

Examining Teacher Supply, Demand, and Shortages in Pennsylvania

Edward J. Fuller, The Pennsylvania State University

Abstract: This study examines teacher shortages, supply, and demand in Pennsylvania rural and urban school districts using state administrative data from 2014 through 2025. This study finds the supply of new teachers has declined substantially and is insufficient to meet demand of both rural and urban districts. Demand has increased through elevated attrition and changes in student characteristics for both rural and urban districts. Both urban and rural school districts have notable percentages of teachers assigned out-of-field. Of equal concern is the increasing number of teachers on emergency permits since 2020. A composite measure of teacher quality indicates higher teacher quality in rural districts, but among Career and Technical Centers (CTCs), quality in rural districts is lower than in urban CTCs. Findings show that newly hired teachers, as well as black and multi-race teachers, are most at risk of leaving. The odds of leaving a teaching position in Pennsylvania are higher in rural districts, and in districts with lower salaries.

Keywords: Teacher Supply, Teacher Demand, Teacher Shortages, Teacher Vacancies, Teacher Emergency Permits, Teacher Attrition

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Executive Summary

There have been numerous stories in the media about the teacher shortage in Pennsylvania over the last five years. By their very nature, these reports document the overall trends in teacher shortages while leaving out some of the nuances of the shortage. This study examines teacher shortages, supply, and demand in Pennsylvania using available state administrative data that span various years between the years 2011 through 2025. Using the definition of rural provided by the Center for Rural Pennsylvania, this study examines these issues for rural and urban districts. Below is a high-level overview of the findings for teacher shortages, teacher supply, and teacher demand.

Throughout this report, districts refers to public school districts, charter schools, and Career and Technical Centers (CTCs) as well as Intermediate Units (IUs). Some analyses focus on only public school districts which exclude all other types of districts listed above. In such instances, analyses clearly identify that results include public school districts alone. In some analyses, the study also compares outcomes between rural fringe, rural distant, and rural remote districts. Rural fringe districts are closest to an urban area while remote rural districts are the farthest away from an urban area. This data comes from the National Center for Education Statistics.¹

When considering the findings below, we must remember that there is a great deal of variation within rural districts and urban districts. Some rural districts have more acute shortage issues and greater attrition than many urban districts, while other rural districts have fewer shortage issues and less attrition than many urban districts. The scope of this report does not explore all possible nuances, which may be very relevant to specific districts.

Teacher Shortages

This study estimates teacher shortages in four ways: teacher vacancies reported by districts, teachers employed on an emergency permit as reported by the Pennsylvania Department of Education (PDE), percentage of teachers assigned out-of-field, and an overall Teacher Quality Index (TQI). TQI is a composite estimate of the teacher quality in each district relative to other districts in the Commonwealth.

For teacher vacancies, a lower number of rural districts than urban districts reported at least one vacancy in the two years for which data are available. From 2024 to 2025, both the percentage of districts with vacant positions and the district vacancy rates declined. Additional years of data will help determine if this is a trend.

Over the last decade, a slightly greater percentage of rural districts than urban districts reported having at least one teacher on an emergency permit. In 2016, the percentage of teachers holding an emergency permit was an estimated 1.4 percent for both urban and rural districts. By 2024, the percentages were substantially greater for

¹ For an explanation of rural typologies, see: <https://nces.ed.gov/programs/edge/Geographic/LocaleBoundaries>.

both, but the increase was much greater for urban districts than for rural districts; the estimated percentage of teachers on an emergency permit peaked at 7.3 percent in 2024 for urban districts and 4.4 percent for rural districts.

It is also relevant to consider the actual number of teachers working with emergency permits across the state. There was a substantial increase in the *number* of teachers employed on emergency permits for both rural and urban districts. Taken together, the sharp increase in emergency permits and the persistent use of out-of-field teaching assignments indicate that many rural and urban districts continue to face significant teacher shortages, which may affect instructional quality.

Finally, rural districts had greater teacher quality than urban districts with rural districts having greater teacher quality for five of the six elements of the TQI. In rural districts, the further the distance to an urban district, the lower the teacher quality scores. Public school districts had much more positive measures of teacher quality than either charter schools or CTCs for the overall TQI and for five of the six measures. This was true for both rural and urban districts. Charter schools, by far, had the lowest measures of teacher quality. Furthermore, rural CTCs scored lower than urban CTCs on five out of six elements.

Overall, both rural and urban districts employ a substantial number of teachers on emergency permits and assign teachers to out-of-field positions. Thus, many rural and urban districts experience a shortage of teachers. This is especially evident in vacancies in specific subject areas like special education, math, and science. While an aggregate measure of teacher quality shows higher scores in all rural districts compared to urban, the lower quality of teachers in rural CTCs is a clear distinction.

Teacher Supply

The quality of teachers in Pennsylvania is dependent on the adequate supply of certified teachers to meet demand. The supply of teachers in Pennsylvania, as measured by the number of initially certified teachers in Pennsylvania teacher preparation programs (TPPs), declined substantially between 2013 and 2017 and has never recovered. From 2012-13 to 2016-17, there was a 66 percent decline in the number of initial in-state certifications. The number of initially certified teachers from Pennsylvania TPPs declined at least 50 percent in every subject area. In most years between 2014 and 2020, the number of newly certified teachers was about the same as the number of teachers leaving. However, since that time, the number of teachers leaving has increased fairly dramatically while the number of newly certified teachers has remained stagnant.

The supply of teachers has declined at similar rates for both urban and rural counties. However, many rural counties have no TPP, thus have a restricted supply of teachers regardless of the overall level of initially certified teachers. This could partially explain why rural schools furthest from urban areas have lower teacher quality.

Teacher Demand

The primary factors in driving demand can include changes in student enrollment, changes in student characteristics, and teacher attrition.

Student enrollment has declined across Pennsylvania over the last decade and will continue to decline for much of the Commonwealth in the coming decade.² The decline in students has been most pronounced in rural districts in Pennsylvania, with a notable number in the western parts of the Commonwealth. Specifically, the number of rural students has declined by approximately 12 percent while the decline in urban districts has declined by about 1 percent.

Student characteristics and the needs of students have changed as well over the last decade. Indeed, the number and percentage of economically disadvantaged and special education students have increased in both rural and urban districts. Moreover, research has shown that the mental health needs of students, including those in rural areas (Gajanan, 2023), have increased over time. This is especially true since COVID (Pennsylvania Attorney General, 2022). These changes in student characteristics may increase the demand for teachers. Research is very clear that smaller class sizes, especially at the elementary school level, improve student outcomes (Ehrenberg et al., 2001); therefore, if funding is available, districts may hire more teachers to lower student-teacher ratios. Further, as the number of special education students increases, the demand for special education teachers increases. Moreover, special education classes have class size limits imposed by the General Assembly³ that are often lower than student-teacher ratios in other classes (Bondebjerg et al., 2023; McLeskey et al., 2004; Smedsrud et al., 2025; US Department of Education, 2005).

Attrition

Past studies have found teacher attrition to be the most important factor explaining the demand for teachers (Sutcher et al., 2019). Attrition in rural districts overall from 2021 onward has remained at 6 to 7 percent; in urban districts, attrition is at 9 percent or higher. Comparing 2020 to 2024, an additional 400 teachers left the teaching profession in rural Pennsylvania and almost 1,900 left urban districts. Thus, the demand for teachers increased in both types of districts. If data are examined in more detail, they show issues with teacher attrition are greater for charter schools and CTCs than for public school districts.

This study also includes an analysis that examined the likelihood of an individual teacher in a rural public school district leaving the teaching profession after one year relative to an individual in an urban public school district. After excluding charter schools and CTCs and adjusting the results for teacher characteristics and district characteristics, this study found that rural teachers in public school districts are slightly

² See data on enrollment at <https://www.pa.gov/agencies/education/data-and-reporting/enrollment>

³ See <https://www.pacodeandbulletin.gov/Display/pabull?file=/secure/pabulletin/data/vol31/31-23/1030a.html&d=reduce>.

more likely than teachers in urban public school districts to leave the teaching profession in Pennsylvania. While the difference is fairly small, it raises the question of what may be causing the difference. Consistent with prior research, newly hired teachers are statistically significantly more likely to leave teaching after one year than teachers who were not newly hired. In fact, the odds of leaving were not just statistically significant, but substantial. Black and multi-race teachers had the highest odds of leaving their teaching jobs. Finally, attrition was shown to be related to lower salaries. The higher the average teacher salary in a district (after adjusting for the wages of other college educated workers in the same labor market), the less likely a teacher was to leave the teaching profession. Since teacher shortages and high attrition have a negative effect on student outcomes (Fuller, 2026; Sutchter et al., 2019) policymakers should take action to address these concerns. Below are selected recommendations to be considered when determining how to address these issues.

Policy Recommendations

Expand and Strengthen the Teacher Preparation Pipeline

This report shows that Pennsylvania's supply of teachers is insufficient to meet the demand for teachers, especially in specific subject areas and in specific areas of the state such as remote rural areas which have no or limited access to TPPs. Expanding the teacher pipeline can include several different policies. Research points to a combination of financial, structural, and professional factors that influence who enters, completes, and remains in teacher preparation.

Based on the available research, Pennsylvania could first expand Grow Your Own (GYO) pathways that recruit high school students, paraprofessionals, and other community members into the teaching profession (Blazar et al., 2024; Camp et al., 2024; Kistler et al., 2024). Evidence shows that GYO programs are particularly effective for increasing the diversity of the teaching workforce (Gist et al., 2019) and filling hard-to-staff positions in both rural and urban districts (Hamman et al., 2023), including for special education (Shelton and Cruz, 2023).

Second, the Commonwealth could financially support teacher residency models which have been shown to drastically reduce attrition of teachers in their first years of teaching (Guha et al., 2017). Such programs would be especially beneficial in areas where districts are relying heavily on the use of emergency permits.

Finally, the General Assembly could provide targeted funds to universities throughout the Commonwealth that must be used to support teacher preparation. Currently, higher education institutions are suffering from a scarcity of financial resources that has negatively affected teacher education. There has been consolidation of some campuses in the Pennsylvania State System of Higher Education (PASSHE) and closures of campuses are planned (Penn State is in the process of closing seven campuses, most of which serve rural communities).

Strengthen Financial Incentives for Entering the Profession

As shown in this research, there has been a dramatic decline in the number of individuals obtaining teacher certification and the supply of teachers has remained insufficient and stagnant over the last several years. Further, as shown in both the supply and shortage sections of this study, the need for additional teachers is more acute in specific subject areas such as special education and mathematics. Programs that provide tuition assistance or loan forgiveness in exchange for teaching service have strong evidence of increasing the number of individuals entering and completing preparation programs (Podolsky and Kini, 2016; Dee and Goldhaber, 2017). The Student Teacher Stipend Program (STS) is an example of this type of program. While the General Assembly recently increased investment in the STS program, we do not yet have data on the success of the program. With limited funds, targeting the most high-demand subject areas could have the biggest return on investment. Currently, the state could prioritize teachers of special education, math, and science. The prioritization list could be adapted in response to additional data over time.

Improve Teacher Compensation

Average teacher salaries have actually declined over the last 20 years and continue to decline. Increasing teacher salaries creates incentives for individuals to enter the teaching profession as well as stay in the teaching profession (Allegretto and Mishel, 2020; Loeb and Page, 2000, Hanushek et al., 2004). Mississippi and Arkansas both increased teacher salaries and have experienced substantial declines in teacher attrition, thus reducing the shortage of teachers (Saunders and Skinner, 2025; Zamarro and McGee, 2025). Thus, one strategy to reduce the shortage of teachers is to provide a salary increase for all teachers.

There are also more targeted strategies to improve teacher salaries. One strategy is to support pay increases for teachers to advance into formal Teacher Leader positions. Teacher Leaders can serve as expert mentors⁴ which can help reduce teacher attrition and increase teacher effectiveness (Ingersoll and Strong, 2011). This strategy can also reduce the substantial time burden on principals, which likely contributes to their annual turnover rate. PDE has already created a certificate for such positions, but not all districts have adopted this strategy.

Another research-based strategy to increase teacher salaries where an increase is needed the most is to adopt a comprehensive performance pay program for teachers in high-need schools located in both rural and urban areas. Recent research has found that such programs can save money in the long run by reducing teacher attrition (Dee and Wyckoff, 2015; Hanushek, et al., 2019). Some research also suggests that such programs

⁴ See <https://www.niet.org/newsroom/show/blog/teacher-leadership-is-more-than-an-add-on-its-the-engine-that-drives-student-outcomes>.

improve student outcomes because teacher effectiveness increases with experience (Cohodes et al., 2023).

Create a Retain Your Own Program

PDE now provides teacher attrition data; we can determine which specific districts struggle most with teacher retention. While rural districts have overall lower attrition rates than urban districts, a greater percentage of rural than urban public school districts or CTCs have attrition rates greater than 10 percent from 2021 through 2024. The underlying causes of high attrition and the potential solutions are likely to differ by local contexts. This program would provide financial support and technical assistance to districts identified as eligible for support based on their average yearly attrition and turnover rate. Technical assistance could be provided through a university-state partnership to assist districts in developing, implementing, and evaluating their efforts to reduce teacher attrition.

Importantly, reducing attrition in high-need districts has a spillover effect that increases the supply of teachers and, thus, reduces the demand for teachers in other districts. If attrition is reduced in districts with high attrition rates, then those districts also reduce the overall statewide demand for teachers, leaving a greater supply of teachers for other districts.

Adopt and Implement a Statewide Teacher Working Conditions Survey

One finding from the multivariate analysis of teacher attrition is that the percentage of white students in a school is associated with decreased odds of leaving teaching. Research, however, has shown that the student demographics are not the actual cause. Rather, research has found that student demographics often serve as a proxy for teacher working conditions (Hornig, 2009; Ladd, 2011; Blanchard et al., 2023). States have used statewide teacher working conditions surveys to help school and district leaders identify areas of concern and develop strategies to address the areas of need identified by teachers. Importantly, the purpose of such an effort must be to provide tools and assistance to schools and districts; such efforts must be distinct from processes of evaluation and accountability.

Enhance State Data Collection and Analysis

For a number of reasons, this study leaves a number of questions unanswered and provides only estimates for some analyses. One reason is a lack of data. While PDE has increased and improved the collection of data, there are still issues with data collection, documentation of details, and timeliness of data production. The current data collection and analysis system is unable to provide timely, in-depth analyses that provide a full picture of the issues surrounding these areas. Thus, the Commonwealth should:

- Build and/or enhance pre-kindergarten through postsecondary statewide longitudinal data systems that allow researchers to follow individual teachers longitudinally through the entire career pipeline.
- Track enrollment, completion, licensure, placement, and retention outcomes across TPPs by individual characteristics and subject area.
- Publish annual teacher workforce dashboards highlighting shortages by region and subject.

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Introduction

Researchers and policymakers widely recognize teachers are the single most important within-school factor influencing a variety of student academic and non-academic outcomes (Blazar and Kraft, 2017; Chetty et al., 2014; Goldhaber, 2012; Jackson, 2018). Well-prepared, experienced, and effective teachers improve both student academic and socio-emotional outcomes (Kraft, 2019). High quality teachers are critical to ensuring students are prepared to be successful for life after high school (Chetty et al., 2014). In fact, access to a high-quality teacher can improve future earnings by hundreds of thousands of dollars (Chetty et al., 2014). Access to even one high quality teacher can increase earnings by at least one percent per year after age 28 and can also increase the percentage of students from a school who enroll in college by one percent (Chamberlain, 2013). Quality teachers also improve student socio-emotional ability and resiliency well after primary education, and offset several factors associated with disadvantaged backgrounds (Blazar and Kraft, 2017; Chetty et al., 2011; Jackson, 2018; Murray and Pianta, 2007; Wang et al., 2012).

While all students need high-quality teachers, a large body of research has demonstrated that students most in need of high-quality teachers are the least likely to have access to them (Clotfelter et al., 2007; Clotfelter et al., 2023; Goldhaber et al., 2015). For example, students of color in low-income schools are between three and ten times more likely to have uncertified, underprepared, or out-of-field teachers than white students in affluent schools (Darling-Hammond, 2010). Further, research suggests students in rural schools often have less access to high-quality teachers as well (Fowles et al., 2014; Monk, 2007). Specifically, relative to other districts, rural districts often face greater barriers to recruiting and hiring well-prepared teachers (Fowles et al., 2014; Monk, 2007).

Shortage of Teachers

A shortage of teachers is of high concern for educators, policymakers, and the public. For example, there are numerous new articles and legislation that address the issue of teacher shortages in Pennsylvania. There continues to be great concern about a lingering shortage of teachers that began prior to COVID and was greatly exacerbated by the high attrition rates that followed COVID (Diliberti and Schwartz, 2025).

The shortage of teachers in particular schools and subject areas will affect access to well-qualified teachers; these shortages are influenced by systematic patterns in applicant preferences, hiring practices, mobility, and attrition (Simon and Johnson, 2015). Even prior to a recent decline in the production of teachers across the nation and in Pennsylvania, there have been persistent shortages of certified Science, Technology, Engineering, and Mathematics (STEM) and special education teachers across all schools (Boe and Cook, 2006; García and Weiss, 2020; Simon and Johnson, 2015). Such shortages have been exacerbated in high-poverty schools by high rates of teacher

attrition (Goldhaber et al., 2015; Sutchter et al., 2019). These teacher shortages have been exacerbated in rural schools by difficulty in attracting applicants (Gagnon and Mattingly, 2015; Monk, 2007).

While Pennsylvania has rarely experienced anything other than isolated teacher shortages, districts have experienced a growing shortage of teachers since 2018 (Fuller and Pendola, 2020). The shortage has increased dramatically since that time such that districts across Pennsylvania report teacher vacancies and widespread employment of teachers on an emergency permit (Fuller, 2025). Anecdotal evidence suggests districts are increasingly having difficulty finding an ample supply of substitute teachers and well-qualified teachers in specific course areas—such as special education, physics, and courses designed for English Language Learners (Dabney, 2022; Gross, 2025; Mistry, 2024). This trend is seen in many rural districts too (Tomasic, 2025). Further, district leaders often report dramatic declines in the number of applicants for positions over the last decade which lowers the quality of their workforce because they cannot be as selective when offering employment to fill needed positions.

Specific to rural districts, two issues stand out. First, research has found that rural schools have difficulty in attracting applicants in part because lower funding levels often lead to lower pay which creates obstacles to luring applicants to vacant positions (Fowles et al., 2014; Gagnon and Mattingly, 2015). Second, graduates from teacher preparation programs (TPP) have a strong preference for working in districts near their home or near their TPP (Boyd et al., 2005; Krieg et al., 2016; Strauss, 1999). Many rural districts are in areas of the state with limited access to TPPs. In the most recent analysis of data from Pennsylvania, Strauss (1999) found about 40 percent of teachers were employed in the district in which they attended high school. This trend noted by Strauss can disadvantage rural districts in Pennsylvania given the declining K-12 enrollment (documented later in this report) and in institutions of higher education (Grawe, 2018). In comparison, evidence suggests most urban districts are in regions that tend to have greater numbers of individuals obtaining licensure in all subject areas (Fuller and Pendola, 2020). Thus, in Pennsylvania, existing evidence suggests that rural school districts may face greater barriers than urban districts in recruiting and hiring well-prepared teachers.

The trends pointed out by the literature suggest teacher shortages are now impacting rural areas of the Commonwealth at least to a similar degree to urban areas. In short, there is ample evidence to warrant the investigation of current and projected teacher shortages across the Commonwealth and rural areas of the Commonwealth that may not have previously experienced shortage of teachers.

Supply of Teachers

An adequate supply of teachers generally improves educational quality by allowing districts to be more selective in the hiring processes as well as allowing districts to select teachers who are fully certified rather than being forced to hire under-qualified

teachers on emergency permits or to use a series of substitute teachers to fill vacancies. (Boe and Cook, 2006; Sutchter et al., 2016). Thus, an adequate supply of teachers is critical to ensuring all children have access to well-qualified teachers who remain at the same school.

In any given year, teacher supply can include teachers who were a public school teacher in Pennsylvania in the prior academic year who choose to continue to work as a public school teacher in Pennsylvania (retained teachers), college graduates entering the profession for the first time, individuals returning to the teaching profession after taking at least a one-year break from teaching, individuals entering from out-of-state, and individuals entering teaching after pursuing another career. The first two sources are substantially greater than the remaining sources of supply combined. There are a number of factors that could influence the supply of teachers, including barriers to entry, occupational prestige, and job satisfaction. These factors are reviewed below.

