,

¹⁰ The 49 percent drop in enrollment in teacher preparation programs between 2010 and 2015 far outstripped the 1.5 percent decline over the same period in New York's total enrollment in degree-granting postsecondary institutions. See Thomas D. Snyder, Cristobal de Brey, and Sally A. Dillow, *Digest of Education Statistics 2016*, 52nd Edition (Washington, DC: National Center for Education Statistics, February 2018), Table 304.10, https://nces.ed.gov/programs/digest/d16/tables/dt16_304.10.asp.

mathematics, foreign languages, and English Language Learning (ELL).¹¹ In the most recent national report based on an annual state survey, New York claimed shortages in special education, bilingual education, and career and technical training.¹²

FIGURE 5. Distribution of Teacher Ages, New York City and Rest of the State Compared, 2015-16

Horizontal axis shows the age categories; vertical axis shows the percentage of teachers.



SOURCE: NYSED PMF Data; USDOE Title II Reports.

While surveys are useful in gauging how administrators see the fit (or lack of fit) between the supply of teachers and the needs of schools, our approach compares the preparations of graduates from teacher education programs in New York with the current profile of teachers and their specializations in the state. The comparison essentially asks: Do new teacher candidates have the preparations needed to fill current vacancies in the statewide teacher workforce, assuming that vacancies occur more or less proportionately across all types of teaching positions?

Figure 5 compares the subject area specializations of graduates from teacher education programs in New York in 2014-15 to the specializations of the state’s practicing

11 Also called English as a Second Language (ESL) or English as a New Language (ENL).
 12 Freddie Cross, *Teacher Shortage Areas: Nationwide Listing 1990-1991 through 2016-2017* (Washington, DC: U.S. Department of Education, Office of Postsecondary Education, August 2016), <http://www2.ed.gov/about/offices/list/ope/pol/tsa.doc>.

teachers in 2015-16 (the year after they graduate). For example, 15 percent of current New York State teachers teach special education, while 21 percent of specializations obtained by graduates from teacher education programs in the prior year are in that area. As the bottom of the graph indicates, about one out of five subject preparations of graduates are hard to compare with current teaching jobs, as they include such areas as “Education – General.”

There are some points of congruence. New graduates are most likely to have training in special education and elementary education; about 40 percent of 2014-15 graduates’ specializations are in these two areas. These are the two most common specializations within the current teaching workforce, comprising about 30 percent of all teaching positions. Three other specializations are also more frequent among graduates than among current teachers, including prekindergarten and kindergarten (when compared to graduates’ backgrounds in early childhood education), English Language Learning (ELL) and bilingual education, and reading.

TABLE 2. Change in Number of Students, by Enrollment Category, 2010-11 to 2015-16

Enrollment Category	2010-11	2015-16	Change	Percent Change
Pre-K & K	244,918	248,454	3,536	1.4%
Elementary	1,201,892	1,204,325	2,433	0.2%
Secondary	1,255,151	1,217,092	(38,059)	-3.0%
Special Education	452,441	498,334	45,893	10.1%
English Language Learning	208,015	216,190	8,175	3.9%

SOURCE: USDOE Common Core of Data (CCD).

Other specializations, however, show big deficiencies in the subject areas of recent graduates when compared to the jobs performed by current teachers. Although 10 percent of New York State teachers teach mathematics, only 3 percent of recent graduates from teacher preparation programs have a subject specialization in math. Large gaps also exist in science (9 percent teachers vs. 3 percent preparations), social studies/social science (9 percent vs. 3 percent), and English (8 percent vs. 3 percent). Smaller gaps exist in music and art (6 percent vs. 3 percent), physical education (5 percent vs. 2 percent), foreign languages (3 percent vs. 1 percent), and technical education/industrial arts (1.2 percent vs. 0.5 percent).

Graduates’ specializations correlate with certain trends in enrollment. [Table 2](#) shows changes in the number of students by grade categories and whether the students are enrolled in special education and ELL classes. Over the five-year period, 2011 to 2016, prekindergarten and kindergarten enrollments have increased, elementary school enrollments have remained stable, and secondary student numbers have declined. The number of special education students has increased substantially in the last five years, by over 10 percent, while the number of students participating in ELL classes has also grown (4 percent). New York State education administrators

have long reported shortages in special education and bilingual/ELL teachers.¹³ This long-run pattern, reinforced by recent enrollment trends as well as policy changes that have enhanced the priority of these services, suggest that special and bilingual/ELL education teachers will be in high demand for some time.¹⁴ Graduates' high rates of preparation in these subject areas may thus alleviate future shortages in these areas, or at least counter some of the effects of the overall drop in the supply of new teachers.

TABLE 3. Changing Racial and Ethnic Profile of New York State Students, 2011-16

	2011	2012	2013	2014	2015	2016	Change, 2011-2016
White	1,324,639	1,285,653	1,255,811	1,226,493	1,197,942	1,171,603	(153,036)
Black/African American	474,700	455,430	436,999	425,159	411,806	399,267	(75,433)
American Indian	13,873	13,813	14,399	14,909	15,457	15,929	2,056
Asian	221,832	226,706	229,912	232,751	235,900	238,940	17,108
Multiracial	14,187	21,087	31,192	37,842	44,113	50,369	36,182
Hispanic/Latino	585,696	602,171	610,698	623,202	637,469	646,525	60,829

SOURCE: NYSED, Report Card Data.

Demographics of Students and Prospective Teachers

Another way of assessing the fit between the supply of teachers and school needs is to compare prospective teachers' backgrounds and characteristics with those of the students they are expected to teach. In the nation as a whole, the fit is not close. The US teacher workforce is predominantly white and non-Hispanic, while a growing share of students are young people of color.¹⁵

In New York, as in the nation, the racial and ethnic composition of students is changing rapidly. As [Table 3](#) indicates, the number of white K-12 students has declined, along with the number of black students (by 12 and 16 percent, respectively). In sharp contrast, Hispanic students have increased by more than 10 percent, while Asian, American Indian, and multiracial students have also grown in number.