Barriers to Entry

The major barrier to entry into the teaching profession in Pennsylvania is the cost of higher education. Increasing tuition at institutions of higher education have likely resulted in reduced TPP enrollment since higher tuition rates tend to reduce enrollment in higher education (Kelchen and Pingel, 2024). Relative to other states, Pennsylvania has high college tuition rates (Hanson, 2025; Wickham, 2025) and student debt loads that are among the highest in the country (McNair, 2025).

There have been changes that have reduced barriers to entry such as the Student Teacher Stipend, expedited processing of applications to become a teacher, improved teacher reciprocity agreements with other states, removal of the Basic Skills test for aspiring teachers, and reduction in some certification fees. However, there have been no substantial regulatory changes, such as changes in licensure requirements, that have made entry into the profession more difficult. Therefore, there is the possibility that the current requirements to enter teaching continue to unnecessarily restrict the supply of teachers in Pennsylvania. Further, we do not yet have any evidence that any of these reductions in barriers to entry have had any positive effect on enrollment in TPPs.

Salary

In Pennsylvania, as shown in Table 1, the average teacher salary in constant 2022 dollars has declined from about \$80,500 in 2000 to about \$72,200 (National Center for Education Statistics [NCES], 2023) in 2022.

Table 1: Average Teacher Salary in Pennsylvania in Constant 2022 Dollars

State	1999- 2000	2009- 10	2019- 20	2020- 21	2021- 22	Percentage Point Change: 2000 to 2022
Pennsylvania	80,498	76,976	77,119	76,606	72,248	-10.2

Data Source: National Center for Education Statistics

https://nces.ed.gov/programs/digest/d22/tables/dt22_211.60.asp;

PDE Professional Staff Summary

<https://www.pa.gov/agencies/education/data-and-reporting/school-staff/professional-and-support-personnel>.

Even after adjusting for the wages of non-educator college graduates, the average salary in Pennsylvania was \$79,701 in 2000 and \$75,811 in 2022. Thus, even when using the methodology preferred by researchers⁵, there was still a substantial decline in the average teacher salaries in Pennsylvania from 2020 to 2022. PDE reported an average teacher salary of about \$70,000 in 2025 (adjusted to 2022 dollars) which shows that the average salary continues to decline.⁶

Further, the wage gap between teachers and those employed in other careers requiring a college-education has widened (Allegretto, 2025). In Pennsylvania, this pay gap has increased from around 14 percent in 2018 (Allegretto and Mishel, 2018) to almost 20 percent in 2024 (Allegretto, 2025). By choosing to enter teaching rather than another profession that also requires a college degree, an individual in Pennsylvania would expect to make nearly 20 percent less in salary than would otherwise be the case (Allegretto, 2025). While retirement benefits helped to offset this disparity prior to 2018, subsequent changes to pension benefits reduced that offset for newly hired employees (Keefe, 2018).

Table 2 compares the 2020 average teacher salaries for districts to the 2025 average teacher salaries for districts in constant 2025 dollars. Salaries declined across all district types for both rural and urban districts. The declines for public school districts were substantial: more than \$9,000 for urban public school districts and about \$8,500 for rural public school districts.

Choosing to enter or remain in teaching in Pennsylvania likely means a decline in purchasing power over time. Both sets of salary figures influence a teacher's decision to continue teaching in a Pennsylvania public school and likely also influence individuals' decisions to enter a teacher preparation program to become a teacher.

⁵ See <https://nces.ed.gov/programs/edge/economic/teacherwage>.

⁶ Author's calculations using PDE data.

Table 2: Estimate of the Average Teacher Salary in Pennsylvania for Rural and Urban Districts by District Type 2020 and 2025*

District Type	Avg Salary 2020	Avg Salary 2025	Change in Salary 2020 to 2025
CTC	\$83,815	\$74,416	-\$9,399
Charter School	\$66,734	\$64,864	-\$1,547
School District	\$89,823	\$80,546	-\$9,277
All Urban Districts	\$81,489	\$74,808	-\$6,813
CTC	\$73,260	\$64,148	-\$9,423
Charter School	\$53,302	\$51,014	-\$2,914
School District	\$77,668	\$69,098	-\$8,569
All Rural Districts	\$76,303	\$67,773	-\$8,448

Data source: PDE professional staff summary report data. Calculations by author.

* Note: Salaries are adjusted for inflation; salaries are in constant 2025 dollars. The salaries were not adjusted using the comparable wage index, nor for differences in the average years of experience in education or in service in the district.

Occupational Prestige

Occupational prestige is the respect and social standing of teachers (Kraft and Lyon, 2024). While there is not any data specific to occupational prestige in Pennsylvania, national data suggests that occupational prestige for teachers has plummeted in the last 15 years (Kraft and Lyon, 2024). According to Kraft and Lyon (2024), the percentage of parents who wanted their children to become teachers declined from almost 70 percent in 2010 to only 37 percent in 2022. Indicators suggest a substantial decline in the prestige accorded teachers may reduce the supply of those willing to continue in the teaching profession or to choose to become a teacher.

Job Satisfaction

Pennsylvania does not collect any information about teacher job satisfaction or the working conditions that heavily influence teacher job satisfaction. Learning Policy Institute (2024) analyzed data from a recent national survey and found that Pennsylvania was ranked in the bottom 40 percent of states on seven of nine indicators about job satisfaction. Thus, while information is lacking, the available evidence suggests Pennsylvania has lower than average teacher job satisfaction. Research is very clear that teachers' perceptions of their working conditions have a strong influence on their decision to remain in the teaching profession (Kraft et al., 2016).

Summary of Supply Factors

The available evidence suggests that Pennsylvania faces substantial barriers regarding the supply of teachers. Barriers to entry, salary, prestige, and job satisfaction all present impediments to the supply of teachers in Pennsylvania. Perhaps most importantly is the cost of obtaining certification relative to wages earned once employed

as a teacher. Indeed, students choosing education as a degree face a declining financial return to becoming a teacher (Kraft and Lyon, 2024) and the financial return on a college degree in education is negligibly greater than zero and is greater than only one other degree (Cooper, 2024; 2025).

Pennsylvania is attempting to address this issue through several strategies. These include reducing the costs of higher education for teachers (e.g., student teacher stipends, Grow PA scholarships, no or minimal increases in PASSHE tuition rates, reducing certification costs), removing Basic Skills test requirement, expediting the processing of certification applications, and supporting both Grow Your Own programs and teacher apprenticeships.

Demand for Teachers

The demand for teachers is driven by five primary factors: the number of students, student needs, regulations, shortage of teachers in specific areas, and teacher attrition (Podolsky et al., 2016). Of these factors, attrition comprises about 90 percent of the demand for teachers.

Number of Students

When the number of students increases, the number of teachers typically increases as districts follow class size regulations and open additional classes for students. Thus, an increase in student enrollment can increase the demand for teachers. An increase in the number of students enrolling in specific types of courses can also increase the demand for teachers for those courses. For example, when more students are interested in taking STEM classes, the demand for STEM teachers will likely increase. For example, the recent emphasis on CTCs has increased the demand for such teachers. Further expansion of CTE programs will continue to increase the demand for CTE teachers. Further, the number of students identified as special education or in need of some form of bilingual language instruction will increase the demand for special education and English Language Learner (ELL) teachers. These trends are discussed later in this study.

Student Needs

The needs of students can also increase the demand for teachers. Student needs that can influence the student-teacher ratio include an increased percentage of children from families with economic challenges, children needing special education, and children with mental health issues (Sutcher et al., 2016). When students have more needs, the amount of stress experienced by teachers typically increases which, in turn, can increase teacher attrition (Sutcher et al., 2016). In addition, many districts respond by hiring more teachers to reduce student-teacher ratios, so student needs are more manageable (Sutcher et al., 2016).

In Pennsylvania, both children and adults in rural areas have experienced increasing mental health issues (Gajanan, 2023; Pennsylvania Office of Rural Health, n.d.; Svistova

et al., 2022). Moreover, as will be shown later, both rural and urban districts have experienced an increase in the percentage of children identified as economically disadvantaged and the percentage of children in need of special education.

Regulations

Regulations such as mandating particular courses, passing state mandated testing, and limiting class size can require more teachers than would be the case for the number of students enrolled. In short, such regulations can increase the demand for teachers.

When states add additional required courses, then the demand for teachers can increase. For example, the newly required Personal Finance course required for graduation may increase the demand for teachers if districts cannot eliminate other courses so they can shift teachers into personal finance courses.

Pennsylvania requires students to take Keystone Examinations in high school. Many students do not initially pass the test and pursue passing the tests on additional attempts. This increases the demand for teachers due to the need to aid such students, typically through additional classes that prepare students for the tests. Further, districts feel pressure to increase test scores at every grade level. This can result in districts offering additional classes that focus on passing the tests. In both cases, additional classes increase the demand for teachers.

Pennsylvania does limit the class sizes of some classes, but the requirements have been in place for a substantial number of years. Moreover, districts can obtain waivers from the requirements. Currently, Pennsylvania caps the number of students in kindergarten through third grade classes at 25 with a cap of 17 students for specific situations. In grades four through eight, class size limits are set at 30 students per teacher. At the high school level, teachers may teach up to 34 students in a class with higher caps for classes such as physical education and music. These class size regulations have not changed in many years and likely only marginally increase the demand for teachers. Importantly, research suggests small classes at pre-kindergarten through elementary school help improve student achievement, particularly for economically disadvantaged students and students of color (Jepsen, 2015).

Teacher Attrition

By far, teacher attrition is the largest component of the demand for teachers. In Pennsylvania, between 7,000 and 10,000 teachers leave the teaching profession (Fuller, 2025a). Teacher attrition includes four individual behaviors: leaving the teaching profession altogether, moving to another state, moving into a non-teaching role within Pennsylvania, and moving into a private school setting. Some teachers only temporarily leave teaching in Pennsylvania and then return later which is a source of teacher supply. Understanding the causes of attrition can be critical, as high attrition disrupts school stability, increases costs for districts, and negatively affects student learning (Fuller, 2026; Ronfeldt et al., 2013; Sorensen and Ladd, 2020). Research also suggests that

teacher attrition rates differ by school level⁷ (Farahmandpour and Voelkel, 2025) and subject area such as mathematics and special education (Darling-Hammond and Carver-Thomas, 2017).

While this study does not delve into the reasons for teacher attrition, there is a wealth of research on why teachers leave the teaching profession (Garcia and Weiss, 2020; Nguyen et al., 2019). The two most consistent findings are that teacher salaries and teacher working conditions influence teacher attrition (Simon and Johnson, 2015; Sorensen and Ladd, 2020). Specifically, the higher a teacher's salary, the greater the likelihood that the teacher will remain in their position. This is especially true when a teacher's salary compares favorably to salaries offered in competing occupations in the same labor market (Nguyen et al., 2019).

A number of studies have also found that teacher working conditions affect teacher attrition (Simon and Johnson, 2015). Specifically, the more favorable a teacher perceives her or his working conditions, the more likely she or he is to remain in their teaching position. There are several components of teacher working conditions that are particularly related to teacher attrition—including strong school leadership, professional autonomy, student behavior, school safety, and opportunity for advancement while remaining in a teaching position.

Strong school leadership is one of the most important factors in teacher retention. Principals shape working conditions, set behavioral expectations, cultivate school culture, and allocate resources. Teachers who feel supported by administration—through clear communication, meaningful feedback, and protection from unreasonable demands—are significantly more likely to stay (Boyd et al., 2011; Kraft et al., 2016).

Teachers have increasingly reported declines in professional autonomy due to standardized testing regimes, scripted curricula, and rigid accountability systems. While accountability reforms sought to improve instructional quality, many teachers feel constrained and devalued when policy mandates limit their ability to exercise professional judgment (Ingersoll and Merrill, 2017).

Escalating concerns about student behavior and school safety are increasingly cited as reasons for teacher exits. Post-pandemic increases in student mental-health challenges, attendance issues, and behavioral disruptions have intensified classroom management demands (Darling-Hammond and Hylar, 2020). Teachers who lack adequate support—such as counselors, behavioral specialists, or clear discipline policies—often experience higher stress and reduced job satisfaction. Safety concerns, including bullying, fights, and in rare cases, threats of violence, also contribute to attrition. Teachers need environments where they feel secure and supported in maintaining order.

Unlike other professions, teaching offers few opportunities for advancement without leaving the classroom. Career ladders such as mentorship roles, instructional coaching,

⁷ School levels are elementary, middle, and high schools

or hybrid teacher-leader positions exist in some districts but remain unevenly available. When teachers perceive limited chances for growth or meaningful professional development, their commitment to the profession can weaken (Tran and Smith, 2020).

Goals and Objectives

The primary goal of this study is to document the shortage of educators in rural and urban school districts and counties across the Commonwealth and to examine the supply and demand issues associated with these shortages. I adopt Darling-Hammond and Podolsky's (2019, p. 3) definition of a shortage as "an inadequate quantity of qualified individuals willing to offer their services for available jobs under prevailing wages and conditions." Qualified individuals are those meeting state licensure standards for their teaching positions. In Pennsylvania, the overall shortage can be captured by three measures: the number and percentage of positions left vacant by a school district, the number and percentage of positions filled by an educator on an emergency permit, and the number of teachers assigned out-of-field. These are defined below in the Methods section.

Below objectives are outlined for three areas: teacher shortages and quality, supply of teachers, and demand for teachers.

Teacher Shortages and Teacher Quality

This section of the report addresses the following three questions.

- What percentage of educator positions were identified as vacant in 2023-24 and 2024-25 for rural and urban school districts?
- What percentage of educator positions were filled by educators on a long-term emergency permit from 2015-16 through 2023-24, and what are the trends over time?
- What percentage of educator positions were filled by teachers assigned out-of-field from 2020 through 2024 and what were the trends over time?
- How did overall teacher quality compare between rural and urban districts in 2024?

The Supply of Teachers

This section focuses on the supply of teachers which affects the shortage of teachers. If the supply is insufficient to meet the demand for teachers, then there will be a shortage of teachers. Alternatively, when supply exceeds demand, there will generally not be a shortage of teachers overall.

- What percentage of teachers were retained in the teaching profession in Pennsylvania from one year to the next from 2015 through 2024 in rural and urban districts?

- What was the number of newly hired teachers in rural and urban districts from 2016 to 2024?
- What were the sources of the supply of newly hired teachers in rural and urban districts from 2016 to 2024?
- What were the numbers of newly certified teachers from Pennsylvania TPPs and from out-of-state from 2011 through 2024?
- What was the spatial distribution of TPPs in rural and urban areas in Pennsylvania?

Teacher Demand

This section focuses on the demand for teachers which affects the shortage of teachers. If the demand for teachers exceeds the supply of teachers, then there will be a shortage of teachers. Alternatively, when demand is lower than supply, there will generally not be a shortage of teachers.

- What are the trends in student enrollment from 2014 through 2024 for rural and urban districts?
- What are the trends in student educational or instructional needs from 2014 through 2024 for rural and urban districts?
- What are the trends in the ratio of students to teachers from 2014 to 2024 for rural and urban districts?
- What are the trends in teacher attrition from 2015 through 2024 for rural and urban districts?
- Are individual teachers employed in rural districts more likely to leave the teaching profession than teachers in urban districts?

Methods

This section includes a discussion of how districts were identified as rural, an explanation on the use of descriptive versus inferential statistics, and a brief review of various methods. Most of the discussion is focused on how important variables were constructed and/or where the variables were found. Additional details regarding the methods are in an appendix.

Identification as Rural or Urban

This report focuses on rural districts in Pennsylvania. This study relies on the definition of rural used by the Center for Rural Pennsylvania (CRP). However, CRP identifies only public school districts as rural or urban. This study also includes charter schools, Career and Technical schools (CTCs), Intermediate Units (IUs). The definitions of each type of district are included in Appendix I: Definitions. Unless otherwise noted, the analyses in this study include CTCs, charter schools, and public school districts. Some analyses include IUs. Most SJCI are missing data relevant to this study, thus are not

included. Because cyber schools do not have a physical location and enroll students from across the Commonwealth, they are not included in any of the analyses in this report.

Most brick-and-mortar charter schools (henceforth called charter schools) are located in counties in which all districts are designated as urban. Thus, this study designated all charter schools in these counties as urban. For charter schools outside such counties, this study relied on Google maps to locate the public school district nearest the charter school. The CRP designation for the nearest public school district was then applied to the charter school. While charter schools serve students in a smaller geographic area than CTCs, they could also enroll students from both rural and school districts. However, the degree to which this occurs is not known.

Most CTCs are located in counties that are designated as rural and all districts within the counties are designated as rural. In these instances, CTCs in these counties are designated as rural. For CTCs outside such counties, the study used Google maps to find the CTC and its nearest public school district. The CRP designation for the nearest public school district was then applied to the CTC. Finally, IUs may include both rural and urban school districts. IUs that had at least 50 percent of students enrolled in rural districts were designated as rural.

Table 3 includes a list of the number and percentage of districts for urban, rural, and cyber entities. I treat cyber schools as a separate category because they do not draw their students from a specific geographical area. Thus, while a cyber charter may have a physical location in an urban or rural area, I treat them as having no physical location.

**Table 3: Number and Percentage* of Education Entities
Located in Urban, Rural, and Virtual Areas of Pennsylvania***

Type of Entity	Urban		Rural		Cyber		All Locales	
	N	Percent	N	Percent	N	Percent	N	Percent
Public School District	269	51.9	231	78.8	0	0.0	500	60.2
Charter School	187	36.1	13	4.4	0	0.0	200	24.1
Career and Technical	45	8.7	30	10.2	0	0.0	75	9.0
Intermediate Unit	16	3.1	12	4.1	0	0.0	28	3.4
Cyber Charter	1	0.2	0	0.0	16	100.0	17	2.0
All Entities	518	100.0	286	97.6	16	100	820	100

Data Source: Pennsylvania Department of Education (PDE) student enrollment files; PDE teacher employment files from the PDE website; and Center for Rural Pennsylvania (CRP) data on rural and urban districts and counties.

* Note: The numbers and percentages reflect all entities that were in existence for at least one year between 2014 and 2025. The actual numbers and percentages vary slightly by year as some schools close and other schools open, although this is primarily true for charter schools.

Descriptive Versus Inferential Statistics

This study primarily relies on the entire universe of data—that is, every single member of the population being studied. When the universe of data is available, only descriptive statistics are needed because there is no uncertainty about the population.

Descriptive statistics simply summarize and present the actual characteristics of that complete group. Inferential statistics, on the other hand, are used to make estimates or test hypotheses about a population based on a *sample* of that population. Because the full population is already available, there is no need to estimate, generalize, or account for sampling error; the results reflect the true values of the population.

Student Enrollment

This study used student enrollment at the district level from the PDE website. When these data are aggregated at the county level or into rural-urban totals, some students are counted multiple times because students may be enrolled in multiple school districts at the same time. Importantly, CTC enrollments are duplicative of public school district enrollments. While I subtract CTC enrollments from the total enrollment for counties, some students are still double counted. Although, the number of such students is relatively small. Thus, in this study, student enrollment counts are greater than the true counts of unique students. PDE does not make data available to provide an accurate headcount by district of unique students.

Teacher Shortages

A shortage of teachers was examined using three measures: teacher vacancies, use of emergency permits, and percentage of teachers assigned out-of-field. Teacher vacancies are self-reported by school districts every quarter. This study relied on the data provided in the fall data collection and was downloaded from the PDE website. Use of emergency permits were collected by PDE in October of each year. This analysis relied on only emergency permits used for long-term substitute teachers (Types 1 and 4).

Teacher Vacancy

According to PDE, a “vacancy is defined as ‘an unoccupied position that has been board approved and posted to allow the LEA to proceed through the hiring process’”.⁸ Vacancy data is collected quarterly from school districts. The data used in this study comes from the quarter ending in the middle of the fall semester. Substitute teachers are included in the analysis when a substitute teacher is reported as filling a teaching vacancy by a district.