This shift in the demographics of K-12 students has led to an increased concern among educators and policymakers to recruit more teachers with similar backgrounds and characteristics, in the hope that such teachers would be more effective in working with their pupils.¹⁶ Greater diversity among teachers may also help white students see

13 Cross, et al., *Teacher Shortage Areas*.

14 The demand for teachers with ELL and multilingual capabilities may have received a strong, recent push from NYSED's increased emphasis on enforcing standards found in the Commissioner's Regulations Part 154-2 relating to ELLs and Multilingual Learners (MLLs). The standards require school districts to provide ELLs and MLLs equal access to all school programs and services offered by the district. See <http://www.nysed.gov/bilingual-ed/english-language-learner-multilingual-learner-regulations-compliance>.

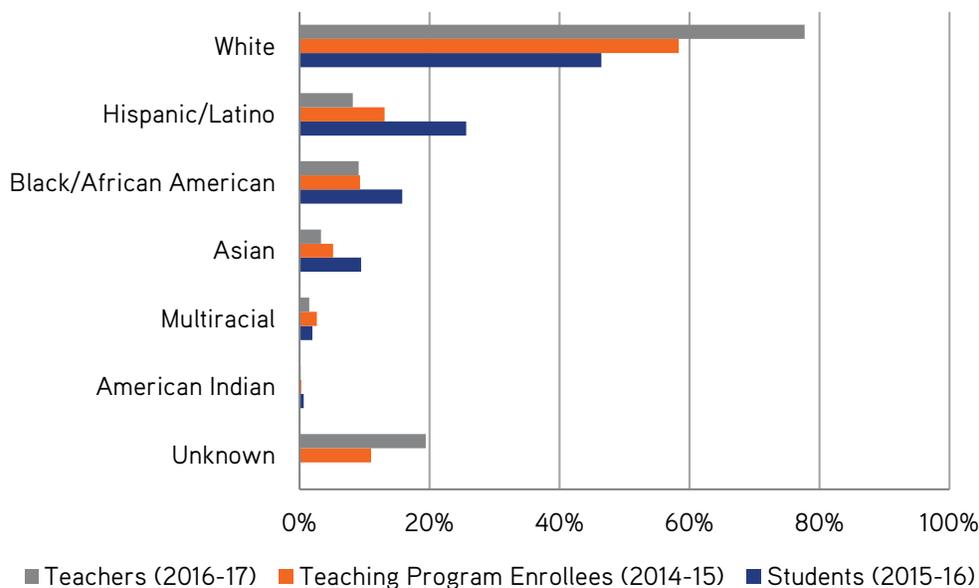
15 Lesli A. Maxwell, "U.S. School Enrollment Hits Majority-Minority Milestone," *Education Week*, August 19, 2014, <https://www.edweek.org/ew/articles/2014/08/20/01demographics.h34.html>.

16 Morva A. McDonald, "The Joint Enterprise of Social Justice Education," *Teachers College Record* 109, 8 (2007): 2047-81; Ali Michael, *Raising Race Questions: Whiteness & Inquiry in Education* (New York: Teachers College Press, 2015). Also see State University of New York, *TeachNY Advisory Council: Report of Findings and Recommendations* (State University of New York, May 2016), 20-5.

subjects from different perspectives and understand and value the changing society we live in.

In New York as in many other states, big gaps exist between the racial and ethnic characteristics of New York teachers and their students. [Figure 6](#) illustrates these points by comparing the race and ethnicity of students, enrollees in teacher preparation programs, and current teachers in New York. The differences between teachers and students are especially large. Only 46 percent of the students identify themselves as white, while 78 percent of the teachers do. Differences with respect to Hispanic backgrounds are even more striking. Twenty-six percent of the students in New York consider themselves to be Hispanic, more than three times the percentage of teachers (8 percent). Students are also more likely to be black and Asian than their teachers: 16 percent of students are black, compared to 9 percent of the teachers, and 9 percent of the students are Asian, versus 3 percent of the teachers.¹⁷

FIGURE 6. Comparison of Race and Ethnicity of New York State Teachers, Teaching Program Enrollees, and K-12 Students



SOURCE: USDOE Title II Reports; NYSED Report Card Data; NYSED PMF Data.

Recent changes in the demographic makeup of prospective teachers may eventually shrink some of these gaps, however. Students enrolled in New York’s teacher education programs are an increasingly diverse group. Between 2010 and 2015, the percentage of Hispanic students preparing to become teachers increased from 8.9 to 13.1 percent, while the number of black students in teacher preparation programs grew from 7.8 to 9.3 percent. Other increases in enrollees occurred among Asian (from 3.9 to 5.2 percent) and multiracial students (from 1.2 to 2.7 percent). As [Figure 6](#) shows,

¹⁷ A 2017 report by the Education Trust–New York found similar differences. Based on 2015-16 data, the report estimated that only 16 percent of the state’s teachers were Latino or black, compared to 43 percent of their students. From *See Our Truth* (New York: Education Trust–New York, October 2017), Figure 1, <https://edtrust.org/resource/see-truth-state-teacher-school-leader-diversity-new-york/>.

enrollees in teacher preparation programs in 2014-15 are less likely to be white and more likely to be Hispanic, Asian, and multiracial than current teachers.

To sum up, despite certain factors, such as the age distribution of current teachers, that may mitigate the short-run effects of this diminished teacher replacement pool, the shrinking number of potential teachers may magnify future mismatches between the preparation subject areas of program graduates and the demands of the teacher labor market. Jobs in core subjects such as math, science, English, and social studies may be particularly difficult to fill in the future. Two developments may help alleviate some gaps between teacher demand and supply: recent teacher program graduates are disproportionately prepared to teach in areas — such as special education, ELL, elementary grades, and pre-K — where enrollment is increasing; and students enrolled in teacher education programs are increasingly diverse in ethnicity and race, like their potential pupils. Nonetheless, whatever differences that exist between the profiles of prospective teachers and the needs of schools and districts may be exacerbated if the rapid decline in the number of graduates from teacher education programs persists.

Equity across School Districts in the Teacher Workforce: Region, Race, Ethnicity, and Poverty

As noted, New York students are increasingly diverse racially and ethnically. They are also more likely to live in cities and come from families and communities that are struggling economically. One set of key questions is whether the teacher workforce in New York is serving all districts equally well, including those where populations are growing, students are nonwhite or Hispanic, and communities have high rates of poverty.