Teacher Employed on an Emergency Permit

A teacher on an emergency permit in Pennsylvania is an individual holding at least a bachelor’s degree who is hired by a public school district to fill a vacant position when no fully certified applicant is available. PDE provides specific language about eligibility

⁸ See Professional Vacancy Reports at <https://www.pa.gov/agencies/education/data-and-reporting/school-staff/professional-and-support-personnel#accordion-2b4cc9f3fe-item-3adb7e1f63>.

and use of the various types of emergency permits.⁹ These temporary, renewable permits allow individuals to serve as long-term or day-to-day substitutes, or to fill specific, hard-to-staff vacancies. Teachers can be employed on any one of 6 different types of emergency permits.¹⁰ This study focuses on two types of emergency permits: Type 1: Long-Term Substitute with Educational Obligation which is a vacant position with an educational obligation to pursue the appropriate certification as the need for a certified professional in the position is expected to continue and Type 4: Long-Term Substitute with No Educational Obligation as the need for a professional in this position is not expected to continue.

Teacher Assigned Out-of-Field

In Pennsylvania, an out-of-field teacher is an educator assigned to teach a subject or grade level for which they do not hold the required state certification.¹¹ This occurs when a teacher's assignment does not match their training or certification area, such as an elementary-certified teacher instructing middle school, or a teacher in one subject area (e.g., English) being assigned to another (e.g., social studies).

Beginning Teacher

A beginning teacher is an individual with no prior experience as a professional in an education system. In the PDE data, a beginning teacher is identified as having 1 year of education experience.

Novice Teacher

A novice teacher is an individual with between 1 and 3 years of experience in an education system. In the PDE data, a novice teacher is identified as having a 1, 2, or 3 in the educational experience column.

Teacher Quality Index

Teacher quality was assessed by the creation of a composite Teacher Quality Index (TQI) score based on 6 research-based measures of teacher quality. Appendix 3 includes the details of the creation of the TQI. The 6 measures are: percentage of teaching positions identified as vacant; percentage of teachers employed on an emergency permit; percentage of novice teachers; percentage of teachers assigned out-of-field; disparity between the proportion of students of color and teachers of color; and teacher attrition rate. Each measure of teacher quality was transformed into z-score¹² which sets

⁹ For specific language, see

<https://www.education.pa.gov/Educators/Certification/PAEducators/Pages/Emergency-Permits.aspx>).

¹⁰ See “Emergency Permits” at <https://www.pa.gov/agencies/education/data-and-reporting/school-staff/educator-preparation-and-certification#accordion-43b97ca7af-item-61eeb6dfb7>.

¹¹ See <https://www.pa.gov/agencies/education/programs-and-services/schools/every-student-succeeds-act-essa/essa-report-card/data-sources>.

¹² <https://www.simplypsychology.org/z-score.html>.

the average of each value to zero with a standard deviation of 1.0. In this way, the value of the measure reflects how far an individual district's teacher quality measure is from the average value for that specific measure.

In creating an index, if measures are not weighted, then all elements are treated as having equal weight. For the TQI, each of the six measures was weighted based on the quality of the research that links the measure to student outcomes.¹³ Measures with the most compelling research regarding the effect of the measure on student outcomes received greater weights while the measures with less compelling research received lower weights. Research suggests that some measures matter more for student outcomes than other measures; those measures were weighted more heavily than other measures. For example, there is limited research that the racial disparity between students and teachers affects the outcomes for all students while there are multiple studies which find that novice teachers, teacher attrition, and the percentage of teachers employed on an emergency permit all affect student outcomes.

The weighting strategy was as follows: 0.50 for the measure of racial disparity, 0.50 for the measure of the percentage of teachers assigned out-of-field, 1.00 for percentage of vacant teaching positions, 1.00 for the teacher attrition rate, 1.25 for the percentage of teachers on emergency permits, and 1.50 for the percentage of novice teachers. The resulting values were averaged to create a single TQI score. To alleviate confusion in the interpretation of the TQI scores, the average TQI was multiplied by -1 so that positive TQI scores indicated positive teacher quality relative to the average district and negative TQI scores indicated negative teacher quality relative to the average district.

Retained Teacher

A retained teacher is a teacher who is employed as a teacher in a Pennsylvania public school in one year and remains employed as a teacher in a Pennsylvania public school in the next year. At the district level, the term "retained teachers" is defined as the percentage of teachers in a district teaching in one year and then remaining a teacher employed in any Pennsylvania public school the next year. The drawback of this calculation is that the analysis does not provide the percentage of teachers who were employed in a rural or urban public school district who remain employed as a teacher in a Pennsylvania public school district. However, the point of the analysis in this study is to identify teachers who remain continuously employed in a Pennsylvania public school district.

Teacher Attrition

Teacher attrition refers to teachers leaving the teaching profession altogether. For example, an individual employed as a teacher in a Pennsylvania public school in Year X but is no longer employed as a Pennsylvania public school in Year X+1 is identified as a

¹³ Evaluation of past research completed by the author.

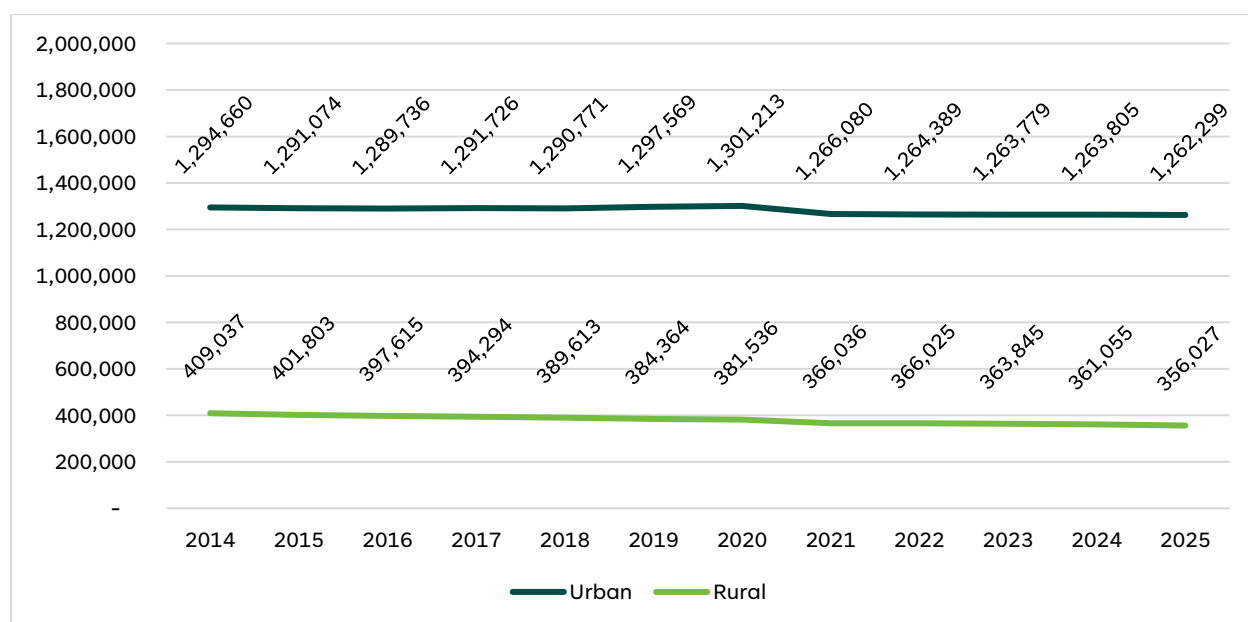
teacher leaving the teaching profession in Pennsylvania. At the district level, teacher attrition is defined as the number of teachers who leave the teaching profession divided by the total number of teachers at the start of the school year. These are the standard definitions used by researchers when examining attrition (National Research Council, 1992).

Results

Rural and Urban Districts in Pennsylvania

As shown in Figure 1, student enrollment has declined slightly for urban entities but has declined more substantially over time for rural entities. Specifically, rural entities experienced a decline of more than 53,010 students from 2014 to 2024, which was 13 percent of total rural enrollment in 2014. In contrast, urban districts had 32,361 fewer students than in 2014, which was just over two percent of what total urban enrollment was in 2014.

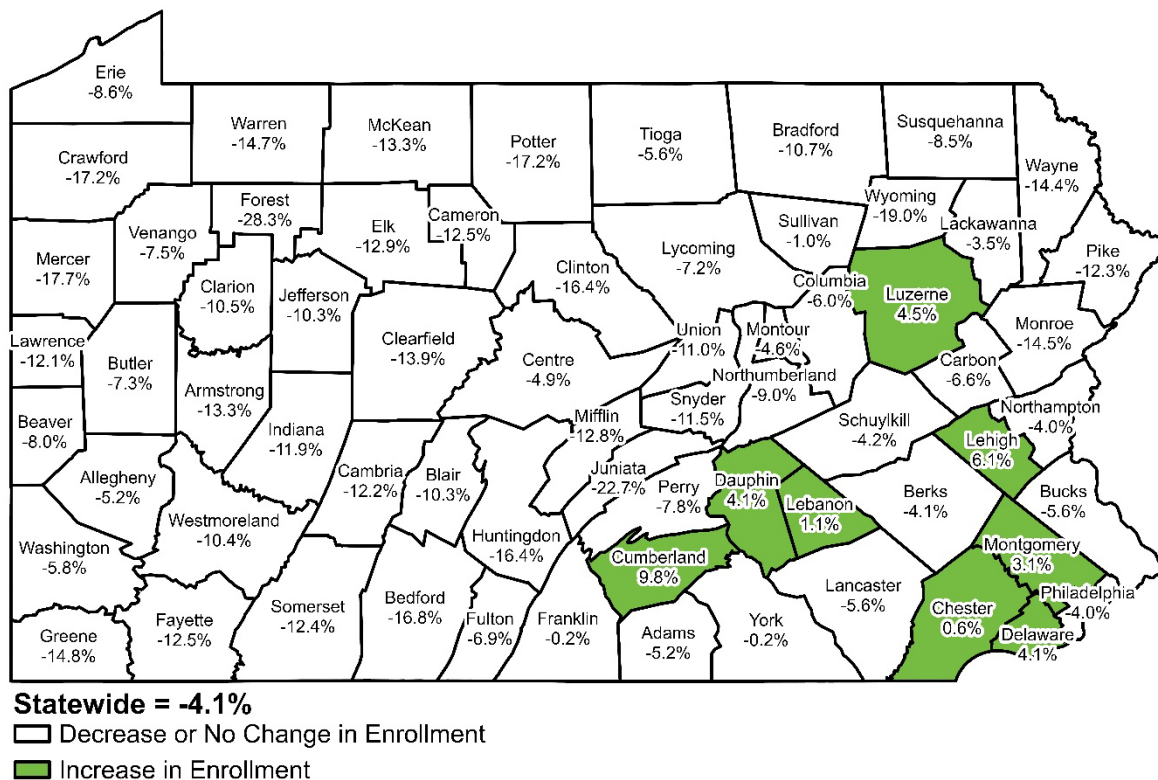
Figure 1: Estimated Number of Students Enrolled in Urban and Rural Districts, 2014-2025



Data Source: PDE student enrollment files and CRP data on school districts and counties. Counts are approximate. Calculations by author. This analysis excludes cyber charter school enrollment, because students enroll from all over the Commonwealth. This analysis is an estimate only because PDE data do not provide an official headcount; PDE may count a student multiple times when they are enrolled in multiple schools. Students in occupational CTC programs are double counted in the PDE data; occupational CTCs enrollment data were excluded from the analysis by the author.

Given that the number of students is vastly different across counties, a helpful way to understand the changes in enrollment is to examine the percent change in student enrollment as shown in Figure 2. The largest declines in student enrollment were for Forest County (-28.3 percent) and Juniata County (-22.7 percent). The rural counties with the smallest declines were Franklin County (-0.2 percent) and Sullivan County (-1.0 percent). Across all counties, Cumberland County had the greatest increase (+9.8 percent) followed by Lehigh County (+6.1 percent). Note that most growth in the number of students in Pennsylvania is in the southeast area of the state stretching from Cumberland to Lehigh County. Student enrollment is declining in the northwestern part of the state where almost every county (except for Erie) is rural, and in other rural counties throughout the state, such as Greene, Bedford, Huntingdon, and Wyoming.

**Figure 2: Percent Change in Estimated Student Enrollment
in PA School Districts by County, 2014 to 2024***



Data Source: PDE student enrollment files

* Note: This analysis excludes cyber charter schools. This analysis is an estimate only. Students can be counted multiple times when enrolled in multiple schools. For example, students in occupational CTC programs are double counted. See Appendix I for more detail.

Teacher Shortages

Teacher shortages have been a topic of discussion in the media and in the General Assembly for much of the last five years. For example, the Student Teacher Stipend (STS) bill (HB301) was passed in 2023 to attract students to teaching; it provides stipends to student teachers to enable them to focus on their student teaching experience. Recipients are required to teach in a Pennsylvania public school for at least three years in order to not have to repay the stipend. Additional money has been added to STS in 2024 and 2025. In addition, Grow PA scholarships established by SB1150 provide tuition support to those seeking a degree in education and in other high-demand areas. There are also several very recent and current bills that further address the situation.¹⁴

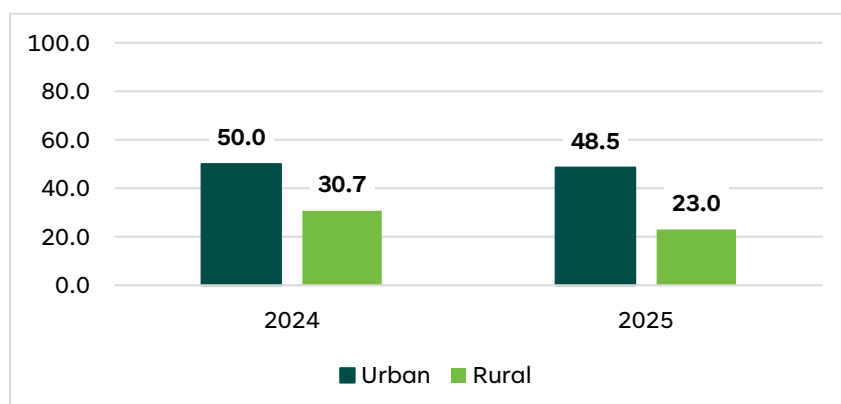
Teacher shortages are caused by an imbalance in the supply of teachers and the demand for teachers. For many districts in Pennsylvania, this has been the case. But, while the state may be described as having a shortage of teachers, we must remember that not every district experiences a shortage, and those shortages may be only for specific subject areas. In this next section, a review of teacher shortages as measured by teaching positions identified as vacant, teachers identified as being on an emergency permit, and teaching positions filled by teachers that are labelled “unqualified.”

Teacher Vacancies

A teacher vacancy occurs when a district is unable to find an appropriately certified teacher to fill a position. PDE started collecting relevant vacancy data in the fall of 2023 and now collects the data from districts quarterly. Teacher vacancy data has only been reported for two academic years: 2024 and 2025. Figure 3 presents the overall percentage of urban and rural districts reporting at least one vacant position. This analysis includes charter schools, CTCs, and public school districts. As shown below, a greater percentage of urban than rural districts reported having at least one teacher vacancy in both 2024 and 2025. Approximately one-half of all urban districts reported having at least one teacher vacancy while only about 31 percent of rural districts reported having at least one teacher vacancy in 2024, and 23 percent reported having at least one in 2025.

¹⁴ For example, for the 2025-2026 Regular Session see HB1403, Professional Development for Teachers, and HB1404, Second Career Certification; for the 2023-2024 Regular session see HB141, Time for Pennsylvania to Grow Our Own Educators, and SB826, Grow Our Own Educators.

Figure 3: Percentage of Districts Reporting at Least One Teacher Vacancy by Year and District Locale (2024 and 2025)



Data Source: PDE educator vacancy files from Quarter 1, 2024 and 2025; PDE data on vacancies include public districts, CTCs and charter schools.

As shown in Table 4, the subject areas with largest number of vacancies for both rural and urban districts were special education, elementary, mathematics, and science. Relative to the number of teachers in each subject area, special education had the highest vacancy rate by far.

Table 4: Number of Teaching Positions Identified as Vacant, 2023-24 and 2024-25

Subject Area	Urban	Urban	Rural	Rural
	2024	2025	2024	2025
All Positions	1,951	1,334	165	131
Elementary*	276	195	21	7
English	80	70	16	11
Math	102	114	14	5
Science	96	86	12	12
Social Studies	42	28	4	3
World Languages	41	42	9	5
Fine Arts	85	64	9	4
PE/ Health Education	40	40	7	2
Computer Science	9	5	3	2
Technology	26	20	3	2
Family and Consumer Sciences (FCM)	23	17	6	8
Career and Technology	28	1	5	
Talented and Gifted	3	3	0	0
Special Education	690	538	49	64
English as a Second Language (ESL)	35	37	1	1

Data Source: PDE Teacher Vacancy Files. Calculations by author.

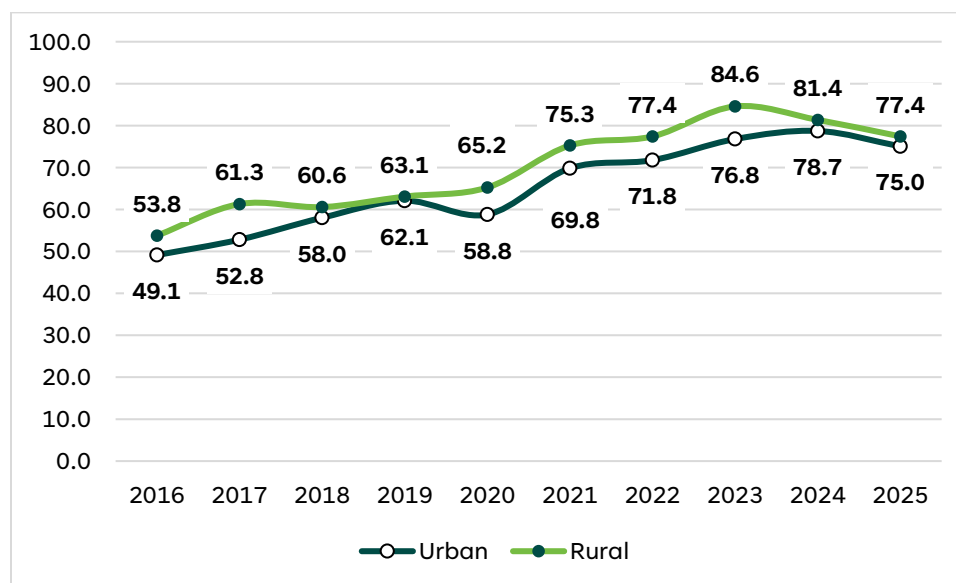
* Note: Most districts report all elementary teachers as elementary; in the few cases where elementary teaching positions were reported in a subject area such as mathematics, positions were counted under the subject area.

Emergency Permits

In Figure 4, the percentage of districts reporting at least one teacher on an emergency permit from 2016 to 2025 is presented, for both urban and rural districts. Across all years, a slightly greater percentage of rural districts than urban districts reported having at least one teacher on an emergency permit.

The percentage of urban and rural districts reporting at least one teacher on an emergency permit was about 50 percent in 2016. For rural districts, the percentage peaked in 2023 at about 85 percent while the greatest percentage of urban districts was 79 percent in 2024. For both urban and rural districts, the use of emergency permits is on a slight downward trajectory through the last year of data.¹⁵

Figure 4: Percentage of Urban and Rural Districts Reporting at Least One Teacher on an Emergency Permit (2016-2025)



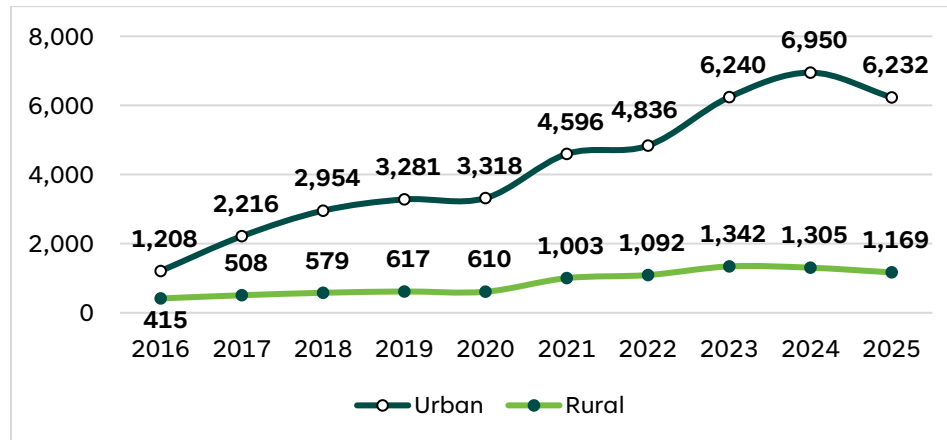
Data Source: PDE emergency permit files.

Figure 5 below shows the increase in the *number* of teachers on an emergency permit for both urban and rural districts from 2016 through 2025. The number of teachers on an emergency permit in urban districts in 2025 was more than 5 times the number in 2016. For rural districts, the number of teachers on an emergency permit in 2025 was more than 2.8 times greater than the number in 2016.

¹⁵ PDE has been encouraging districts to place teachers on an intern certificate which is not included in the count of emergency certificates. From the perspective of teacher quality, teachers on an intern certificate arguably could be counted the same as a teacher on an emergency permit, which could affect the trend line. At the time this data was analyzed, PDE was in the process of counting the number of intern certificates.

There has been a steady increase in the number of emergency permits in urban districts through 2024. Although, the number increased dramatically from 2022 onward. For rural districts, most of the increase in the number of teachers on an emergency permit occurred after 2020. For both groups of districts, the percentage of teachers on an emergency permit declined from 2024 to 2025.

Figure 5: Number of Teaching Positions Filled by Teachers on a Long-Term Emergency Permit, All Educational Entities, 2016 to 2025

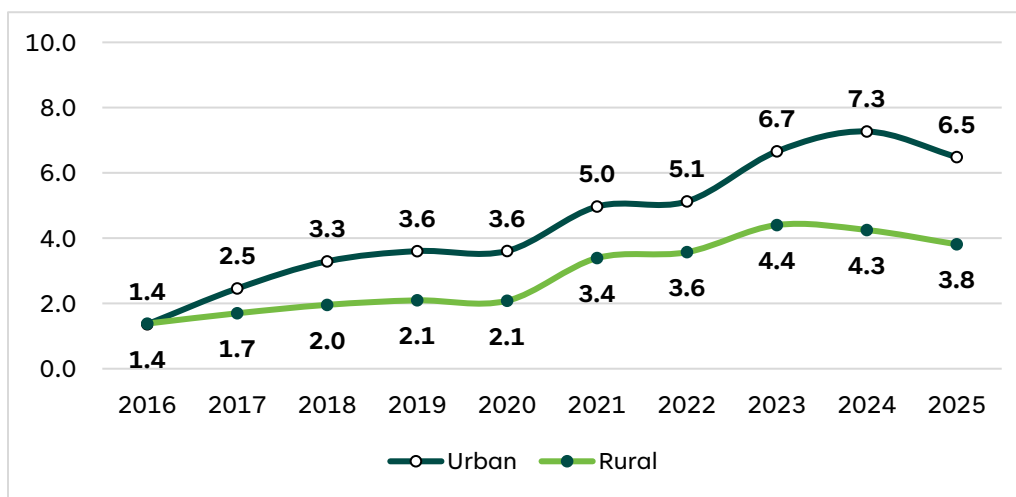


Data Source: PDE emergency permit files from PDE website

Figure 6 shows the percentage of teachers employed on an emergency permit in urban and rural districts. The percentages are obtained by dividing the number of teachers on an emergency permit by the number of teachers employed in a locale, multiplied by 100. Thus, this is not the average of the district percentages, but the percentage of teachers in rural and urban districts.

In 2016, the percentage of teachers holding an emergency permit was an estimated 1.4 percent for both urban and rural districts. By 2024, the percentages were substantially greater for both, but the increase was much greater for urban districts than for rural districts. The estimated percentage of teachers on an emergency permit peaked at 7.3 percent in 2024 for urban districts and 4.4 percent for rural districts. For both urban and rural districts, there was an increase in the use of emergency permits the year following the closure of schools in the spring of 2020 due to COVID. There was also a steep increase from 2022 to 2023. For urban districts, there was a substantial decline from 2024 to 2025. For rural districts, there has been a slight decline from 2023 to 2025.

Figure 6: Estimate of the Percentage of All Teachers Employed on an Emergency Permit by Locale, 2016 to 2025



Data Source: PDE emergency permit files from PDE website

Number of Emergency Permits by Subject Area

Table 5 documents the number of teachers employed on an emergency permit by subject area in urban and rural districts from 2016 through 2024. The table shows that the number of teachers employed on an emergency permit has increased over time for all subject areas and for both rural and urban districts. Some of the increases have been dramatic. For example, the number of special education teachers employed on an emergency permit in urban districts increased ten-fold (204 to 2,021) while the number increased by more than four-fold for rural districts (124 to 461). For rural districts, the subject areas with the highest number of teachers employed on an emergency permit were special education (461), science (120), English Language Arts (118), mathematics (85), and CTE/agricultural education (83).

**Table 5: Estimated Number of Teachers Employed
on an Emergency Permit in Urban and Rural Districts 2016 through 2024**

Subject Area	Urban	Urban	Urban	Urban	Urban	Rural	Rural	Rural	Rural	Rural
	2016	2018	2020	2022	2024	2016	2018	2020	2022	2024
Elementary	90	344	427	611	707	9	8	22	51	74
English Lang Arts	129	418	470	638	829	34	43	58	115	118
Math	98	276	297	414	586	31	36	32	86	85
Science	87	239	223	306	566	41	44	29	92	120
Soc Studies	48	147	174	225	288	9	9	21	47	24
World Languages	71	108	115	158	192	25	26	28	42	36
Fine Arts	32	80	84	150	230	4	9	16	26	39
PE and Health Education	9	52	75	128	246	2	9	7	18	28
Comp Science	0	0	0	8	17	0	0	0	2	3
Technology Ed*	42	70	68	65	83	7	16	13	25	29
FCM	32	54	77	114	154	14	31	28	58	36
Special Educ	204	560	714	1,169	2,021	124	153	172	311	461
ESL	33	107	111	151	n/a	20	31	28	24	n/a
CTE or Agriculture	141	191	184	191	205	52	71	71	85	83

Data Source: PDE emergency permit files from PDE website. Due to space limitations, only the even numbered years are included in the table. Technology Ed includes any technology courses not designated as computer science. FCM refers to Family and Consumer Sciences.

Prior research has often found differences in teacher quality by the distance of the rural district from an urban area (Liu et al., 2025; Monk, 2007; Player et al., 2017). This study compared the percentage of teachers employed on an emergency permit for rural districts in three types of areas: rural fringe, rural distant, and rural remote. This study found that the percentage of teachers employed on an emergency permit was greater in districts in rural remote areas than in other rural areas. More details are provided in Appendix IV.

Teachers Assigned Out-of-Field

Teachers assigned out-of-field are certified teachers who are assigned to teach a grade level or subject area for which they do not hold the proper certificate. For example, someone with a PK-4 certificate assigned to teach the 5th or 6th grades would be considered out-of-field. Similarly, a math teacher assigned to teach physics would be considered out-of-field. This data is from PDE's ESSA Report Card webpage on the PDE website.¹⁶ The PDE report does not include information about teachers assigned out-of-field for about 50 districts in each of the four years for which data was reported. Still, most of the missing data was for IUs and SJCIs, neither of which were included in this

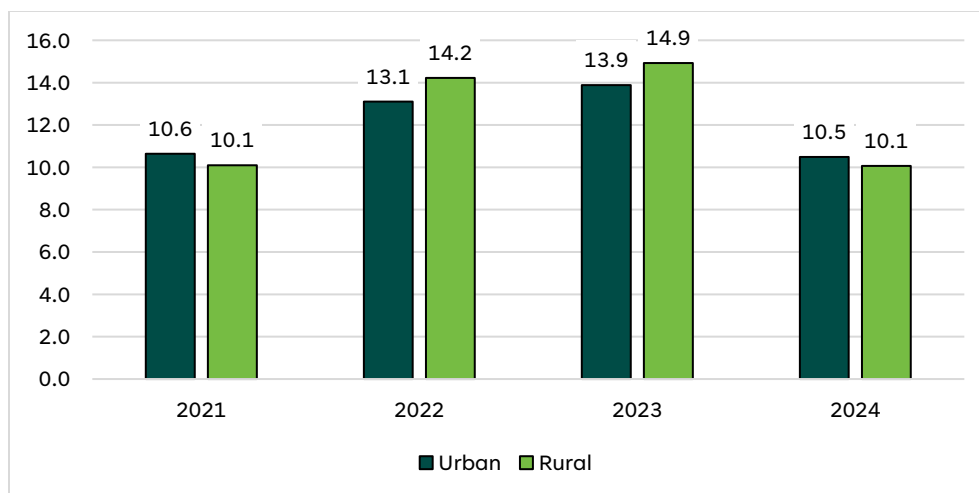
¹⁶ <https://www.pa.gov/agencies/education/programs-and-services/schools/every-student-succeeds-act-essa/essa-report-card/data-sources>.

analysis. In some cases, charter schools did not report any data for either the number of teachers assigned out-of-field or for teachers employed. These districts were not included in the analyses.

Almost all rural and urban districts assigned at least one teacher out-of-field. For 2022 through 2024, at least 94 percent of rural districts had at least one teacher assigned out-of-field while at least 95 percent of urban districts did so. There was little difference between rural and urban districts, and the evidence shows that the assignment of teachers out-of-field is widespread.

As shown in Figure 7, at least 10 percent of teachers employed in both rural and urban areas were assigned out-of-field with percentages between 13 percent and 15 percent for 2022 and 2023. In 2021 and 2024, urban districts had a slightly greater percentage of teachers assigned out-of-field than rural districts. In 2022 and 2023, the reverse was true—rural districts had slightly greater percentages of teachers assigned out-of-field than urban districts. For both groups of districts, the percentages increased from 2021 through 2023, then declined from 2023 to 2024. This may indicate a decline in the percentage of teachers assigned out-of-field that parallels the decline for vacancies and emergency permits. However, additional years of data are needed to determine if this is a trend.

**Figure 7: Percentage of All Teachers
in Rural and Urban Districts Assigned Out-of-Field, 2021-2024**



Data Source: PDE data on Educator Equity included in the annual ESSA report card. Analysis completed by author.

As noted above, prior research has often found differences in teacher quality by the distance of the rural district from an urban area. This study compared the percentage of teachers assigned out-of-field for rural districts in three types of areas: rural fringe, rural distant, and rural remote. The percentage of teachers assigned out-of-field was greater

in districts in remote rural areas than in other rural areas. More details are provided in Appendix IV.

Teacher Quality Index

Table 6 below presents the TQI scores for urban and rural districts by type of district. The TQI scores range from negative to positive. The lower the score, the lower the teacher quality. The higher the score, the higher the teacher quality. Negative TQI values less than -0.500 are shaded with dark green and index values between -0.001 and -0.499 are shaded light blue. Positive TQI values greater than 0.000 and less than 0.500 are shaded a pale green. There were no TQI values of 0.500 or greater.

There are several important conclusions we can draw from the table. First, urban districts had a lower TQI than rural districts. The difference was fairly large—about one-third of a standard deviation. Second, public school districts had much more positive measures of teacher quality than either charter schools or CTCs for the overall TQI and for five of the six measures. This was true for both rural and urban districts. Charter schools, by far, had the lowest measures of teacher quality. Rural CTCs scored lower than urban CTCs on five out of six elements.

Table 6: Teacher Quality Index Values for Urban and Rural Districts, 2024

District Type	Teacher Vacancies	Emergency Permits	Novice Teachers	Racial Disparity	Out-of-Field	Teacher Attrition	TQI
Urban CTCs	-0.042	-0.406	-0.459	-0.671	-0.096	0.227	-0.231
Urban Charter	-0.701	-0.976	-1.002	0.474	-0.882	-1.152	-0.802
Urban Public School District	0.203	0.373	0.400	0.255	0.391	0.406	0.333
Urban All Districts	-0.117	-0.145	-0.143	0.239	-0.072	-0.124	-0.094
Rural CTCs	0.265	-0.504	-0.670	-1.304	-0.182	0.038	-0.346
Rural Charter	-1.653	-0.606	-1.571	-0.373	-1.394	-0.970	-1.106
Rural Public School District	0.292	0.365	0.431	-0.335	0.238	0.303	0.275
Rural All Districts	0.210	0.238	0.232	-0.433	0.129	0.220	0.152

Data Source: Author analysis of PDE emergency permit files, educator vacancy files, employment files, ESSA files. Racial disparity indicates that demographics of teachers do not align with the student population.

Prior research has often found differences in teacher quality by the distance of the rural district from an urban area (Liu et al., 2025; Monk, 2007; Player et al., 2017). This study found that rural districts classified as furthest from an urban area, or remote, had lower teacher quality across all six measures than those on the fringe of urban areas. More details are provided in Appendix IV.

Summary of Teacher Shortages

In sum, rural districts have both lower numbers of vacancies and lower vacancy rates for all teachers as well as for teachers in each of the 15 subject areas. There were declines in the number and percentage of teaching positions identified as vacant in rural districts from 2023-24 to 2024-25 for 12 of the 15 subject areas. The areas with increases in the number of vacancies were early childhood education, talented and gifted, and special education. While there were increases, the number of new vacant positions was small, ranging from 6 to 14. While rural districts had a lower number and percentage of teachers employed on an emergency permit, the differences in the percentages between rural and urban districts were less than two percentage points until 2023 when the percentages of teachers employed on emergency permits increased rapidly in urban districts. Rural and urban districts have similar rates of teachers assigned out-of-field, with rural districts having slightly greater percentages for 2022 and 2023 and slightly lower percentages for 2021 and 2024.

With respect to the TQI, all rural districts had a greater TQI score than all urban districts for five of the six TQI measures and the overall TQI score. The only measure that was lower for rural districts than for urban districts was the disparity in the percentage of students of color to the percentage of teachers of color. While rural districts appear to have not suffered from teacher shortages to the degree that urban districts have, the data above clearly show that some rural districts are, in fact, experiencing a shortage of teachers, especially when measured by the use of emergency permits and assigning teachers out-of-field. For example, nearly 20 percent of rural districts assigned at least 20 percent of teachers out-of-field and about 17 percent of rural districts had at least 10 percent of teachers employed on an emergency certificate.

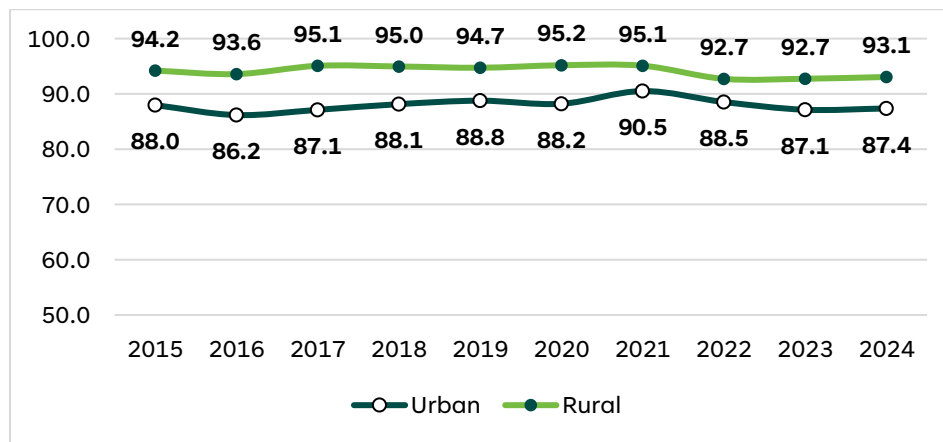
Teacher Supply in Pennsylvania

This section presents information about the supply of teachers in Pennsylvania. There are different measures of teacher supply; the proportion of teachers retained in the teaching profession from one year to the next is one indicator, while the number of newly hired teachers is another indicator. Both measures are discussed below, followed by additional detail on three sources of newly hired teachers: beginning teachers, former teachers returning to the profession after a break in teaching (reserve pool), and entering through other routes such as emergency permits teachers. Finally, trends in enrollment in teacher preparation programs and in the number of individuals obtaining certification are also examined, as this affects the potential supply of new teachers.

Retained Teachers

Figure 8 shows the retention rates for urban and rural districts.¹⁷ For rural districts, between 92 and 95 percent of the teachers returned to teaching in Pennsylvania while the percentage for teachers in urban districts ranged from around 86 to 91 percent. Retention rates for both groups of teachers were greatest between 2017 and 2021. After 2021, retention rates declined for both urban and rural districts but then rebounded slightly through 2024. The decline was slightly greater for urban districts than for rural districts. Note, however, that the retention rate for rural districts in 2022, 2023, and 2024 was all slightly lower than any other retention rate since 2015.

**Figure 8: Annual Teacher Retention Rates
for All Urban and Rural Districts, 2015 to 2024**



Data Source: PDE teacher employment files.

Newly Hired Teachers

The other primary source of the supply of teachers was newly hired teachers. A newly hired teacher is an individual who was not employed as a teacher in a public school in Pennsylvania in the prior academic year. There are three sources of newly hired teachers: beginning teachers, returning teachers, and transferring teachers. Beginning teachers are individuals who have never been employed as a teacher. Typically, such individuals are recent graduates of a teacher preparation program. Returning teachers

¹⁷ A retained teacher is defined as a person employed as a teacher in a Pennsylvania public school in year X who was also employed as a teacher in a Pennsylvania public school in year X+1. A teacher on sabbatical was designated as being employed in a Pennsylvania public school. So, for example, a teacher employed in 2024 is considered a retained teacher if that person was employed as a teacher in 2023. Note that this definition of retention includes individuals remaining employed as Pennsylvania teachers, but who may have moved from one district to another. Teachers moving from one Pennsylvania district to another are considered retained teachers because the movement does not influence the overall demand for teachers at the state level.

are individuals who were formerly employed as teachers in a Pennsylvania public school but were not employed as a teacher in a Pennsylvania public school in the prior year. Finally, there is also an undefined source of newly hired teachers. There simply is not enough information to determine their employment prior to becoming a Pennsylvania teacher. This study uses the term “other” to describe teachers entering through an unknown pathway into teaching. These teachers could enter a teaching position in Pennsylvania by transferring from a private school in Pennsylvania, transferring from another state, entering teaching from another profession by using an emergency permit, or being hired as a teacher after serving as a substitute teacher.

Table 7 shows the percentage of newly hired teachers in urban and rural districts from the three different sources of newly hired teachers. A slightly greater percentage of newly hired teachers were beginning teachers for rural districts than for urban districts. Thus, rural districts were slightly more dependent on recent TPP graduates for their supply of teachers than urban districts. In contrast, a slightly greater percentage of newly hired teachers in urban districts were returning teachers. Thus, rural districts relied less on returning teachers as a source of supply than urban districts. This makes sense given that the attrition rate for rural districts is lower than for urban districts. With fewer departing teachers, rural districts have fewer returning teachers to hire. Finally, a greater percentage of newly hired teachers in urban districts than rural districts entered teaching through some other source of supply. This may be explained by a greater number of private schools in urban areas, a greater number of teachers entering urban areas of Pennsylvania from out of state, or a greater number of teachers beginning on an emergency permit.

Table 7: Percentage of Newly Hired Teachers in All Urban and Rural Districts by Source of Newly Hired Teachers, 2015 to 2024

Source of Newly Hired Teachers	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Beginning: Urban	42.0	39.3	36.7	35.3	37.2	38.4	35.5	38.1	38.2	39.4
Beginning: Rural	45.2	45.1	46.1	44.3	49.6	45.7	40.4	43.8	44.9	41.1
Returning: Urban	16.2	20.4	20.5	20.1	18.8	18.8	19.4	18.6	19.0	19.0
Returning: Rural	14.5	18.0	16.6	16.2	16.4	16.6	22.2	14.7	15.3	17.5
Other Source: Urban	41.7	40.4	42.8	44.6	44.1	42.7	45.2	43.3	42.8	41.5
Other Source: Rural	40.4	36.9	37.2	39.5	34.0	37.7	37.4	41.5	39.8	41.4

Data Source: PDE educator employment files. Calculations by author.