Regional Changes

Trends in students, as well as teachers, have varied greatly among different localities between 2010-11 and 2015-16, producing major geographical shifts in the locations of both. [Table 4](#) shows changes in the numbers of students and teachers across different types of communities in New York. The categories are based on a twelve-level classification used by the USDOE, but here we have collapsed the categories into a five-level taxonomy: large cities (i.e., New York City); small and midsized cities (e.g., Rochester, Syracuse, Utica); suburbs; towns; and rural areas.¹⁸

It is clear from [Table 4](#) that an increasing share of New York State students live in cities. New York City was in fact the only type of locality where the number of students grew over the five-year period. In small and midsized cities (mostly upstate cities, though also including Yonkers), student enrollment declined, but not nearly as much as in other parts of the state; in rural and town districts, student numbers fell several times faster. Suburban districts also experienced a decline in enrollment, though not nearly as steep as in the towns and rural areas of the state.

Changes in the number of teachers lagged behind enrollment trends in cities, however. The difference was not large in New York City: enrollment increased by 3.9 percent, while the number of teachers grew by 3.2 percent. The difference was much larger in other cities: the student population declined by 1.6 percent, while the number of teachers dropped by 4.6 percent. In towns and rural areas, the pattern was reversed; teacher numbers declined less than enrollment. In suburban districts, the

¹⁸ Note that the many “districts” in New York City include “community districts” and charter schools, even though NYC is only one school district.

respective declines were comparable in size. Although there are good reasons why the teacher workforce in rural and small-town districts cannot decline as much as the student population, such as the need to ensure minimum coverage for individual curricular areas, these trends still suggest that the New York teacher workforce is not fully adjusting to shifts in where students live.

TABLE 4. Regional Shifts in Distributions of Students and Teachers in New York State, 2011-16

Locality	Number of Districts	Students		Teachers		Percent Change	
		2010-11	2015-16	2010-11	2015-16	Students	Teachers
New York City	165	1,049,240	1,090,001	69,596	71,793	3.9%	3.2%
Midsized & small cities	44	171,485	168,663	13,347	12,733	-1.6%	-4.6%
Suburbs	254	946,722	918,601	72,623	70,767	-3.0%	-2.6%
Towns	80	211,562	199,171	17,141	16,540	-5.9%	-3.5%
Rural	307	327,967	303,649	27,200	26,153	-7.4%	-3.8%

SOURCE: U.S. Department of Education, CCD Files.

Poverty, Race, and Ethnicity

These regional shifts in students and teachers are associated with differences in the economic affluence or poverty of communities as well as in the racial and ethnic backgrounds of their people. These differences pose a challenge for the state of creating an equitable distribution of qualified teachers, regardless of the race and ethnicity of the students or the economic circumstances of their families and communities. The challenge is a growing one. Not only are more and more New York students racially, ethnically, and linguistically diverse, they are also increasingly likely to live in distressed economic conditions.

The number of K-12 students eligible for free lunches — a rough indicator of poverty — increased by 8.6 percent in New York between 2011 and 2016.¹⁹ In addition, a growing number of New York students lived in school districts with child poverty rates over 20 percent: about 14.4 percent of students lived in such districts in 2016, a slight increase over 2011 (14.2 percent).²⁰ These changes raise questions about equity in teacher recruitment in New York: How are different districts responding to changes among their students and the communities they serve? Can all districts recruit the qualified teachers they need?

To answer these questions, we classified New York State school districts based on two sets of factors: 1) poverty levels, measured by the percentage of schoolchildren eligible for free lunches and the estimated child poverty rate in the district; and 2) racial and ethnic diversity, measured by the percentages of schoolchildren in each district who are black or Hispanic vs. white. Using a statistical technique called cluster analysis, which finds “clusters” of items (here, school districts) that resemble

¹⁹ Report Card Data, “Student Demographics” file.

²⁰ Based on data from the U.S. Census Bureau’s Small Area Income and Poverty Estimates program (SAIPE), <https://www.census.gov/did/www/schooldistricts/data/poverty.html>.

one another yet differ from other districts on these measures, we identified four basic groups of New York State school districts. The four clusters were distinctive in the sense that the average differences within the clusters were much smaller than the average differences *between* the four groups.²¹

[Table 5](#) displays several characteristics of the four clusters, which are represented in the columns. The top rows (section A) show some of the variables used to create the clusters.²² Group one's districts largely served white students (80.0 percent) and few students were eligible for free lunch (18.5 percent). Group two had an even greater average percentage of white students (90.1 percent) but a much higher percentage of students eligible for free lunch (43.1 percent). Groups three and four had few white students, and they reported that most of their students were eligible for free lunches. The third group, however, was composed of districts with large proportions of Hispanic students, while the fourth group were districts with greater percentages of black students.

The four groups of districts also differed on factors not part of the clustering procedure. The low poverty/white group (group one) was mostly composed of suburban districts, with a smaller number of rural districts. Rural and small-town districts dominated the second group (high poverty/white population), while districts in the third and fourth groups were mostly in cities and, to a lesser extent, suburban areas.

[Table 5](#) also shows that the largest enrollments were found in the suburban low poverty/white and the urban/Hispanic clusters; the vast majority of New York students in 2015-16 were in these two types of districts. The clusters differed considerably in the average enrollment in each type of district: the high poverty/white districts were quite small, with a median of only 875 students, while the high poverty/Hispanic and high poverty/black districts were several times larger. Finally, the districts also differed in their student-teacher ratios. The lowest ratio (11.7) was in the rural, high-poverty, largely white group; the two minority, high-poverty clusters showed the highest ratios (15.0 in Hispanic districts and 14.4 in black districts); and the suburban, more affluent districts had a ratio in between (12.4).

The basic question is whether teacher demand and supply processes operate differently in districts that vary with respect to the affluence or poverty of their students as well as the children's race and ethnicity. Four criteria were used to measure district effectiveness in teacher recruitment:

1. *Number of teachers relative to students:* Are there sufficient numbers of teachers to keep class sizes down?
2. *Teacher certifications:* Are there teachers teaching out of their certifications? Such assignments may reflect difficulties in staffing positions with appropriately trained teachers. And do teachers have permanent or only provisional or no certifications?²³

21 Details regarding the cluster analysis are found in the Appendix.

22 The table shows variables for the school year 2015-16. The cluster analysis also included the same variables for the school year 2010-11 in order to base the clusters on relatively stable district characteristics. See the Appendix for averages and standard deviations for all of these variables.