As a reference point for the percentages discussed above, Table 8 provides the number of newly hired teachers for urban and rural districts from 2017 through 2024. For both sets of districts, the number of newly hired teachers has varied over time as the

attrition rate and demand for teachers rises and falls over time. However, for both sets of districts, the number of newly hired teachers has been greatest for 2022, 2023, and 2024. The large changes for urban districts are explained almost entirely by changes in the number of newly hired teachers in the Philadelphia School District. The additional revenue provided to underfunded districts will also likely increase the demand for teachers. Thus, there will likely continue to be increases in the number of newly hired teachers in many urban districts and some rural districts.

Table 8: Number of Newly Hired Teachers in All Urban and Rural Districts, 2017-2024

District Locale	Spring of Academic Year							
	2017	2018	2019	2020	2021	2022	2023	2024
Urban	7,124	5,481	6,395	6,414	5,539	7,025	7,306	7,935
Rural	1,369	1,183	1,344	1,288	1,250	2,013	1,798	1,847
Total	8,493	6,664	8,022	7,702	6,789	9,038	9,104	9,782

Data Source: PDE educator employment files. Calculations by author.

Newly Certified Teachers

The pool from which districts draw their beginning teachers is comprised primarily of newly certified teachers, either from in-state or out-of-state TPPs. In addition, districts may hire individuals on an emergency permit or internship permit to temporarily fill a position for which they cannot find a certified teacher. The subsections below present the number of Instructional I licenses granted each year from in-state TPPs, the spatial distribution of newly certified TPP programs by county in the state, and the number of licenses from out-of-state TPPs from 2011-12 through 2023-24.

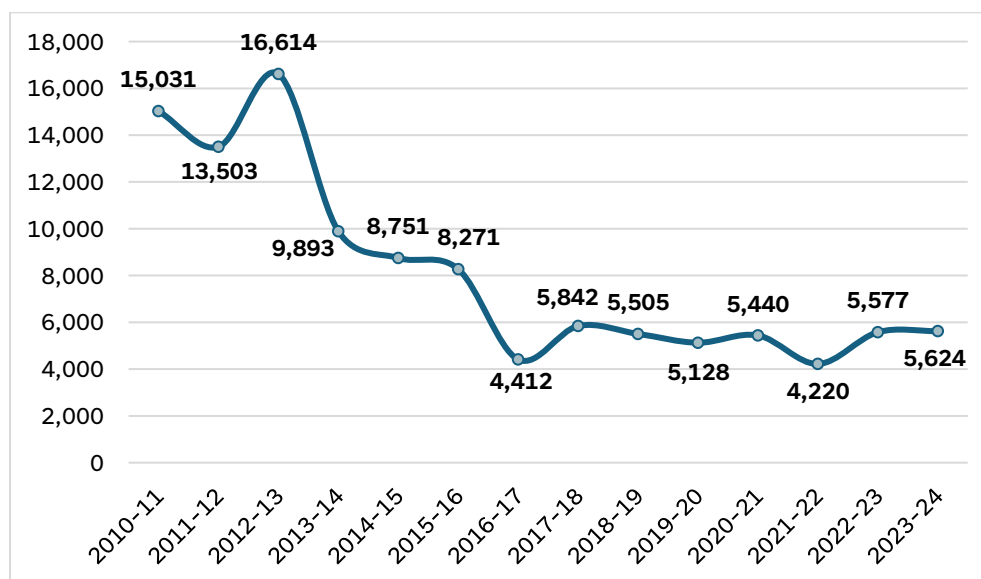
In-state Instructional I Certifications.

This section presents information on the number of newly certified individuals completing an in-state TPP. Figure 9 displays the dramatic decline in the number of newly licensed individuals in Pennsylvania. The high point was 2012-13 with almost 17,000 people obtaining certification. Note that this number is substantially greater than in the prior year or subsequent year. This is likely due to aspiring teachers accelerating their certification process in response to changing statutes around certification, particularly around the grade spans for which teachers were allowed to teach. For example, in earlier years, a teacher could obtain a license and teach at any grade level from pre-kindergarten through 6th grade. After the changes, a person could only teach grade levels pre-kindergarten through 4th grade.

From 2012-13 to 2016-17, there was a decline of 66 percent in the number of initial in-state certifications. Since 2016-17, the number of initially certified teachers has remained relatively constant, bouncing from lows around 4,200 to highs around 5,800. Importantly, this pattern is almost identical for both urban and rural districts. Specifically, urban TPPs experienced a decline of 68 percent in the number of in-state

initial certifications from 2012-13 to 2023-24 while for rural TPPs it was 64 percent.¹⁸ These declines may have a more severe impact on rural districts because they rely on beginning teachers to fill vacancies to a greater degree than urban districts.

Figure 9 : Number of Initially Certified Teachers from In-State Teacher Preparation Programs, 2010-11 to 2023-24



Data Source: PDE Act 82 Report

As shown in Table 9, there has been a major decline for all subject areas. The smallest decline in the number of newly certified teachers for a subject area was 53 percent for English Language Arts while the greatest declines were above 80 percent for computer science/technology and business/family consumer sciences. Given that the number of students has not declined substantially over the same time period and the teacher attrition rate has increased over the same time period, the existence of a shortage of teachers is not surprising.

Table 9: Number of Newly Certified Teachers by Subject Area*

Subject Area	2010-11	2023-24	# Change	% Change
			2011 to 2024	2011 to 2024
Pre-K and Elementary	6,594	2,348	-4,246	-64.4
English Lang Arts	1,302	611	-691	-53.1
Mathematics	632	266	-366	-57.9
Science	675	223	-452	-67.0

¹⁸ When compared to the first year of data (2010-11), urban TPPs had a decline of 46 percent and rural TPPs had a decline of 44 percent.

Subject Area	2010-11	2023-24	# Change	% Change
			2011 to 2024	2011 to 2024
Social Studies	1,012	424	-588	-58.1
PE and Health	503	177	-326	-64.8
Fine Arts	807	304	-503	-62.3
World Languages	240	55	-185	-77.1
Comp Sci / Tech Ed	79	12	-67	-84.8
Family Consumer Sci	331	57	-274	-82.8
Special Education	2,786	1,140	-1,646	-59.1

Data Source: Act 82 report by PDE

<https://www.pa.gov/agencies/education/data-and-reporting/school-staff/educator-preparation-and-certification/act-82-of-2018-report-on-educator-preparation-and-certification>.

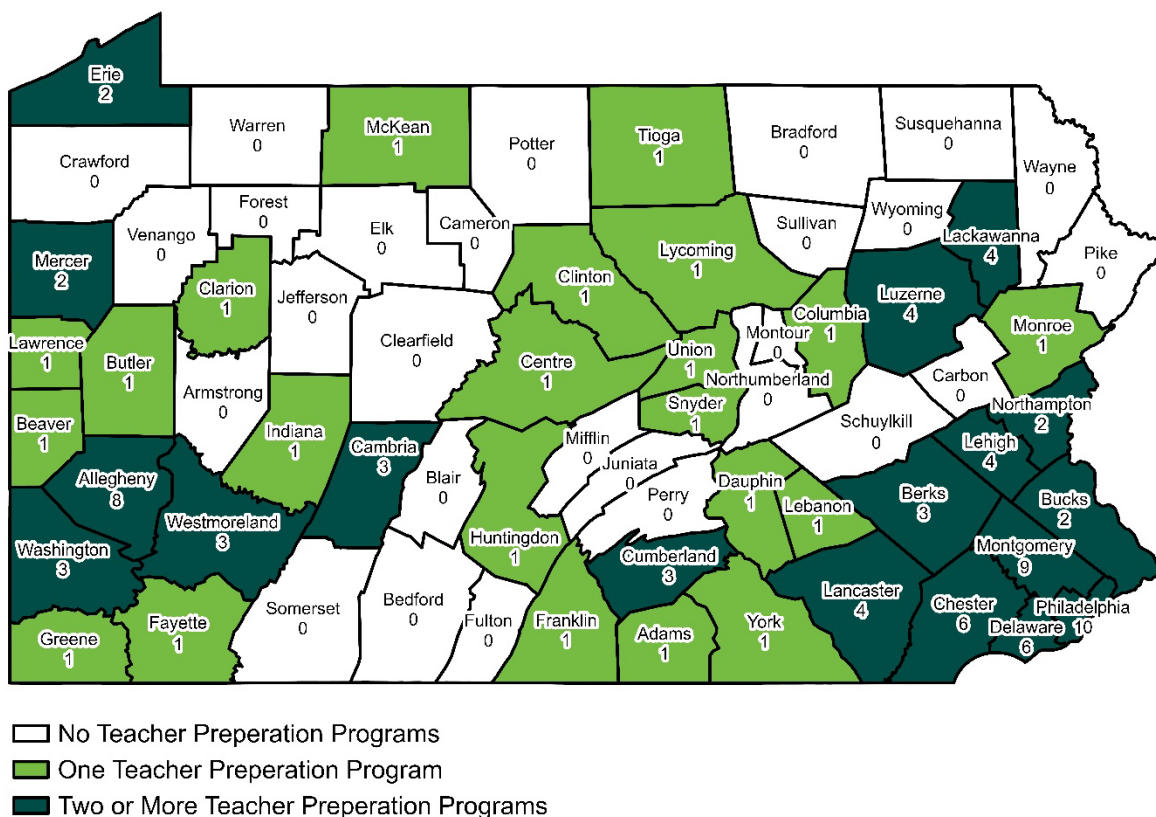
* Numbers in subject areas are determined by the author; PDE data had to be aggregated in some cases. For example, Science includes biology, chemistry, physics and general science.

Spatial Distribution of In-State Instructional I Certificates by Locale.

One important aspect of the supply of newly certified teachers is how teacher supply is distributed spatially across the Commonwealth, especially by geographic locale. This spatial distribution is important given that researchers have consistently found beginning teachers often choose to teach either close to their family or close to their TPP (Boyd, et al., 2005; Reininger, 2012; Strauss, 1999). Before exploring the extent to which this is true in Pennsylvania, the spatial distribution of TPPs by county in the Commonwealth is portrayed below.

As shown below in Figure 10, TPPs are not distributed equitably throughout the state. In fact, there are more TPPs in three counties (Philadelphia, Montgomery, and Delaware) than in all 48 rural counties combined. Overall, 60 of the 100 TPPs are located in just 12 counties: three counties around the Pittsburgh area with 14 TPPs and nine counties in the southeastern corner of Pennsylvania with 46 TPPs. Note the lack of TPPs along the border with New York, in the counties surrounding Jefferson County, and in the arc following the mountains from Fulton, Juniata, Schuylkill, and Carbon counties. Because TPP graduates tend to seek jobs either where they graduated from high school or where they graduated from college, the lack of TPPs in rural areas may contribute to an insufficient number of qualified applicants which leads to teacher vacancies, the use of emergency permits, and difficulty in hiring new teachers.¹⁹

¹⁹ This pattern has been observed in personal communications at Penn State with rural superintendents.

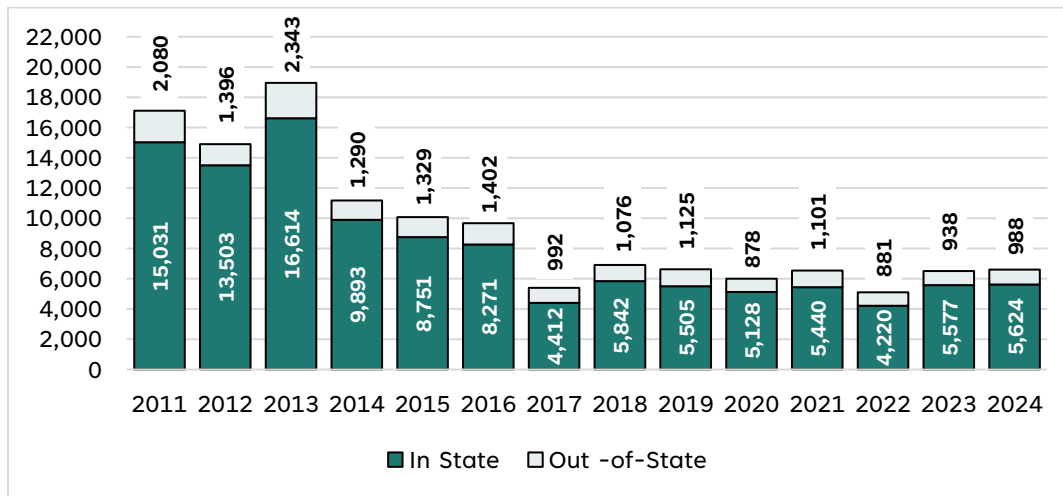
Figure 10: Number of Teacher Preparation Programs (TPPs) by County

Data Source: PDE Act 82 Report (<https://www.education.pa.gov/Data-and-Statistics/Pages/Act82.aspx>).

Out-of-state Instructional I Certifications.

Figure 11 shows the number of individuals obtaining initial teaching certification from in-state institutions and from out-of-state institutions. By far, most newly certified teachers in Pennsylvania are from in-state institutions. Since 2011, out-of-state teachers have comprised between 9 percent and 17 percent of initially certified teachers. While the addition of out-of-state teachers certainly provides needed help with the supply of teachers in Pennsylvania, increasing the number of out-of-state teachers is not going to solve the teacher supply problem in the Commonwealth. What is not known, however, is where out-of-state teachers find employment. Thus, the degree to which out-of-state teachers contribute to the supply of urban or rural school districts is not known. This would be important to determine as the out-of-state teachers could constitute a significant supply of teachers for rural districts.

**Figure 11: Number of Newly Certified Teachers
from In-State TPPs and from Out-of-State, 2010-11 through 2023-24**



Data Source: PDE Act 82 Report (<https://www.education.pa.gov/Data-and-Statistics/Pages/Act82.aspx>).

Summary of Supply

As shown above, the supply of teachers available to be hired by Pennsylvania school districts has plummeted from 2011 through 2024. While all states experienced a large decline in the number of students enrolled in TPPs, Pennsylvania experienced one of the largest declines (Fuller, 2024). The declines were for newly certified teachers from both Pennsylvania TPPs as well as from out-of-state. These declines were for TPPs located in both rural and urban areas of the Commonwealth. Moreover, as shown by the map above, many rural areas had even further restricted access to newly certified teachers because they were located in an area of the state with no TPPs or a limited number of TPPs.

The decline in the number of newly certified teachers cut across all subject areas. Indeed, there was at least a 50-percent decline in the number of newly certified teachers for each subject area. Finally, about 40 percent of newly hired teachers in rural and urban districts were beginning teachers and another 20 percent were former teachers returning to the profession. Unfortunately, a lack of data makes it impossible to accurately understand the source of the other 40 percent of teachers. Better understanding the supply of teachers could help identify appropriate policies to address the current situation.

Demand for Teachers

In this section information on the demand for teachers is presented. There are several factors that affect the demand for teachers. These factors include the number of students enrolled, the characteristics of students enrolled, and teacher attrition.

Trends in Student Enrollment and Student Needs

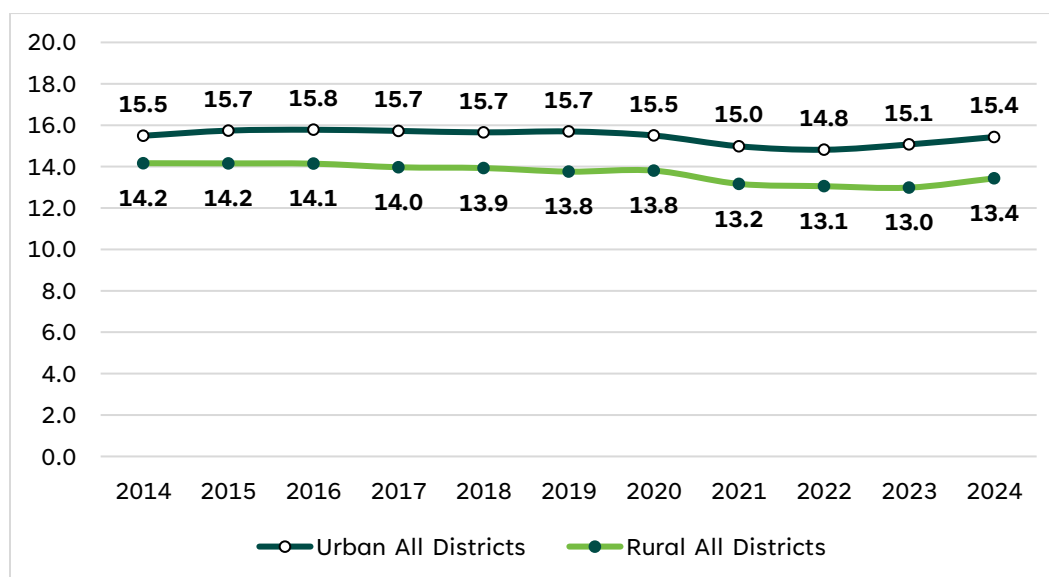
Student enrollment can influence the demand for teachers in several ways. The most obvious way is that an increase in the number of students enrolled can increase the demand for the number of teachers. The characteristics of students can also increase the demand for teachers. Specifically, the percentage of special education students and the percentage of English Language Learner (ELL) students can also increase the demand for teachers. Districts also could choose to create smaller class sizes (thereby increasing demand for teachers), for students with lower socioeconomic status (SES). SES is measured by the percentage of students participating in the federal free or reduced-cost lunch program. These factors are examined in the sections below.

Student Enrollment

As shown in Figure 1, student enrollment for urban districts has declined since 2020 while the enrollment for rural districts has gradually and steadily fallen from 2014 to 2024. There are multiple reasons for these declines, including a lower number of children in the age group attending school, more families leaving the state than entering the state, and student transfers into cyber schools, private schools, or home school settings.

Further analysis reveals that urban districts have added additional teachers while student enrollment has declined. In contrast, rural districts have maintained about the same number of teachers while student enrollment has declined. In 2014, there were 86,133 teachers in urban districts which increased by over 6,400 teachers to 92,571 in 2025; for rural, the numbers are fairly stagnant only slightly increasing from 29,356 to 29,748.

Figure 12 shows the student-teacher ratio for all urban and rural districts from 2014 to 2024. The ratio was fairly stable for urban districts from 2014 through 2020, then declined in 2021 and then again in 2022. For rural districts, there was a slight yet steady decline from 2014 through 2020, then a decline in 2021, 2022, and 2023. Both urban districts and rural districts have been trending upward over the last two years. The decline in the ratio in 2021 is likely due to the influx of federal money provided to districts to address the mental health needs and learning loss that occurred during COVID in spring 2020 and the 2020–2021 school year.

Figure 12: Estimate of Student-Teacher Ratios for Urban and Rural Districts, 2014-2024

Data Source: PDE data on student enrollment and on teacher employment. Calculations by author.

Economies of scale have an influence on this issue as well. Districts must offer specific classes, especially at the secondary level. Thus, they need to maintain the same number of teachers to offer the same quality of education, even if student enrollment declines. The only other option for districts is to reduce the options available to students, which would likely have a negative impact on their educational experience.

Student Needs

As noted above, changing student demographics can indicate changing needs of students. The potentially changing needs of students may in turn increase the demand for teachers even if the number of students stays constant or declines. Indeed, students whose families are economically challenged, students who need special education services, and students in need of ELL services will typically increase the demand for teachers. ELL students may increase demand because they may require more individual attention which requires fewer students per teacher.

The next three tables include the percentage of economically disadvantaged students, percentage of special education students, and the percentage of ELL students. There is a negative correlation between the first two characteristics and the student-teacher ratio. In other words, the greater the percentage of economically disadvantaged students and special education students, the smaller the student teacher ratio. This correlation suggests that districts do, in fact, tend to hire more teachers in response to student characteristics.

Table 10 shows that the percentage of economically disadvantaged students increased from 2014 through 2024 for both urban and rural districts. The increase was slightly greater for urban districts (9 percent) than for rural districts (about 7 percent).

The number of additional economically disadvantaged students in 2024 compared to 2014 was more than 76,000 for urban districts and about 8,500 for rural districts.

**Table 10: Percentage of Economically Disadvantaged Students
for Urban and Rural Districts, 2014-2024**

Locale	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Urban	47.7	49.4	51.0	50.7	50.3	50.9	51.7	51.4	51.7	55.1	56.7
Rural	44.1	46.1	46.7	47.6	47.7	47.7	47.5	46.5	46.0	49.6	50.7

Data Source: PDE Future Ready Index, PDE enrollment files, NCES ELSI student demographics. Students qualifying for federal free or reduced-price meal programs.