23 Permanent certifications are available to teachers who have met several requirements since holding a provisional certificate, including two years of full-time teaching experience, a master's degree

3. *Teacher experience*: Do many district teachers have less than three years of experience? On average, teachers' effectiveness increases substantially in their first years of experience.
4. *Teacher turnover*: Do teaching positions frequently turn over in the district? Although teacher turnover does not always indicate staffing problems, frequent turnover may reflect problems of retention, and it can lead to administrative burdens and struggles to find replacements.

TABLE 5. Selected Characteristics of Four Types of Districts, by Child Poverty and Racial and Ethnicity of Students

	Clusters			
	#1 Low Poverty, White	#2 High Poverty, White	#3 High Poverty, Hispanic	#4 High Poverty, Black
A. Students:				
Black/African-American students (mean %, 2016)	3.2	2.3	17.1	49.8
Hispanic students (mean %, 2016)	9.2	3.6	46.3	25.9
White students (mean %, 2016)	80.0	90.1	25.6	16.2
Percent eligible for free lunch (mean %, 2016)	18.5	43.1	53.8	65.4
B. Locality:				
City (percent of districts)	1.0%	1.9%	35.6%	55.6%
Suburban (percent of districts)	59.4%	8.5%	45.2%	38.9%
Towns (percent of districts)	9.7%	23.3%	12.3%	0.0%
Rural (percent of districts)	29.9%	66.2%	6.8%	5.6%
Total	100.0%	100.0%	100.0%	100.0%
C. Enrollments, teachers, and ratios:				
Total enrollment (2016)	811,425	370,475	984,870	387,474
Median district enrollment (2016)	2,233	875	5,931	7,331
Total teachers (2016)	65,266	31,630	65,704	26,906
Aggregate student-teacher ratio (2016)	12.4	11.7	15.0	14.4
Number of districts (including geographic districts in NYC)	288	317	73	36

SOURCE: NYSED Report Card Data; USDOE CCD.

Table 6 addresses the first question. It compares districts of different poverty and minority composition with respect to their average (mean) class sizes. The classes are distinguished by their grade levels and core subject areas.

Average class sizes were consistently large among the high poverty/Hispanic districts for all levels; high poverty/black districts had the largest elementary school classes but declined in size through 8th and 10th grades. The smallest class sizes

from an accredited institution, and qualifying scores on state exams. Provisional certifications are time-limited and are typically used by beginning teachers. Some teachers, however, are identified by NYSED as uncertified, which means that they have neither a permanent nor a provisional certificate for their particular assignment.

were typically the typically rural and small-town high poverty/white districts. The largely suburban, low-poverty/white districts reported moderate class sizes and little variation across grade levels. Although it is unclear whether the differences in the early grades were due to supply (difficulties in recruiting teachers) or demand (financial and other constraints in creating teacher positions), it is evident that high poverty/high minority districts faced different staffing conditions than other districts, especially in elementary and middle schools.

TABLE 6. Average Class Sizes by Grade and Subject, in Districts of Different Poverty/Minority Compositions, 2015-16

Grade Level and Subject Area	#1 Low Poverty, White	#2 High Poverty, White	#3 High Poverty, Hispanic	#4 High Poverty, Black
Elementary	20.2	18.2	22.7	23.3
Grade 8				
English	20.7	18.1	23.8	20.9
Math	20.3	17.3	23.7	21.4
Science	21.0	18.4	24.0	21.3
Social Studies	21.5	19.0	24.7	21.8
Grade 10				
English	21.0	18.2	22.6	18.2
Math	19.3	15.4	19.8	19.7
Science	19.9	17.8	20.5	18.6
Social Studies	20.9	18.3	21.9	20.1

SOURCE: Average (mean) class sizes from NYSED, PMF Files, 2015-16.

The other questions ask whether districts varied in their recruitment and retention of teachers with appropriate credentials. [Table 7](#) shows the mean values for the four district clusters: they show large differences in teacher workforces with respect to districts’ poverty levels and the race and ethnicity of their students. For example, an average of only a little more than 1 percent of the teachers in low poverty/white districts are teaching out of their certification, while the averages for high poverty/Hispanic and high poverty/black districts are several times higher (5.8 and 8.0 percent, respectively). Large average differences are also found in teacher inexperience and turnover.

These averages do not show all of the important differences across these four types of districts. One of the most striking patterns is the greater variation among the nonwhite districts. To see this variation, [Figure 7](#) displays box plots that indicate the median district (the central vertical line within the box), the districts at the 25th and 75th percentiles (indicated by the left and right edges of the box), and 10th and 90th percentiles (shown by the “whiskers” at the end of each line). The box plots not only show central tendencies in the data but also variation within each of the groups or clusters.

[Figure 7](#) reinforces the basic points in [Table 7](#). High poverty/high minority districts consistently reported weaknesses in teacher recruitment and imbalances in teacher

supply and demand. As indicated by the medians in each of the box plots, the high poverty/black and the high poverty/Hispanic districts were more likely to have teachers teaching outside their certification areas, a greater proportion of teachers on staff who have provisional or no certification, a higher percentage of teachers with fewer than three years of experience, and greater rates of annual teacher turnover.

TABLE 7. The Average (Mean) Values of Teacher Noncertification, Inexperience, and Turnover Are Greater among High Poverty and High Minority Districts, 2015-16

	Number of Districts	Teachers Out of Certification	Teachers with None or Provisional Certification	Teachers with Fewer than Three Years Experience	Annual Turnover
Low poverty, white	288	1.35	8.98	3.22	8.06
High poverty, white	317	2.74	12.66	4.89	9.38
High poverty, Hispanic	73	5.78	17.81	6.72	10.42
High Poverty, Black	36	8.00	21.40	8.69	15.67

SOURCE: NYSED Report Card Data (2015-16).

There also was substantial variation among the districts with high poverty and high minority student populations, especially in comparison to the more affluent and white districts. For example, half of the low poverty/white districts (between the two ends of the box) reported that between 0 and 2 percent of their teachers are teaching out of their certification; these are the values at the 25th and 75th percentiles. By comparison, the middle half of the districts in the high poverty/black cluster ranged between 1 and 14 percent; in the high poverty/Hispanic group, the same middle range ran from 3 to 12 percent. Greater variation within the high poverty/minority groups was also evident with respect to teacher inexperience and teacher turnover. Districts with many minority students and high poverty rates faced quite varied teacher workforce conditions.

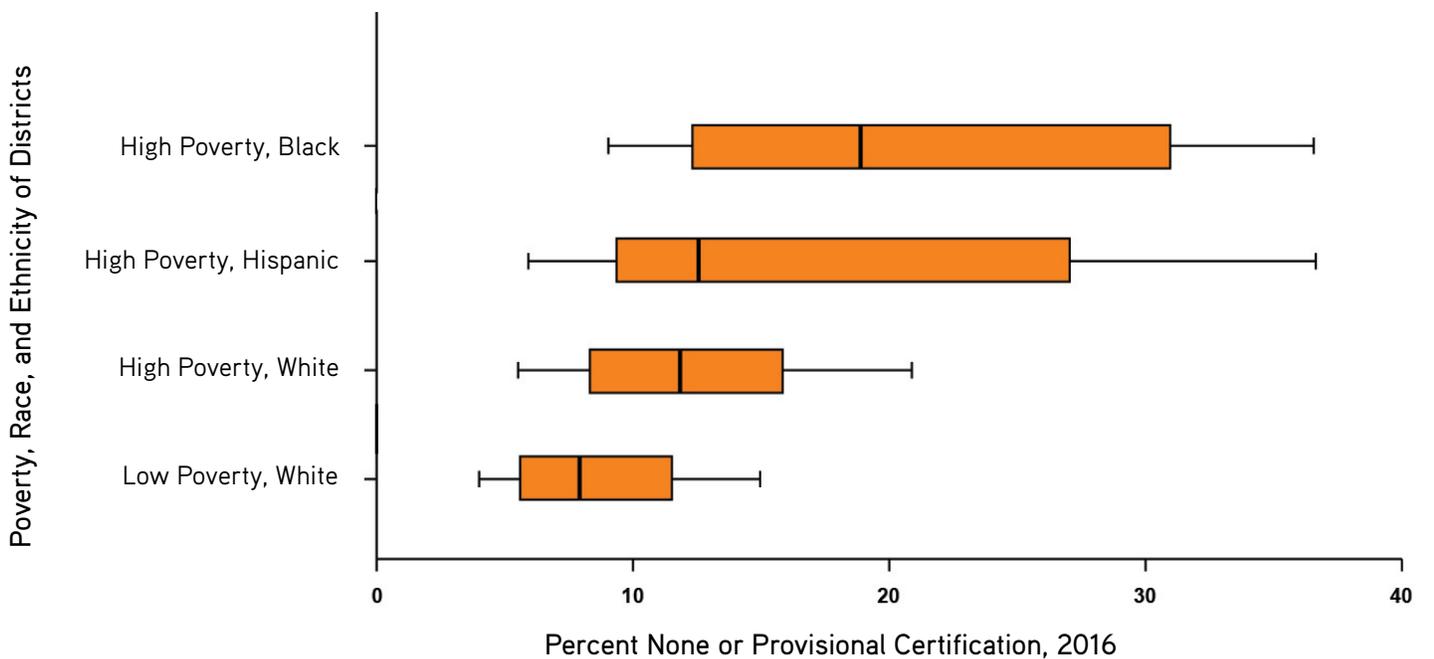
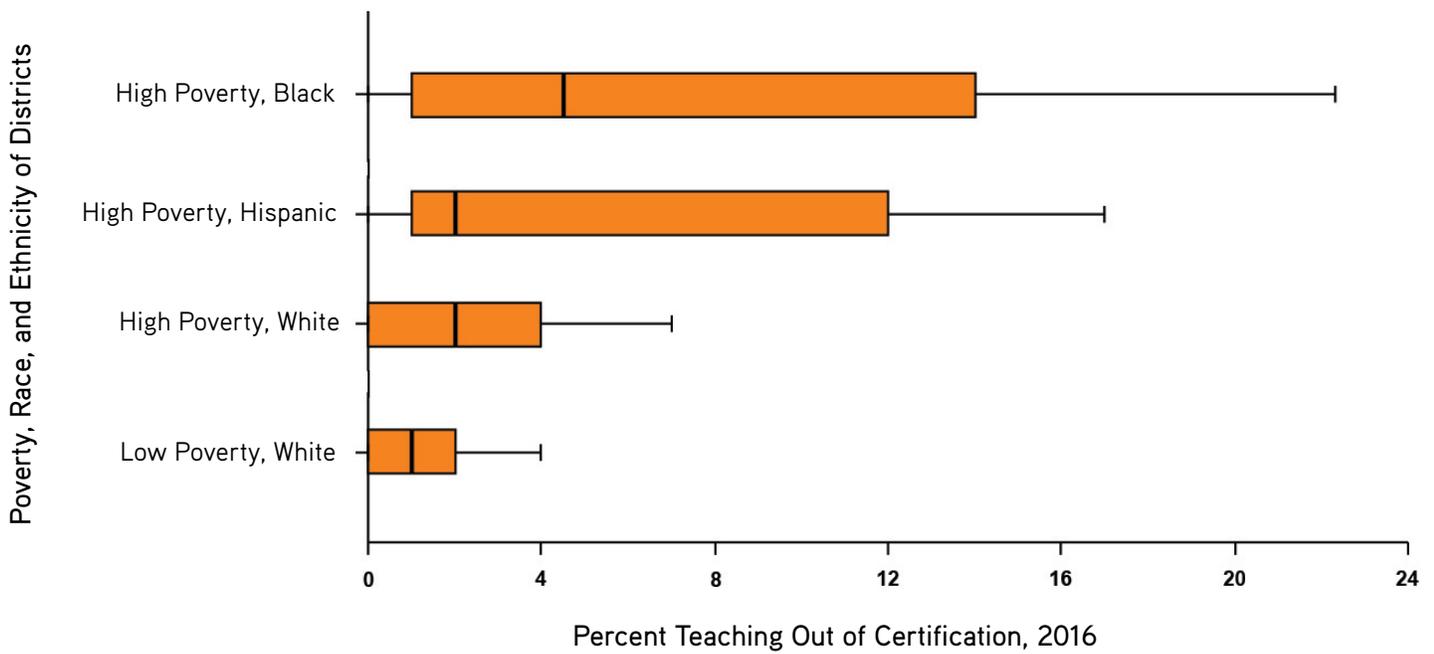
In sum, teacher workforce issues have varied in kind and severity across New York school districts. Between the 2010-11 and 2015-6 school years, there has been a substantial shift in the geography of students and teachers in the state, away from towns and rural areas and toward urban areas, especially New York City. This change is associated with greater racial and ethnic diversity among students as well as a smaller increase in the proportion of students from economically disadvantaged families and communities.