Table 11 shows that the percentage of special education students increased from 2014 through 2024 for both urban and rural districts. The increase was slightly greater for urban districts (6.2 percent) than for rural districts (5.4 percent). The number of additional special education students in 2024 compared to 2014 was more than 59,000 for urban districts and about 12,600 for rural districts.

**Table 11: Percentage of Special Education Students
for Urban and Rural Districts, 2014-2024**

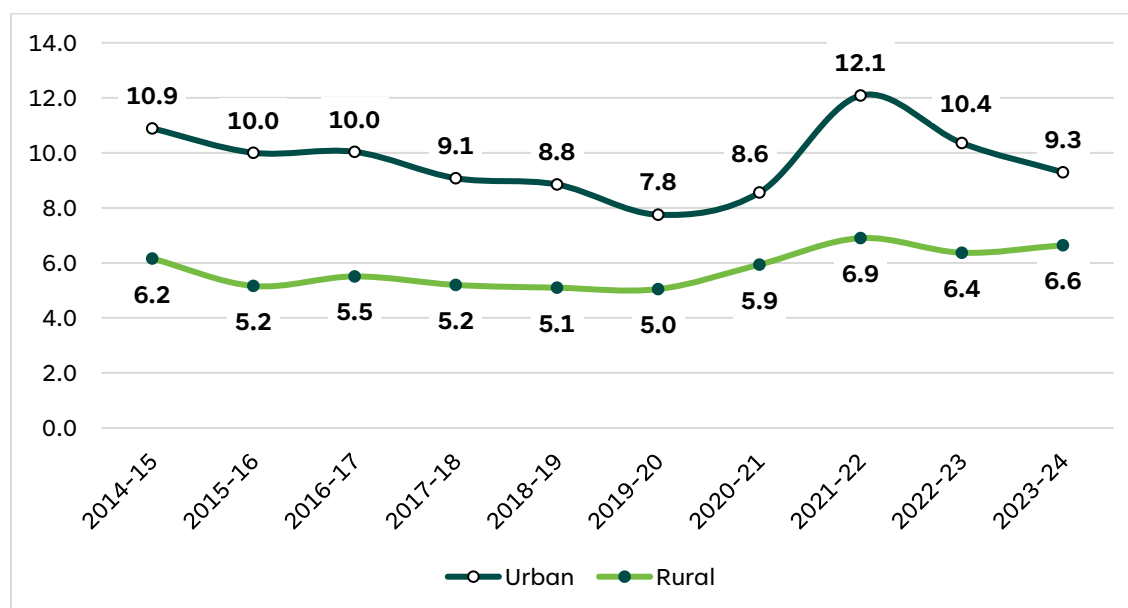
Locale	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Urban	14.1	13.7	14.9	14.8	15.4	18.5	19.0	19.1	19.6	19.3	20.3
Rural	15.3	14.8	16.1	15.7	16.0	18.4	19.0	19.0	19.5	19.9	20.7

Data Source: PDE Future Ready Index, PDE enrollment files, NCES ELSI student demographics. To be classified as special education, a student must have an Individualized Education Plan (IEP).

Teacher Attrition.

Attrition is measured as the number of teachers leaving the teaching profession from year X to year X+1, divided by the number of teachers in year X, multiplied by 100. As shown in Figure 13, the teacher attrition rate was substantially greater for urban districts than for rural districts for each year. For both urban and rural districts, attrition declined from 2013-14 to 2019-20 (with one exception for urban districts) and then increased from 2019-20 to 2021-22. From 2021-22, there has been a decline in the urban teacher attrition rates while the rural teacher attrition rates have remained fairly constant. With an average U.S. attrition rate of 8 percent, note that the urban attrition rate is consistently greater than the national attrition rate while the rural attrition rate is consistently less than the national attrition rate.

Figure 13: Percentage of Teachers Who Left the Teaching Profession (Teacher Attrition) by District Locale, 2014-15 to 2024-25



Data Source: PDE educator employment files. Calculations by author.

Table 12 shows the number of individuals in rural and urban districts leaving the teaching profession in Pennsylvania from 2014 through 2024. Indications are that substantial numbers of individuals are leaving public education in Pennsylvania, and most of these positions need to be filled with replacement teachers. Note that the trends for both rural and urban districts are slightly U-shaped, with larger numbers in the beginning and ending years than in the middle years. Comparing 2020 to 2024, an additional 400 teachers left the teaching profession in rural Pennsylvania and almost 1,900 left urban districts. Thus, the demand for teachers increased in both types of districts.²⁰

Table 12: Number of Teachers Leaving the Teaching Profession in Pennsylvania for Rural and Urban Districts, 2014-2024

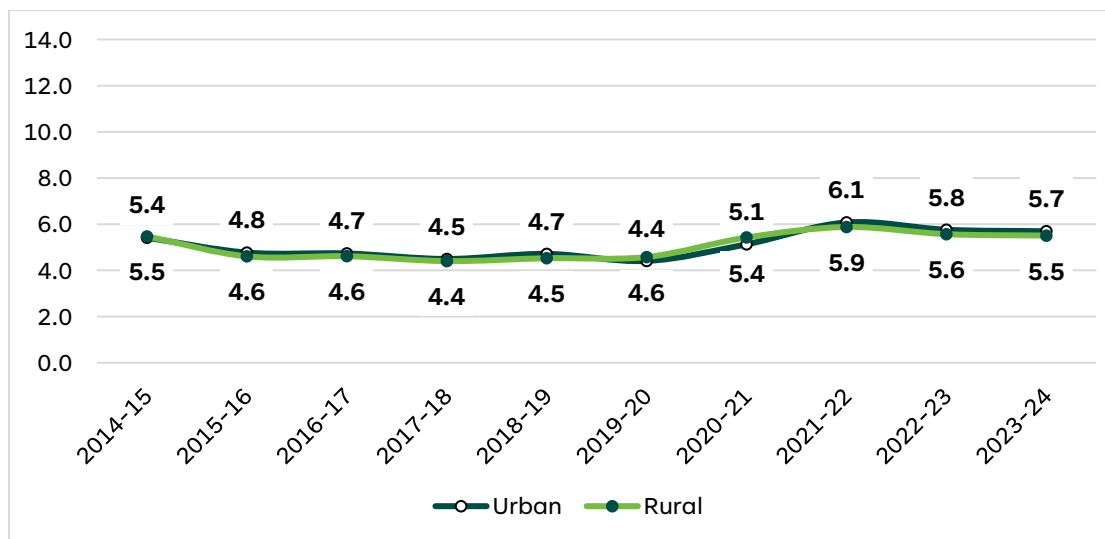
Locale	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Urban	7,090	6,990	5,637	5,819	5,132	5,521	5,102	5,882	7,666	6,478	6,995
Rural	1,945	1,679	1,514	1,456	1,411	1,372	1,402	1,607	1,891	1,764	1,817

Data Source: PDE educator employment files. Calculations by author.

²⁰ The overall statewide demand due to attrition grew by almost 2,500 teachers if cyber charter schools are included in the analysis.

Figure 14 includes a comparison of the teacher attrition rates between rural and urban public school districts only. Thus, this analysis excludes CTCs, charter schools, and IUs. For public school districts only, there is virtually no difference in teacher attrition rates in bivariate descriptive data between urban and rural districts across all years. However, a deeper look at attrition is merited, and is included below.

Figure 14: Percentage of Teachers Who Left Their Public Urban or Rural School District, 2014-15 to 2024-25



Data Source: PDE educator employment files. Calculations by author.

Logistic Regression Analysis of Teacher Attrition.

The problem with relying on simple descriptive statistics to compare attrition rates between urban and rural districts is that there are differences in teacher and school characteristics that may influence attrition that are not captured by descriptive statistics. For example, higher salaries are often associated with lower attrition rates. To identify the unique relationship between rural districts and the likelihood of a teacher leaving the profession, this study uses a logistic regression analysis with a teacher quitting the profession after one year being the dependent variable (the variable we are trying to explain). If a teacher leaves the teaching profession, then the variable takes on a value of 1. If a teacher remains in the teaching profession, then the variable takes the value of zero. This categorization makes the variable binary since there are only two possibilities that the variable can have.

Any type of regression identifies the unique influence of a factor (such as a district being in a rural area) on the variable of interest apart from the influence of all the other variables in the analysis. Suppose a regression analysis includes a variable indicating that a district is in a rural location and a variable indicating the percentage of white students in the district. The rural variable will show the relationship between rural districts and the likelihood of a teacher leaving the profession while holding the

percentage of white students constant. This set up of the regression means the results for rural districts will be separate from any influence of the percentage of white students on the likelihood of a teacher quitting. The regression analysis presented below includes the personal characteristics of teachers, the characteristics of districts, a variable identifying if the district is a rural district, and variables indicating years in which teachers were employed. The analysis uses individual teacher data and includes only the years 2018 through 2024 because racial/ethnic data was only available for those years at the time of the study.²¹

Personal Characteristics

Research consistently shows that personal characteristics of teachers are associated with the likelihood of leaving the teaching profession (Nguyen et al., 2019). Most importantly, the years of education experience of a teacher is strongly associated with leaving the profession with teachers having only a few years of experience and teachers with many years of experience being most likely to leave (Nguyen et al., 2019). To capture this U-shaped relationship between experience and attrition, two variables were included in the analysis: experience and experience squared. In addition, there is also a variable to indicate whether a person is likely to be able to retire (years experience > 30) since retirement eligibility increases the likelihood of someone quitting. Research suggests that a newly hired teacher in a state, regardless of their years of education experience elsewhere, is more at risk of quitting (Nguyen, et al., 2019). Thus, the final variable related to experience was an indicator of whether or not the teacher was newly hired. A newly hired teacher is someone hired as a teacher in Pennsylvania who has no prior experience teaching in Pennsylvania.

Research has also shown that a teacher's race or ethnicity can be associated with the likelihood of leaving teaching. In particular, teachers of color (American Indian/Alaska Native, Asian American or Pacific Islander, Black, Hispanic, and multi-race) are more likely to leave teaching than their white peers. Thus, five binary variables were included in the analysis, one each for the above five categories.

District Characteristics

District characteristics can also be associated with the likelihood of a teacher leaving the profession (Nguyen et al., 2019). Specifically, the size of the district, the student characteristics of the district, and the salary offered to teachers by the district can all be associated with the likelihood of a teacher leaving the profession. Teachers can be more likely to leave the teaching profession if employed in very small or large districts, in districts with greater percentages of economically disadvantaged students,

²¹ Data limitations prohibit the inclusion of charter schools and CTCs in the same analysis. Average district salaries, adjusted for the wages of other college graduates in the same labor market, are not available for charter schools and CTCs.

in districts with lower percentages of white students, and in districts offering lower salaries.

Thus, the regression analysis includes a variable that identifies very small districts (District size < 300) and one that identifies very large districts (District size > 5,000). There is also a variable that identifies the percentage of students enrolled in the district qualifying for a free or reduced-cost meal (Percent of students: Econ Disadvantaged) and another variable that identifies the percentage of white students enrolled in the district (Percent of students: White).

Finally, there is a variable that includes the adjusted average teacher salary in a district. The average teacher salary, as reported by PDE, was adjusted using the comparable wage index (CWI). The CWI is a number that indicates the wages of college graduates other than teachers in the labor market. When comparable wages are higher, we would expect school districts typically must respond by offering higher wages to compete with other businesses for the labor of teachers. The inclusion of this variable is important since past research finds that teacher salaries strongly influence teachers' decisions to stay or leave the teaching profession (Darling-Hammond and Carver-Thomas, 2017; Nguyen et al., 2019).

Years

There are also six binary variables for each year of possible employment other than 2018 which is the first year of the data set. The 2018 year is excluded so that the results for every other year (2019 through 2024) can be interpreted as relative to the likelihood a teacher decided to leave the teaching profession in 2018.

Rural District

Finally, the regression includes a variable that indicates whether or not a district is a rural district. The inclusion of this variable reveals whether teachers in rural districts or urban districts were more or less likely to leave the teaching profession.

Regression Results Explanation

Table 13 presents the results from the logistic regression analysis. Rows without shading were not statistically significant. Rows shaded in blue were statistically significant and negatively associated with leaving the teaching profession. Rows shaded in green were statistically significant and positively associated with leaving the profession.

The odds ratio in logistic regression shows the odds that the dependent variable will change (in this case, the odds a teacher will quit) when one factor changes. If a factor does not change the odds at all, it will have an odds ratio of 1.0. To interpret the odds ratio in Table 13, compare the odds ratio to 1.0. Any result greater than 1.0 shows that the factor is associated with an increase in the odds that a teacher will quit. The greater the number, the greater the effect that factor has on a teacher quitting the teaching

profession. A ratio lower than 1.0 shows that the factor is associated with a decrease in the odds that a teacher will quit. The smaller the number, the stronger the association between that factor and lower odds of leaving the teaching profession.

Regression Results: Personal Characteristics

As expected, given prior research (Nguyen et al., 2019), variables measuring years of experience were all statistically significant. First, teachers eligible for retirement (more than 30 years of experience) were more likely to leave teaching than other teachers. Second, the years of experience and years of experience squared were both statistically significant. This result shows that the pattern of teacher attrition by years of experience is u-shaped. This u-shaped pattern means less experienced teachers and more experienced teachers are most at risk of leaving the teaching profession, while teachers with moderate levels of experience are less at risk of leaving the profession. Consistent with prior research, newly hired teachers are statistically more likely to leave teaching after one year than teachers who were not newly hired. In fact, the odds of leaving were not just statistically significant, but substantially greater as well. Finally, almost all teachers of color were more likely to leave teaching than white teachers; the only exception was for American Indian/Alaska Native teachers. While four of the groups were statistically more likely to leave than white teachers, Black and multi-race teachers had the highest odds of leaving. All racial categories were statistically significant.

Regression Results: District Characteristics

District size was not statistically related to teachers leaving the profession. Regardless of how district size was measured, no variable measuring district size was associated with teacher attrition. The percentage of economically disadvantaged students in a district was not significantly associated with teacher attrition in the final model. However, when the percentage of White students was removed from the analysis, the percentage of economically disadvantaged students was positively associated with teacher attrition, and the relationship was statistically significant. In other words, as the percentage of economically disadvantaged students enrolled in a district increased, the likelihood of a teacher leaving the profession increased. The percentage of White students was negatively associated with teacher attrition, and the relationship was statistically significant. This means that, as the percentage of white students enrolled in a district increased, the likelihood of a teacher leaving the profession decreased.

Regression Results: Teacher Salaries

A very important finding is that the adjusted average teacher salary for a district was negatively associated with the likelihood that a teacher would leave the profession, and the relationship was statistically significant. Thus, the higher the average teacher

salary in a district after adjusting for the wages of other college educated workers in the same labor market, the less likely a teacher was to leave the teaching profession.

Regression Results: Teachers in Rural Districts

Another statistically significant finding pertinent to this study is that teachers in rural districts were more likely to leave the teaching profession than their urban peers. This finding held true even after considering the influence of a number of personal and district characteristics. While there was a statistically significant difference, the difference was fairly small, because the odds ratio is so close to one.²²

Regression Results: Year Effects

Finally, excluding 2020, the likelihood of teachers leaving the profession was greater from 2019 through 2024 than in 2018. Also shown below is that the likelihood of leaving the profession was greatest in the years after the COVID years of 2020 and 2021.

Table 13: Logistic Regression Results for One-Year Teacher Attrition

Variable Name	Coefficient	Statistical Sig	Odds Ratio
Years of Experience	-0.079	<.001	0.924
Years of Experience squared	0.003	<.001	1.003
Years of Experience > 30	0.823	<.001	2.277
Newly Hired Teacher	0.675	<.001	1.964
Teacher Race: AIAN	-0.044	0.838	0.957
Teacher Race: AAPI	0.227	<.001	1.255
Teacher Race: Black	0.407	<.001	1.502
Teacher Race: Hispanic	0.292	<.001	1.340
Teacher Race: Multi	0.413	<.001	1.512
District size < 300	0.099	0.420	1.104
District size > 5000	0.012	0.378	1.012
Adjusted Salary	-0.783	<.001	0.457
Percent of students: Econ Disadvantaged	0.000	0.253	1.000
Percent of students: White	-0.006	<.001	0.994
Teacher in a Rural District	0.062	<.001	1.064
Year 2019	0.050	0.014	1.052
Year 2020	0.008	0.710	1.008
Year 2021	0.173	<.001	1.189
Year 2022	0.362	<.001	1.437
Year 2023	0.241	<.001	1.273
Year 2024	0.292	<.001	1.339
Constant	6.330	<.001	560.9

²² As a reminder, the finding only applies to public school districts; results for charter schools or CTCs may be different, but data are not available.

Data Source: PDE Educator Employment Files; PDE enrollment files, educator employment files, NCES comparable wage index. Calculations by author.

Note: Unshaded rows are not statistically significant. Rows shaded blue are statistically significant and negatively associated with leaving teaching. Rows shaded green are statistically significant and positively associated with leaving teaching.

Summary of Demand

The demand for teachers has increased over the past 15 years for both rural and urban districts. The factors influencing the demand for teachers in Pennsylvania include increased teacher attrition and changing student characteristics. Due to increased teacher attrition and increased student needs following COVID, the demand for teachers increased markedly over this time. This extra demand placed a strain on the already low supply of teachers.

The percentage of economically disadvantaged students and special education students increased for both urban and rural districts. This increased the demand for all teachers and especially special education teachers. While the increase in the percentage of economically disadvantaged students was greater for urban districts, the increase in the percentage of special education students was the same for both rural and urban.

When examining the attrition rate for all districts, urban districts had substantially greater attrition rates than rural districts across all years of the study. However, when the analysis is limited to public school districts, rural and urban districts exhibit very similar attrition rates. After accounting for teacher and district characteristics, the logistic regression indicates that teachers in rural public school districts are slightly more likely to leave the teaching profession than their urban counterparts.

The logistic regression did find that a number of other factors influenced teacher attrition in Pennsylvania. At the individual teacher level, attrition was associated with being a newly-hired teacher, having low levels of experience, having high levels of experience, being eligible to retire, and being a teacher of color. Attrition was related to the percentage of white students in a district, and the average salary of teachers in the district; average teacher salary had the greatest influence on teacher attrition.

Conclusions and Discussion

Overall, this study shows that there is a teacher shortage in some districts and in some subject areas throughout the state, including both urban and rural districts. The TQI analysis reveals that rural districts tend to have higher levels of teacher quality than urban districts. However, the analyses of emergency permits and teachers assigned out-of-field documents that many rural districts also suffer from a shortage of fully certified teachers. This is especially true regarding teachers assigned out-of-field. Rural districts are especially at risk of having teachers assigned out-of-field because of the small size of many rural schools. For example, if a rural high school only has five students who want to enroll in physics or Latin, can a rural district, especially a small one with limited

funding, afford to offer a class with only five students? Can a rural district entice a physics teacher or a German teacher to work at a school where they would only teach one class in physics or German? If the answers to these questions are no, then rural districts may place a teacher without the appropriate certification in those classrooms. In this way, children in rural schools cannot have the same access to quality education as children in other situations. This limits both their ability to enroll in and succeed in college and also may restrict their career choices.

For both urban and rural districts, special education is the subject area with the most acute shortage. This acute shortage in special education must be addressed given the needs of the students impacted by the shortage. Other subject areas with the most acute shortages of teachers in rural areas include English Language Arts, science, mathematics, and world languages.

With respect to rural districts, the further a rural district is located from an urban center, the greater the shortage of teachers and the lower the quality of teachers. This shortage and quality issue is likely to be the case because rural districts furthest away from urban centers tend to be small and graduate few students each year and they are also more likely to be in a county with no TPP. Since graduates from TPPs typically teach either close to where they went to high school or close to their TPP, such districts may have more difficulty in attracting applicants to vacant teaching positions.