Teacher recruitment and retention, however, has not fully adjusted to these changes in the student population. In districts with greater proportions of nonwhite and Hispanic students as well as higher rates of poverty, school districts are more likely to have teachers teaching out of their certification areas, have teachers without permanent certification, have inexperienced teachers, and experience high annual rates of teacher turnover. The teacher demand and supply system in New York thus reveals persistent inequalities in the abilities of districts to recruit and retain a stable and qualified teaching staff, and the inequality is compounded by the fact that the problems are more acute in the districts where an increasing number of New York State students are enrolled.

FIGURE 7. New York State School Districts with Greater Child Poverty and More Minority Students Have Greater Teacher Staffing Challenges (2015-16)

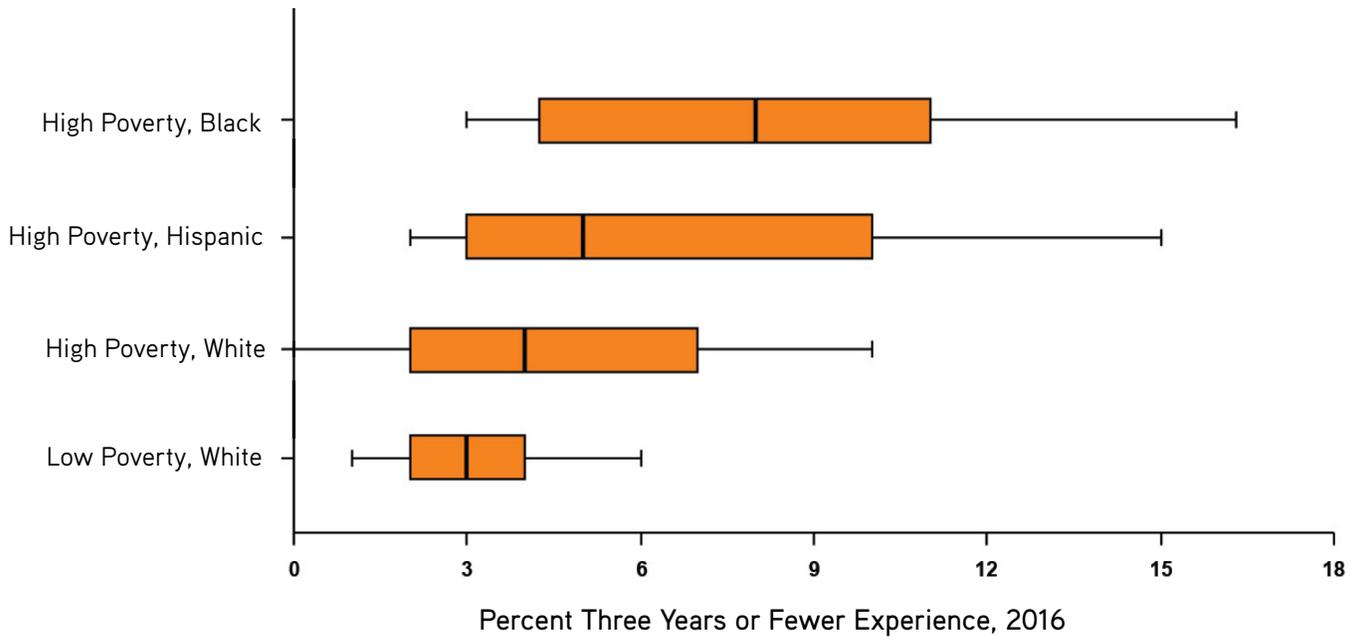
Measures include: 1) Percent of Teachers Teaching Outside Their Certification; 2) Percent of Teachers in District with Less than Three Years of Experience; and 3) Percent of Teaching Positions Turned Over in the Year.

Each box plot shows the median value in the central vertical line within the box. The left and right sides of the box show the 25th and 75th percentiles. The ends of the lines indicate the 10th and 90th percentiles.