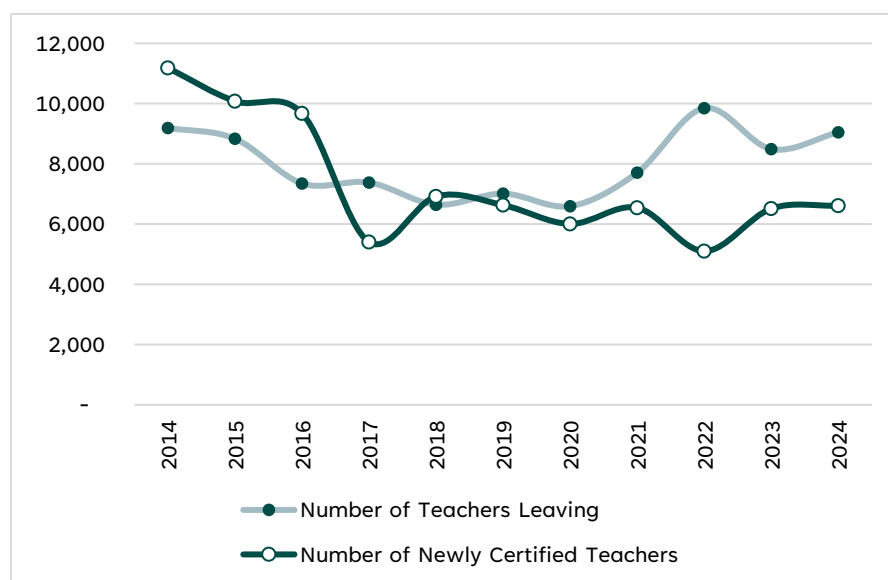
What explains the shortage of teachers? The simplest explanation is that the demand for teachers exceeds the available supply. As discussed above, teacher attrition is the primary driver of teacher demand, followed by changes in student characteristics. Teacher attrition has remained above pre-2020 levels since 2022, increasing the need for replacement teachers across the Commonwealth. Although average teacher attrition rates are lower in rural districts than in urban districts, high attrition remains a challenge for many rural schools. From 2021 through 2024, nearly 14 percent of rural public school districts and rural CTCs had annual teacher attrition rates of at least 10 percent. High attrition in these districts increases the demand for teachers and intensifies competition for a limited pool of qualified candidates. Because school districts often recruit from the same regional labor markets, efforts to reduce teacher attrition in one district may increase the availability of qualified teachers for neighboring districts, including nearby rural districts (Darling-Hammond and Carver-Thomas, 2017). Teacher attrition, however, is not distributed equally across districts or schools. CTCs and charter schools have far greater attrition rates than public school districts. For public school districts, those serving more economically disadvantaged students and students of color have greater rates of teacher attrition than other districts.

In addition, as shown above, both rural and urban districts have experienced changes in student characteristics that have increased the demand for teachers. Specifically, the percentage of economically disadvantaged students and the percentage of special education students have increased across the Commonwealth. Moreover,

research concludes that student mental health needs and family poverty have increased in rural areas of the Commonwealth (Gajanan, 2023).

If the supply of newly certified was anywhere close to the levels of newly certified teachers prior to 2017, the Commonwealth would have a better balance between the demand for teachers and the supply of teachers. However, since 2017, the number of newly certified teachers has stubbornly remained at least 2,000 newly certified teachers below prior levels. This dynamic can be visualized in a couple of ways. First, Figure 15 shows the number of teachers leaving the teaching profession in Pennsylvania and the number of newly certified teachers from Pennsylvania TPPs. As shown above, not all positions left vacant by a teacher are filled by a newly certified teacher. The comparison, however, provides a sense of the difficulty that districts are facing each year. In most years between 2014 and 2020, the number of newly certified teachers was about the same as the number of teachers leaving. However, since 2020, the number of teachers leaving has increased fairly dramatically while the number of newly certified teachers has remained stagnant.

Figure 15: Number of Teachers Leaving the Teaching Profession in Pennsylvania and the Number of Newly Certified Teachers from Pennsylvania Teacher Preparation Programs, 2014 to 2024

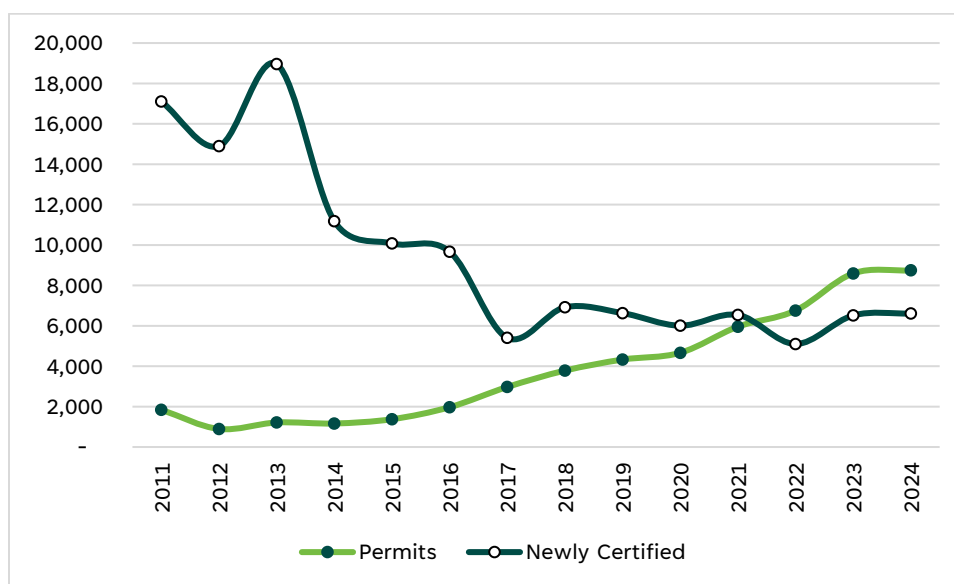


Data Source: PDE Act 82 Report from PDE website and author's calculations of the number of teachers leaving using PDE employment data.

We can visualize the response to this problem by examining the number of newly certified teachers and the number of emergency permits used each year over the same period of time. As shown in Figure 16, as the number of newly certified teachers from Pennsylvania TPPs has declined over time, the number of emergency permits has increased. Note that once the number of teachers leaving the profession became much

larger than the number of newly certified teachers from Pennsylvania TPPs, the number of emergency permits became larger than the number of newly certified teachers from Pennsylvania TPPs.

Figure 16: Number of Newly Certified Teachers from Pennsylvania Teacher Preparation Programs and the Number of Emergency Permits, 2011-2024



Data source: PDE Act 82 Report from PDE website and author's calculations of the number of teachers leaving using PDE employment data.

Thus, as a result of increasing demand and stagnant supply Pennsylvania districts are currently relying on teachers employed on emergency permits and teachers assigned out-of-field to balance their supply of teachers with increased demand. In other words, many Pennsylvania districts are experiencing a shortage of teachers in specific subject areas.²³

Policy Considerations

This section presents some policy considerations based on the findings in this report. There are many resources that provide additional policy options that could be considered, such as an Education Commission of the States report that focuses on policies addressing these issues in rural areas.²⁴ The downward trend in the supply of

²³ Based on personal communication with the author, superintendents have remarked they often cannot find an applicant who has the right characteristics and qualities for working in a vacant position. Because there are so few applicants for positions, they hired the best available certified teacher. Superintendents have observed that although a vacancy is filled, the lack of applicants hinders their ability to provide the best quality of instruction.

²⁴ <https://www.ecs.org/wp-content/uploads/Rural-SPED-Teacher-Shortages-June-2016.pdf>

teachers through 2017 and the stagnant supply of teachers over subsequent years already led to several policies that address teacher supply. Unfortunately, there is little evidence to date that shows these policies have had any substantial effect. Policymakers should not overlook the issue of teacher shortages in rural districts because the shortage of teachers is less severe than in urban areas of the state. There are rural districts suffering from a shortage of teachers and many rural districts are experiencing the hidden effects of the shortage which may manifest as an insufficient number of applicants. Any shortage of qualified teachers harms students, given the well-documented links between teacher shortages, lower academic outcomes, and reduced long-term opportunities for children.

Expand and Strengthen the Teacher Preparation Pipeline

As shown in the teacher supply section of the study, Pennsylvania's supply of teachers is insufficient to meet the demand for teachers, especially in specific subject areas and in specific areas of the state such as remote rural areas which have no or limited access to TPPs. Expanding the teacher pipeline can include several different policies. Research points to a combination of financial, structural, and professional factors that influence who enters, completes, and remains in teacher preparation.

Based on the available research, Pennsylvania could first expand Grow Your Own (GYO) pathways that recruit high school students, paraprofessionals, and other community members into the teaching profession (Blazar et al., 2024; Camp et al., 2024; Kistler et al., 2024). Evidence shows that GYO programs are particularly effective for increasing the diversity of the teaching workforce (Gist et al., 2019) and filling hard-to-staff positions in both rural and urban districts (Hamman, Matteson, and Nguyen, 2023), including for special education (Shelton and Cruz, 2023).

Second, the Commonwealth could financially support teacher residency models which have been shown to drastically reduce attrition of teachers in their first years of teaching (Guha et al., 2017). Such programs would be especially beneficial in areas where districts are relying heavily on the use of emergency permits.

Finally, the General Assembly could provide targeted funds to universities throughout the Commonwealth that must be used to support teacher preparation. Currently, higher education institutions are suffering from a scarcity of financial resources that has negatively affected teacher education. There has been consolidation of some campuses in the Pennsylvania State System of Higher Education and closures of campuses are planned. The Pennsylvania State University is in the process of closing seven campuses, most of which serve rural communities. Perhaps there is a way to maintain access to TPPs in impacted communities through targeted investments by the General Assembly.

Strengthen Financial Incentives for Entering the Profession

As shown in this research, there has been a dramatic decline in the number of individuals obtaining teacher certification and the supply of teachers has remained

insufficient and stagnant over the last several years. Further, as shown in both the supply and shortage sections of this study, the need for additional teachers is more acute in specific subject areas such as special education and mathematics. Programs that provide tuition assistance or loan forgiveness in exchange for teaching service have strong evidence of increasing the number of individuals entering and completing preparation programs (Podolsky and Kini, 2016; Dee and Goldhaber, 2017). The Student Teacher Stipend Program (STS) is an example of this type of program. While the General Assembly recently increased investment in the STS program, we do not yet have data on the success of the program. With limited funds, targeting the most high-demand subject areas would have the biggest return on investment. Currently, the state could prioritize special education teachers, ESL teachers, math teachers, science teachers, computer science teachers, and world language teachers. The prioritization list could be changed using new data over time.

Improve Teacher Compensation

As shown above (in Table 1), average teacher salaries have declined over the last 20 years and continue to decline. Increasing teacher salaries creates incentives for individuals to enter the teaching profession as well as stay in the teaching profession (Allegretto and Mishel, 2020; Loeb and Page, 2000, Hanushek et al., 2004). Mississippi and Arkansas both increased teacher salaries and have experienced substantial declines in teacher attrition, thus reducing the shortage of teachers (Saunders and Skinner, 2025; Zamarro and McGee, 2025). Thus, one strategy to reduce the shortage of teachers is to provide a salary increase for all teachers.

There are also more targeted strategies to improve teacher salaries. One strategy is to support pay increases for teachers to advance into formal Teacher Leader positions. Teacher Leaders can serve as expert mentors²⁵ which can help reduce teacher attrition and increase teacher effectiveness (Ingersoll and Strong, 2011). This strategy can also reduce the substantial time burden on principals, which likely contributes to their annual turnover rate. PDE has already created a certificate for such positions, but few districts have adopted this strategy.

Another research-based strategy to increase teacher salaries where an increase is needed the most is to adopt a comprehensive performance pay program for teachers in high-need schools located in both rural and urban areas. Recent research has found that such programs can save money in the long run by reducing teacher attrition (Dee and Wyckoff, 2015; Hanushek, et al., 2019). Some research also suggests that such programs improve student outcomes because teacher effectiveness increases with experience (Cohodes et al., 2023).

²⁵ See <https://www.niet.org/newsroom/show/blog/teacher-leadership-is-more-than-an-add-on-its-the-engine-that-drives-student-outcomes>

Create a “Retain Your Own” program

PDE now provides teacher attrition data so that we know which districts struggle with teacher retention. While rural districts have overall lower attrition rates than urban districts, a greater percentage of rural than urban public school districts or CTCs have attrition rates greater than 10 percent from 2021 through 2024. The underlying causes of high attrition and the potential solutions are likely to differ by local contexts. This program would provide financial support and technical assistance to districts identified as eligible for support based on their average yearly attrition and turnover rate. Technical assistance could be provided through a university-state partnership to assist districts in developing, implementing, and evaluating their efforts to reduce teacher attrition.

Importantly, reducing attrition in high-need districts has a spillover effect that increases the supply of teachers and, thus, reduces the demand for teachers in other districts. For example, if attrition is reduced in districts with high attrition rates, then those districts also reduce their demand for teachers. Lower attrition reduces the demand for replacement teachers in these districts, increasing the supply of qualified teachers available to other districts.

Adopt and Implement a Statewide Teacher Working Conditions Survey

One finding from the logistic regression results on teacher attrition is that the percentage of white students in a school is associated with decreased odds of leaving teaching. Research, however, has shown that the student demographics are not the actual cause. Rather, research has found that student demographics often serve as a proxy for teacher working conditions (Horng, 2009; Ladd, 2011; Blanchard et al., 2023). States have used statewide teacher working conditions surveys to help school and district leaders identify areas of concern and develop strategies to address the areas of need identified by teachers. Importantly, the purpose of such an effort must be to provide tools and assistance to schools and districts; such efforts must be distinct from processes of evaluation and accountability.

Enhance State Data Collection and Analysis

For a number of reasons, this study leaves a number of questions unanswered and provides only estimates for many of the analyses. One reason is a lack of data. While PDE has increased and improved the collection of data, there are still issues with data collection, documentation of details, and timeliness of data production. The current data collection and analysis system is unable to provide timely, in-depth analyses that provide a full picture of the issues surrounding these areas. Thus, the Commonwealth should:

- Build and/or enhance pre-kindergarten through postsecondary statewide longitudinal data systems that allow researchers to follow individual teachers longitudinally through the entire career pipeline.

- Track enrollment, completion, licensure, placement, and retention outcomes across TPPs by individual characteristics and subject area.
- Publish annual teacher workforce dashboards highlighting shortages by region and subject.

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Appendix I: Definitions

In this section, I define the terms used throughout this study. When applicable, links to official definitions are provided.

District Type

District type identifies the different types of school districts in Pennsylvania. These include public school districts, Career and Technology Centers, Charter Schools, State Schools (for special education students or incarcerated students). Also included in some of the analyses are Intermediate Units (IUs) when they report data on enrolled students and employed teachers.

A charter school is an independent public school that operates under a charter granted by a local board of school directors and is open to public enrollment. These schools function as public, non-profit entities, and are exempt from certain state and local regulations to allow for greater operational flexibility. Importantly, charter schools are allowed to hire teachers who are not fully certified and, thus, employed on an emergency permit. A cyber charter school is a type of charter school that offers instruction remotely. Cyber school students may live anywhere in the Commonwealth. Student enrollment is reported separately from any other type of school.

A CTC is a school entity that offers State Board of Career and Technical Education-approved programs designed to provide students with skills for specific occupations through a combination of academic and hands-on learning. A CTC may be located within a public high school or as a separate building. Importantly, CTC students are counted as enrolled in both their home school district and in the CTC. However, CTCs that enroll students for one-half of a day are excluded from the number of students since they are counted as enrolled in their home district. Further, a CTC may enroll students from multiple districts in the surrounding area.

A SJCI is a secure facility for youth under the age of 21 who have been adjudicated delinquent by a juvenile court. These facilities are administered by the Pennsylvania Department of Human Services through its Bureau of Juvenile Justice Services. SJCIIs enroll a very small number of students. Only three of the 11 SJCI schools provided information on student enrollment. The remaining three SJCIIs had enrollment of less than 100 students combined. Thus, these schools are removed from analyses.

Finally, an Intermediate Unit (IU) is a regional geographic service unit within the public school system that provides a wide range of educational and administrative services to local school districts and nonpublic schools. An IU may enroll students as well as employ teachers. IUs may include both rural and urban school districts. IUs that had at least 50 percent of students enrolled in rural districts were designated as rural.

School Level

School level is used to identify three levels of public schooling: elementary schools, middle schools, and high schools. School level was used in making projections of supply,

demand, and shortages as well as in analyzing the survey of school- and district-administrators.

Teacher Supply

Defined in methods section in the body of the paper.

Teacher Demand

Defined in methods section in the body of the paper.

Emergency Permit

In this study, trends in the number and percentage of teachers holding an emergency permit are examined. According to PDE:

An emergency permit is issued by the Department upon the request of an employing public school entity (LEA) when a position has been advertised and no fully qualified and properly certificated applicant is available. A private employing agency CANNOT request an emergency permit. The candidate for an emergency permit must have earned a bachelor's degree from a state-approved college or university and must meet all other eligibility requirements.

The emergency permit may be requested for an individual to serve in a vacant position as a long-term or day-to-day substitute. The permit is valid from the first day of the month of issuance until the last day of summer school in that school year and may be reissued in subsequent years upon the submission of the appropriate application to the Department of Education from the public school entity and completion of conditions set by the Department.

<https://www.education.pa.gov/Educators/Certification/PAEducators/Pages/Emergency-Permits.aspx>)

This study includes only emergency permits granted for long-term substitutes or for individuals assigned to a position for which they do not hold the appropriate license. A fully certified teacher whose certification aligns with their assigned courses would not need an emergency permit. Teachers who are either not fully certified at all or who are fully certified, but whose certificate does not match their teaching assignment theoretically need to be on an emergency permit.

Beginning Teacher

Defined in methods section in the body of the paper.

Novice Teacher

Defined in methods section in the body of the paper.

Newly Hired Teacher

Defined in methods section in the body of the paper.

Teacher Demand

Defined in methods section in the body of the paper.

Teacher Labor Markets

The teacher labor market is a specialized, localized, and often segmented "two-sided matching market" where teacher preferences for school environments (e.g., student demographics, commute) interact with school district needs. It involves a complex interplay of supply, demand, and compensation, where salaries are often not responsive to market needs, leading to shortages in certain areas. See https://cepa.stanford.edu/sites/default/files/CR03.BLLW_.TeacherMkts.pdf for a study of teacher labor markets.

Types of Rural Districts

This study extends the rural-urban analyses by examining some measures for different types of rural districts. This study used the National Center for Education Statistics (NCES) geographic locale data to identify districts as rural fringe, rural remote, or rural distant. The three definitions from NCES are provided below. Note that not every district identified as rural by CRP is identified by NCES as rural. In the analyses, only districts identified as rural by both CRP and NCES were included.

Rural Fringe

NCES defines rural fringe as:

“Territory outside an urban area that is less than or equal to 5 miles from an urban area with population of 50,000 or more, as well as territory outside an urban area that is less than or equal to 2.5 miles from an urban area with population less than 50,000.”

Rural Distant

NCES defines rural distant as:

“Territory outside an urban area that is more than 5 miles but less than or equal to 25 miles from an urban area with population of 50,000 or more, as well as territory outside an urban area that is more than 2.5 miles but less than or equal to 10 miles from an urban area with population less than 50,000.”

Rural Remote

NCES defines rural remote as the most geographically isolated:

“Territory outside an urban area that is more than 25 miles from an urban area with a population of 50,000 or more and is also more than 10 miles from an urban area with population less than 50,000.”

Appendix II: Data Sources

Individual Teacher Employment Data

Many of the analyses in this report rely on information included in the teacher employment data files provided by PDE. These files are also located on the PDE website (<https://www.education.pa.gov/DataAndReporting/ProfSupPers/Pages/ProfPersIndStaff.aspx>). The files provided by PDE have a unique identifier that is common across school years that allowed for the calculation of retention and attrition.

The files indicate each unique educator with an identification number as well as their first, last, and middle name. The data also identifies the employing school and district for each educator using both the names and identifying numbers used by PDE. In addition, the data includes personal information for each educator, including years of education experience, years of experience in the district, race/ethnicity, gender, birth year, degree held (Bachelor's degree, master's degree, or doctoral degree), and salary.

The data include each person's assignment such as "Mathematics, 10-12" or "Elementary, Primary Grades 1-3". Further, the amount of each day that a person is assigned to these roles is also included in the data. So, if a person is assigned to teach "Mathematics, 10-12" for one-half of the school day, then their full-time equivalency (FTE) number would be "50".

PDE provides the teacher employment files for 2007-08 through 2024-25. This study relies primarily on the data from 2013-14 through 2024-25 since PDE personnel have suggested that the data in prior years were more likely to contain errors. The data allows a researcher to calculate annual teacher turnover rates across all these years. The employment files from 2007-08 through 2012-13 and the years of experience data contained within the employment files were used to identify beginning and novice teachers from 2014 through 2024.