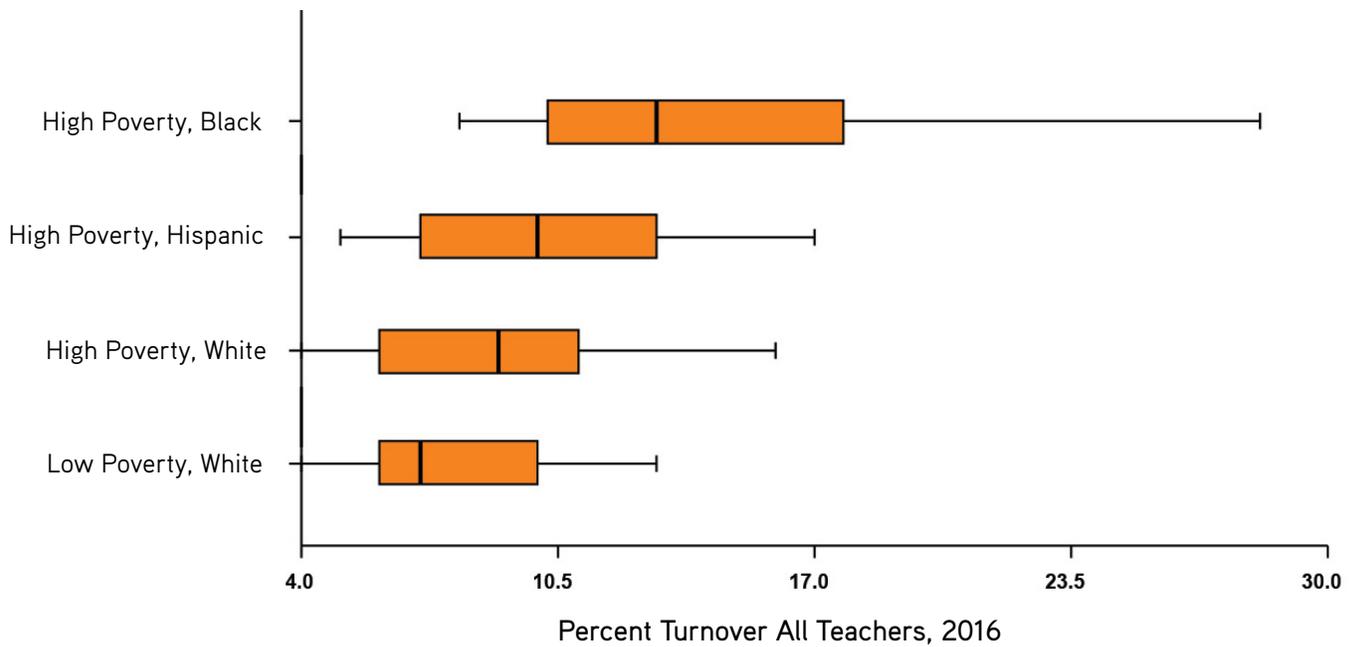




Poverty, Race, and Ethnicity of Districts



Poverty, Race, and Ethnicity of Districts



SOURCE: Teacher certification and student free lunch and race/ethnicity data from NYS Education Department, Report Card Data (2015-16); data on district child poverty rates from U.S. Census Bureau.

Conclusions

While available data do not reveal a general teacher shortage in New York through 2015-16 and is not expected to grow through 2025, sharp and continued declines in enrollment and graduations from the state's teacher preparation programs could produce future challenges if these teacher-preparation trends do not reverse. Like other subject matters with persistent shortages, like bilingual and special education, future shortages may become particularly severe with respect to core subject areas, such as science, mathematics, English, and social studies. New York State may have a few years to mitigate these problems. Statewide enrollments are expected to continue their decline. Teachers in the downstate area are comparatively younger and may generate relatively few retirements soon, while steep drops in enrollment in upstate nonurban areas may not require large number of replacements in teaching positions. Also, a growing share of prospective teachers are prepared to teach students whose numbers are increasing, including special education students, English language learners, and prekindergarten students. Despite these mitigating factors, teacher shortages may well occur within several years unless the steep drop in teacher-preparation graduates reverses or at least ends soon.

Other ongoing, and perhaps more difficult, challenges are found in districts with high rates of child poverty and high proportions of Hispanic and black students. These districts are much more likely to have teachers who are teaching out of their certification areas, who have not yet qualified for permanent certification, who have little teaching experience, and who cycle frequently in and out of teaching jobs. This weakness in teacher recruitment is particularly troubling since more and more students in New York have such characteristics and live in such districts, mostly in urban areas. One significant development relating to the change in student characteristics is the growing share of enrollees in teacher education programs who are racially and ethnically diverse.

While general efforts to increase the number of individuals going into teaching may be needed to stem or reverse the declines in enrollment in teacher preparation programs, targeted policies and programs should be the focus of policymakers in order to increase the number of prospective teachers with core subject area specializations — and to increase the supply and retention of teachers in districts with many minority and economically disadvantaged students to help address the current inequities. In New York, as we found in South Dakota, policymakers have begun such an approach. For example, in 2013, the state adopted the Master Teacher Program, in partnership with the State University of New York, to improve and expand the teacher pipeline in science, technology, engineering, and math (STEM).²⁴ In 2014, State University of New

While general efforts to increase the number of individuals going into teaching may be needed to stem or reverse the declines in enrollment in teacher preparation programs, targeted policies and programs should be the focus of policymakers in order to increase the number of prospective teachers with core subject area specializations — and to increase the supply and retention of teachers in districts with many minority and economically disadvantaged students to help address the current inequities.

²⁴ For more information on the Master Teacher Program, see <https://www.suny.edu/masterteacher/>.

York Chancellor Nancy Zimpher and New York State Education Commissioner Mary Ellen Elia assembled the TeachNY Advisory Council—a distinguished panel of state and national thought leaders in the area of teacher and leader preparation—to take immediate action to rectify the persistent lack of accurate and timely data to support continuous improvement and excellence across P–20.²⁵

The New York State Education Department has been administering several programs aimed at improving the supply, quality, and equity of teaching in New York schools. Through its Teacher Opportunity Corps, NYSED offers competitive grants to teacher preparation programs adopting practices—such as mentor systems and clinically rich internships in high-needs schools—to increase the participation of historically underrepresented and economically disadvantaged individuals in teacher careers.²⁶ Its Teachers of Tomorrow program provides funding to districts that offer incentives to prospective teachers to take positions where general or subject area teaching shortages exist.²⁷ The department’s Mentor Teacher-Internship Program supports public school districts and Boards of Cooperative Educational Services (BOCES) in providing mentoring by highly qualified teachers to teachers in their first or second year of teaching.²⁸ New policies are also being considered or in progress. The governor has proposed providing financial incentives to teachers in high poverty and minority districts; and NYSED has included a commitment in its Every Student Succeeds Act (ESSA) plan to issue annual reports that track equitable access among districts to effective teachers, a key follow-up to its TeachNY promise to collect, disseminate, and use data for continuous improvement across New York State’s entire education system.²⁹

Appendix

Data Sources

This report relies on several sources of data. They are listed and briefly described below, along with links and abbreviations used to refer to them in the report tables and figures.

U.S. Department of Education, Title II Reports: National Teacher Preparation Data, 2012-16 reports, New York State, available at https://title2.ed.gov/Public/Report/DataFiles/DataFiles.aspx?p=5_01. These reports include annual data on teacher preparation programs, including the number of enrollments, completers, the subject area specializations of graduates. Note that the 2016 report provides data on the 2014-15 academic year. Abbreviated: USDOE Title II Reports.

U.S. Department of Education, Institute of Education Sciences, National Center for

²⁵ For more information on TeachNY, see <https://www.suny.edu/teachny/>.

²⁶ For more information, see <http://www.highered.nysed.gov/kiap/toc/toc.html>.

²⁷ See <http://www.highered.nysed.gov/kiap/tot/tot.html>.

²⁸ The Mentor Teacher Internship Program is described at <http://www.highered.nysed.gov/kiap/mtip/mentorinternship.html>.

²⁹ For the proposal, see Governor Andrew M. Cuomo, *Excelsior – Ever Upward: 2018 State of the State* (Albany: Office of the NYS Governor, January 30, 2018): 120, <https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/2018-stateofthestatebook.pdf>. The state’s ESSA plan is available at <http://www.p12.nysed.gov/accountability/essa/documents/nys-essa-plan-final-1-16-2018.pdf>.

Education Statistics, Common Core of Data, Local Education Agency (School District) Universe Survey Data, 2010-11 — 2015-16 files, available at <https://nces.ed.gov/ccd/pubagency.asp>. These files include annual data at the district level on students, including numbers, race, ethnicity, disabilities, and English learners; and on teachers, including grade levels (mostly general ranges). Abbreviated: USDOE CCD.

New York State Education Department, Basic Educational Data System, Personnel Master File, Standard Statistical Runs, 2010-11 — 2015-16, available at <http://www.p12.nysed.gov/irs/pmf/>. These files include annual data on teachers, including district-level information on their age, gender, years of experience, degree status, average class size, certification status (including subject area specialization), and salary. Abbreviated: NYSED PMF Data.

New York State Education Department, Report Card Database, 2010-11 — 2015-16, available at <https://data.nysed.gov/downloads.php>. These files include multiple years of enrollment, staff, graduation, dropout, assessment, and accountability data at several levels, including districts. Abbreviated: NYSED Report Card Data.

New York State Education Department, Information and Reporting Services, Enrollment Data Archive, 2011-12 — 2015-16, available at <http://www.p12.nysed.gov/irs/statistics/enroll-n-staff/ArchiveEnrollmentData.html>. Annual enrollment data for all students and by gender, race/ethnicity, economic disadvantage, limited English proficiency, and disability. [These data were used as a check against other sources.] Abbreviated: NYSED Enrollment Data.

Cluster Analysis

The cluster analysis used a *k*-means algorithm to partition the school districts with respect to economic disadvantage (measured by percentage of students eligible for free lunches), race (percentage of children enrolled who are black or white), and ethnicity (percentage of enrolled students who are Hispanic). The technique aims to divide the districts with respect to these dimensions into a set number of clusters so that the within-cluster sum of squares is minimized. There are many possible solutions, so the technique simplifies the task by seeking a local optimum — a solution in which no movement of an observation from one cluster to another will reduce the within-cluster sum of squares. The algorithm is repeated several times with different starting configurations, and the optimum of the solutions is then selected.

[Appendix Table 1](#) shows the cluster means and standard deviations for the variables used to identify the clusters. It also includes the F ratios for each of the variables. The F ratios are calculated as the mean square of the variable between clusters, divided by the mean square of the variable within the clusters.

APPENDIX TABLE 1. Average (Mean) Values, Standard Deviation, and F Ratios of Variables Used to Create K-Means Clusters

Variables	Clusters				F Ratios
	Low Poverty, White	High Poverty, White	High Poverty, Hispanic	High Poverty, Black	
Child poverty level, 2011	8.4	20.6	16.3	26.5	212.2
<i>Standard deviation</i>	<i>4.3</i>	<i>7.1</i>	<i>7.4</i>	<i>11.1</i>	
Child poverty level, 2016	7.6	19.3	16.7	25.6	278.2
<i>Standard deviation</i>	<i>3.5</i>	<i>5.6</i>	<i>8.1</i>	<i>11.0</i>	
Percent free lunch, 2010-11	11.0	32.2	44.4	69.6	413.6
<i>Standard deviation</i>	<i>7.5</i>	<i>10.1</i>	<i>22.2</i>	<i>19.8</i>	
Percent free lunch, 2015-16	18.5	43.1	53.8	65.4	135.2
<i>Standard deviation</i>	<i>10.6</i>	<i>10.0</i>	<i>18.1</i>	<i>15.9</i>	
Percent black, 2010-11	3.4	2.6	20.2	55.3	954.7
<i>Standard deviation</i>	<i>3.9</i>	<i>3.7</i>	<i>11.2</i>	<i>15.8</i>	
Percent black, 2015-16	3.2	2.3	17.1	49.8	888.4
<i>Standard deviation</i>	<i>3.7</i>	<i>3.5</i>	<i>9.7</i>	<i>15.1</i>	
Percent Hispanic, 2010-11	5.9	2.1	39.8	20.9	555.6
<i>Standard deviation</i>	<i>5.7</i>	<i>2.9</i>	<i>17.4</i>	<i>12.3</i>	
Percent Hispanic, 2015-16	9.2	3.6	46.3	25.9	564.2
<i>Standard deviation</i>	<i>7.5</i>	<i>3.9</i>	<i>17.2</i>	<i>13.8</i>	
Percent white, 2010-11	84.8	92.6	31.0	18.5	884.4
<i>Standard deviation</i>	<i>11.2</i>	<i>8.1</i>	<i>20.0</i>	<i>18.8</i>	
Percent white, 2015-16	80.0	90.1	25.6	16.2	830.1
<i>Standard deviation</i>	<i>13.4</i>	<i>9.6</i>	<i>15.5</i>	<i>17.0</i>	
Number of districts	288	317	72	36	713

SOURCE: NYSED Report Card Data; USDOE CCD; district poverty data from U.S. Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program, <https://www.census.gov/programs-surveys/saipe.html>.

ACKNOWLEDGMENTS

The Rockefeller Institute of Government is undertaking a comprehensive study of teacher supply and demand in states across the nation. This study is the second in a series of reports to come. Special thanks to the staffs of the Council of Chief State School Officers and the College Football Playoff Foundation’s Extra Yard for Teachers program for their continued help and assistance on the nationwide project with the Rockefeller Institute of Government.

ABOUT THE ROCKEFELLER INSTITUTE

Created in 1981, the Rockefeller Institute of Government is a public policy think tank providing cutting-edge, evidence-based policy. Our mission is to improve the capacities of communities, state and local governments, and the federal system to work toward genuine solutions to the nation’s problems. Through rigorous, objective, and accessible analysis and outreach, the Institute gives citizens and governments facts and tools relevant to public decisions.

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A photograph of the Rockefeller Institute of Government building, a grand multi-story structure with classical architectural features like arched windows and a balcony. The image is overlaid with a semi-transparent blue filter. The text is centered on the building's facade.

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