Teacher Vacancy Data

This study relies on teacher vacancy data that is collected and made public on the PDE website at:

<https://www.pa.gov/agencies/education/data-and-reporting/school-staff/educator-preparation-and-certification>

Emergency Permit Data

This study relies on emergency permit data provided by PDE on their website. The data is by educator role (one role is classroom teacher) by subject area for each district in Pennsylvania. The data can be found at:

<https://www.pa.gov/agencies/education/data-and-reporting/school-staff/educator-preparation-and-certification>

Teacher Out-of-Field Data

Teacher out-of-field data is a required data element in state Every Student Succeeds Act (ESSA) reports. The data can be found under “Education Equity” at:

<https://www.pa.gov/agencies/education/programs-and-services/schools/every-student-succeeds-act-essa/essa-report-card/data-sources>

Student Enrollment

Student enrollment data was obtained from the PDE website. The data includes the number of students enrolled in each district by grade level as well as the total number of students enrolled in the district. Data are available for all years of this study. The data can be found at:

<https://www.education.pa.gov/DataAndReporting/Enrollment/Pages/PublicSchEnrReports.aspx>

Student Demographics:

Student demographic data can be found at the NCES Elementary and Secondary Information (ELSI) website at: <https://www.pa.gov/agencies/education/programs-and-services/schools/every-student-succeeds-act-essa/essa-report-card/data-sources>

Data has to be downloaded and then merged over time.

Teacher Salaries

Teacher salaries for all Pennsylvania teachers in public school districts were downloaded from <https://www.pa.gov/agencies/education/data-and-reporting/school-staff/professional-and-support-personnel#accordion-c5cf13b887-item-22b2751d52>

Comparable Wage Index

The comparable wage index data (CWI) was found at <https://nces.ed.gov/programs/edge/economic/teacherwage>

Types of Rural Districts

The types of rural districts is from NCES and is located at: <https://nces.ed.gov/programs/edge/Geographic/LocaleBoundaries>

Appendix III: Methods

This section describes the methods used to measure teacher supply, demand for teachers, etc. In many cases, the methods are also included prior to the presentation of results to remind readers of how certain types of teachers were identified or how calculations were made to arrive at the numbers included in tables or figures. The methods below include both how the patterns of interest are measured and the methods used to analyze data.

Teacher Quality Index

Research has consistently shown that the quality of teachers has one of the strongest school-based effects on student outcomes.²⁶ Thus, including some measures of overall teacher quality is informative for readers because the results can provide an estimate of the teacher quality in different types of districts across the Commonwealth. Specifically, using this measure can suggest whether teacher quality in rural districts differs from teacher quality in urban districts.

There are a number of different measures of teacher quality. The most direct measure is to examine the effect teachers have on test scores. This is often referred to as teacher value-added. While Pennsylvania provides a value-added score for schools in Pennsylvania, the scores are limited to mathematics and reading in grades 4 through 8 and grade 10 as well as science in grades 8 and 10. Thus, value-added scores do not include the majority of teachers employed in schools. Thus, this study relies on indirect measures of teacher quality as discussed below.

The Teacher Quality Index (TQI) was calculated by ranking all districts on the following six measures:

1. Percentage of teaching positions identified as vacant
2. Percentage of teachers employed on an emergency permit
3. Percentage of novice teachers
4. Percentage of teachers assigned out-of-field
5. Disparity between percentages of students of color and teachers of color
6. Teacher attrition rate

When creating an index that includes either the sum of all variables or the average of all the variables, the variables should have similar standard deviations. If the standard deviations are substantially different, then some values will automatically have a greater effect on the overall measure of teacher quality than other measures—solely because the standard deviation differs from the standard deviation from other measures. If the standard deviations are not similar, then the variables should be transformed such that the standard deviations are similar. One common transformation is to convert each variable to a z-score of the variable. Doing so ensures the mean for each variable is zero and the standard deviation for each variable is one.

Second, when creating an index of multiple variables, the variables should be measured in similar units. In this case, five of the six variables are measured as percentages while the disparity between students of color and teachers of color is a ratio rather than a percentage. Transforming the measures into z scores ensures that each variable is measured in the same unit.

²⁶ Research has also found that principals and counselors also have large effects on student outcomes, but the research on these two roles is more limited relative to the large body of research for teachers.

Thus, each variable was ranked in ascending order and then transformed into a z-score. This transformation resets each measure such that the mean of the measure is 0 and the standard deviation of the measure is 1.0. The use of z scores also makes the interpretation of the results easier since the resulting number reflects standard deviations from the mean for all districts.

When transforming the measures into z scores, lower values become negative numbers and higher values become positive numbers. For example, a district with a z-score value of -0.45 shows that the district's measure is below the average for all districts. Unfortunately, lower numbers in the TQI actually indicate positive characteristics for schools. For example, lower vacancy rates and lower attrition rates are positive indicators of teacher quality. Alternatively, higher values of the measures are negative indicators of teacher quality. To address this issue, all of the z scores were multiplied by minus 1 so that negative z scores reflect negative indicators of teacher quality and positive z scores reflect positive indicators of teacher quality.

Simply averaging the six z scores would mean that each of the six measures would contribute equally to the TQI. While this is desirable from a technical standpoint, there is a stronger research base for some of the variables and, moreover, research suggests some of the variables have a greater influence on student outcomes than other variables. Thus, based on my interpretation of the research, I created weights to either reduce or amplify the influence of the six measures on the TQI. These are included in the body of the report above. After weighting the measure to reflect differences in influence on student outcomes, the average of the six measures was calculated to create a final value for each district.

Thus, the final equation for the TQI measure was:

$$\text{TQI} = -1 \times \text{average} (0.50 \times \text{student-teacher racial disparity} + 0.50 \times \text{percentage of teachers assigned out-of-field} + 1.00 \times \text{percentage of vacant teaching positions} + 1.00 \times \text{teacher attrition rate} + 1.25 \times \text{percentage of teachers on emergency permits} + 1.50 \times \text{percentage of novice teachers}).$$

The greater the weight, the stronger the research base is that connects the measure of teacher quality to student outcomes. For example, the weight of 1.50 for novice teachers indicates that there is a strong research base that shows the measure has an effect on student outcomes. The weight of 0.50 for the student-teacher racial disparity signals that the research base for the effect of student-teacher racial match on the outcomes for *all* students is weak relative to the other measures.

Teacher Supply

Retained Teachers

A retained teacher is defined as a person employed as a teacher in a Pennsylvania public school in year X who was also employed as a teacher in a Pennsylvania public school in year X-1. A teacher on sabbatical was considered to be employed in a Pennsylvania public school.

Newly Hired Teachers

A newly hired teacher is defined as a teacher who was employed as a teacher in a Pennsylvania public school in year X but was not employed as a teacher in a Pennsylvania public school in year X-1. A newly hired teacher could be a beginning teacher, a teacher returning to the profession after leaving teaching, a teacher transferring into a Pennsylvania public school from a Pennsylvania private school, or a teacher transferring into a Pennsylvania public school from another state. Teachers transferring from another state could also be beginning teachers or have been previously employed in either a public or private school in another state. Because of limitations in the data, I cannot accurately identify the specific origin of many newly hired teachers in any detail.

Further, reliance on years of teaching experience does not necessarily help to identify teachers returning to the profession. For example, in Table XX, the teacher in row two would have an identical pattern of employment and identical years of experience as the teacher in row one. The teacher in row two, however, would not be a returning teacher because she taught in Maryland instead of Pennsylvania in the 2011-12 school year. To further complicate matters, the teacher in row three could have either two or three years of experience. The employing district in 2013-14 could either deny the person's employment as a teacher in the private school—in which case the person would have two years of teaching experience in 2013-14—or the district could credit the person with teaching in a private school, and the person would have three years of teaching experience.

Another issue with the data was that it did not include information about employment in another state or in private schools. This, coupled with the discretion school districts have about granting experience to teachers (Clapper, 2020), can cause difficulty in identifying beginning teachers. For example, in Table AIII-1, in rows four through eight, each of the teachers could have reported 2013-14 years of experience as one, two, or three. Hypothetically, each person could appear to be a beginning teacher in 2013-14 despite having taught at least one school year prior to entering the Pennsylvania public school system. Without this prior information, there will be some error in identifying beginning teachers.

Table AIII-1: Hypothetical Teacher Employment Patterns

2020-21	Employed in		Experience 2022-23	Returning Teacher
	2021-22	2022-23		
PA District	No	PA District	2	Yes
MD District	No	PA District	2	No
PA District	PA Private	PA District	2 or 3	Yes
MD District	No	PA District	1 or 2	No
PA Private	PA Private	PA District	1, 2, or 3	No
MD District	MD District	PA District	1, 2, or 3	No
NJ District	NJ Private	PA District	1, 2, or 3	No

Data Source: Researchers hypothetical development of teacher careers

Beginning Teachers

To identify teachers as beginning teachers, this study relied on PDE employment data from 2007-08 through 2024-25. The data identified the years of education experience for each individual. As defined by PDE, a beginning teacher should be in their first year of being employed as an educator which is denoted as a “1” in the educator experience data submitted by districts to the state through the Teacher Information Management System (TIMS).

Unfortunately, there were two issues that made this information inaccurate in the PDE data. Actual examples from the PDE data are shown below in Table AIII-2 to reveal these issues. The first column includes a teacher identifier, the next six columns contain the original experience data for each of six academic years, and the final six columns contain the teacher experience data for the same six academic years after data were modified as described in this section.

The first of the two major errors with the experience data was that there was a data entry error. For example, the years of experience entry for teacher 32 in Table AIII-2 was incorrect for the 2017-18 academic year. The data for the four prior years suggested the years of experience for the 2017-18 academic year should be 5. This change is reflected in the revised experience data column for 2017-18 where a 4 was replaced with a 5.

The second type of error stemmed from the discretion districts have in recognizing a teacher’s years of experience. Districts can choose to recognize or ignore an individual’s teaching experience in districts outside of the Commonwealth. Further, a district has discretion about whether to grant prior work experience to teachers transferring from private schools into public schools. In short, districts have some discretion in recognizing an individual’s years of experience as an educator.

This discretion can be problematic in identifying a beginning teacher. For example, a district could choose not to recognize an individual’s experience in another district. Thus, the individual’s historic record of years of experience over a five-year time span could be 1, 2, 3, 9, 10 (see teacher 21 below in AIII-2) where the individual changed districts after year three and the second district recognized the individual’s prior experience as

an educator while the first district did not. What is unclear from the data are the errors for teachers 200 through 202 below. One could make the argument that the teachers may have changed districts from 2013-14 to 2014-15 and the second district did not recognize the person's prior education experience. On the other hand, one could argue that because each of the individuals had three or four consecutive years of employment, the prior entries were simply data errors. Such errors are not easily resolved.

Several steps were taken to remove these errors. When three or more consecutive years of teacher experience were correct and represented the end years of the data, such as for Teacher 32 in Table AIII-2, then this study assumed the consecutive years were correct and the other entries were data error. If, on the other hand, there were two sets of consecutive data that were correct (e.g., Teacher 21), then the most recent set of data was assumed to be the most accurate and was used to complete the teacher years of experience.

Unfortunately, because of the large number of educators and number of errors in the years of experience data, many assumptions were made in rectifying erroneous teacher experience data. Further, not all errors have been identified and updated due to the enormous amount of time it takes to do so. However, the data used to identify beginning teachers was reviewed and modified for all teachers from 2014 through 2024. I am confident that the beginning teacher data is much more accurate than the original PDE data. I am still working through issues with additional errors. Correcting just beginning teachers was about 50 hours of work.

**Table AIII-2: Examples of Problematic Teacher Experience Data
in the PDE Employment Files**

AIII-2: Examples of Problematic Teacher Experience Data in the PDE Employment Files

Educator Identifier	Original Experience Data						Revised Experience Data					
	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18
21		1	2	3	9	10		6	7	8	9	10
32		1	2	3	4	4		1	2	3	4	5
44		1	1	3	4	6		2	3	4	5	6
67		1		8	8	8		6		7	8	9
10		1	8	9	10	11		7	8	9	10	11
104	19	1	2	2	21	22	17	18	19	20	21	22
845	1	1		2	14	15	11	12		13	14	15
200		7	1	2	4	5		1	2	3	4	5
201		8	2	3	4	5		1	2	3	4	5
202		9	8	3	4	5		1	2	3	4	5

Source: PDE Educator Employment Data

Out-of-State Teachers

This study relied on the aggregate data on out-of-state teachers provided in the Act 82 data referenced above in order to include an estimate of out-of-state teachers.

Demand for Teachers

Student Enrollment

Student enrollment data was downloaded from the PDE website for the 2013-14 through 2023-24 school years. All years of data were merged using a unique number (AUN) for each district that is created by PDE. All analyses relied on descriptive statistics.

Student-Teacher Ratio

The student-teacher ratio was calculated by dividing the number of students enrolled in a district for any given year by the number of teachers in that district in the same year. The number of students was downloaded from the PDE website. The number of teachers was calculated by summing all of the teachers for each district for each year using the educator employment files from the PDE website. All analyses relied on descriptive statistics.

Teacher Attrition

Teacher attrition was determined by merging consecutive years of employment data together and then calculating whether a teacher employed in year X was still employed as a teacher in year X+1. Any teacher reported as employed by the district, including substitute teachers, were included in the analysis. This results in a higher attrition rate than analyses that use only teachers who are employed full-time.

Most of the analyses of teacher attrition were based on descriptive statistics. As mentioned in the report, descriptive statistics are appropriate when a researcher has access to the universe of all data which was the case with this study.

In addition, this study includes a statistical analysis of teacher attrition. The section on teacher attrition provides a fairly lengthy description of the methods. However, the salary data deserves a deeper explanation and is provided here.

Teacher salaries were also included in the analysis. The study used data on teacher salaries located on the PDE website.²⁷ This study adjusted the salaries using the comparable wage index (CWI) developed by Lori Taylor (see Taylor and Fowler, 2006). According to Taylor and Fowler (2006, p. 3),

The basic premise of a comparable wage index is that all types of workers—including teachers— demand higher wages in areas with a higher

²⁷ <https://www.pa.gov/agencies/education/data-and-reporting/school-staff/professional-and-support-personnel#accordion-c5cf13b887-item-22b2751d52>

cost of living (e.g., San Diego) or a lack of amenities (e.g., Detroit, which has a particularly high crime rate) (Federal Bureau of Investigation 2003). Therefore, one should be able to measure most of the uncontrollable variation in educator pay by observing variations in the earnings of comparable workers who are not educators.

In other words, the CWI adjusted all teacher salaries within a county by the average wages of individuals with a college degree in non-education positions within the same county in the same year.

Shortage of Teachers

Teacher Vacancies

A teacher vacancy is an unfilled teaching position that a school or district has budgeted for and intends to hire someone to fill, but no qualified teacher is currently assigned to the role. PDE first collected data from districts about teacher vacancies in the fall of 2023. In the subsequent school year, PDE collected data from districts about teacher vacancies in the fall, winter, and spring. In this study, I used the data from PDE to identify the number of vacant teaching positions overall, for each district, for urban and rural districts, and by subject area positions. Districts report how they responded to the vacancy. The options included: leaving the position vacant, using short-term substitute teachers to fill the position, or using long-term substitute teachers.

Emergency Permits

Trends in the use of emergency permits are important because such individuals are not fully certified to teach. The PDE definition is below:

An emergency permit is issued by the Department upon the request of an employing public school entity (LEA) when a position has been advertised and no fully qualified and properly certificated applicant is available. A private employing agency CANNOT request an emergency permit. The candidate for an emergency permit must have earned a bachelor's degree from a state-approved college or university and must meet all other eligibility requirements.

As described in this report, emergency permits are used for a variety of purposes, including the hiring of long-term substitute teachers to fill vacancies and the hiring of individuals without the appropriate certification to fill vacant positions. As shortages become more acute, the use of emergency permits increases (Sutcher et al., 2019). Thus, examining trends in the use of emergency permits provides a reasonably accurate indicator of the degree to which a shortage of qualified teachers exists (Sutcher et al., 2019). Further, research suggests that teachers employed on an emergency permit

receive lower teacher evaluations (Hamlin et al., 2025) and are less effective at increasing student achievement (Clotfelter et al., 2007).

Appendix IV: Results by Type of Rural District

This section provides details on analyses that compare various measures of teacher shortages and quality across three types of districts: rural fringe, rural distant, and rural remote as defined above.

Emergency Permits by Type of Rural District

As shown in Table AIV-1, from 2014 to 2021, there was no pattern to which type of rural district had the greatest percentage of teachers employed on an emergency permit. However, with the post-COVID increases in attrition and teacher shortages, a pattern emerged where rural remote districts had the greatest percentages of teachers employed on emergency permits. The differences were relatively large and worthy of concern. The reasons behind these differences are unknown but should be investigated.

One potential factor in this pattern could be rural remote districts have the most difficult time recruiting and hiring teachers. Many of the districts are far from a TPP and send very few students to college, thus have no established pipeline of teachers to come to the district. Another possibility is that rural remote districts are very small and simply 1 or 2 teachers can dramatically increase the percentage of teachers on an emergency permit.

**Table AIV-1: Percentage of Teachers Employed
on an Emergency Permit by Type of Rural District**

Type of Rural District	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rural: Fringe	2.6	3.0	4.3	2.8	2.5	3.8	4.5	5.4	5.2	5.0
Rural: Distant	2.3	2.7	2.8	3.1	3.2	5.4	5.4	6.0	5.5	5.0
Rural: Remote	1.8	2.8	4.3	3.1	4.4	4.4	6.0	7.1	8.8	6.6

Teachers Assigned Out-of-Field by Type of Rural District

As shown in Table AIV-2, the percentages of teachers assigned out-of-field were substantially greater in rural remote districts than the other two types of rural districts. Again, as with emergency permits above, the differences were relatively large and worthy of concern. The reasons behind these differences are unknown but should be investigated.

One potential factor in this pattern could be rural remote districts have the most difficult time recruiting and hiring teachers. Many of the districts are far from a TPP and send very few students to college, thus have no established pipeline of teachers to come to the district. Another possibility is that rural remote districts are very small and simply

1 or 2 teachers can dramatically increase the percentage of teachers on an emergency permit.

Table AIV-2: Percentage of Teachers Assigned Out-of-Field by Type of Rural District

Type of Rural District	2021	2022	2023	2024
Rural: Fringe	9.5	13.2	12.6	8.4
Rural: Distant	12.4	16.8	17.2	12.0
Rural: Remote	14.0	20.1	23.6	15.1

TQI by Type of Rural District

In this section, further geographical distinctions are made among school districts. Three types of rural districts are fringe, distant, and remote. In general, fringe is closest to an urban area and remote is the furthest from an urban area with distant being in-between the two.

Table AIV-3 shows that rural fringe districts had greater teacher quality than rural distant districts which, in turn, had greater teacher quality than rural remote. Thus, rural remote public school districts had the lowest teacher quality of the three types of rural school districts.

While we do not know the causes of this pattern, distance to a TPP is likely one cause. Relatedly, since rural distant districts tend to be very small, they do not send very many students to college, including to major in education. Because TPP graduates tend to choose employment either where they graduated from high school or where they graduated from college, these two factors may explain some of the reasons behind the results shown below in Table AIV-3.

Table AIV-3: Teacher Quality Index Values for Rural Districts by Type of Rural District

District Type	Teacher Vacancies	Emergency Permits	Novice Teachers	Student Teacher Racial Disparity	Out-of-Field	Teacher Attrition	Overall TQI
Rural Fringe	0.345	0.458	0.479	-0.268	0.407	0.472	0.383
Rural Distant	0.288	0.364	0.485	0.000	0.404	0.390	0.360
Rural Remote	0.268	0.321	0.380	-0.541	0.069	0.176	0.204

Data Source: PDE vacancy files, emergency permit files, teacher employment files, ESSA report, NCES student enrollment files, and NCES district geographic locale file.

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Laura R. Dimino, Ph.D., Assistant Director

Michaela Miller, Quantitative Data Analyst

Kaitlyn Goode, Data Visualization Specialist

Linda Hinson, Office Manager/Controller



625 Forster St., Room 902, Harrisburg, PA 17120

717-787-9555 | www.rural.pa.gov