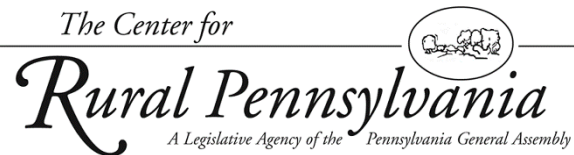


# K-12 Teacher Supply, Demand, and Shortages in Pennsylvania

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*\*Note: The original publication included four authors. Two authors requested to have their names removed because they felt their contribution levels to the study did not warrant co-authorship. Their decision does not reflect on their perceptions of the study's quality, contents, or recommendations. Updated: August 2020.*

## EXECUTIVE SUMMARY

Pennsylvania has long been known as an exporter of teachers and has rarely been mentioned as a state experiencing a shortage of teachers in areas other than the traditional shortage areas of mathematics, selected science courses, English Language Learner, and special education. Recent news stories and evidence, however, suggest a growing shortage across the state. This research, conducted in 2018-2019, used state administrative data, data collected by other entities, a focus group, and a survey of principals and superintendents to review the supply and demand of teachers to identify and understand existing and projected shortages of teachers in the Commonwealth.

### **Supply of Teachers**

According to the research, the supply of teachers in Pennsylvania has declined dramatically from 2011-12 to 2017-18. Indeed, the number of Instructional I licenses granted by the Pennsylvania Department of Education (PDE) decreased by at least 49 percent for all subject areas. For eight of the 11 areas, the decline was at least 60 percent, and there was at least a 70 percent decline for secondary mathematics, technology-related areas, and physical/health education. Thus, across all subject areas, there have been dramatic declines in the number of newly licensed teachers for every subject area. Pennsylvania, as shown in this report, has experienced some of the steepest declines in the number of students enrolled in teacher preparation programs (TPPs) and the number of graduates from TPPs of all states. In addition, the number of teachers entering the Commonwealth from out-of-state and the number of teachers transferring from private schools or returning to teaching after a hiatus have all declined as well.

In sum, Pennsylvania has experienced a dramatic decline in the supply of new teachers—a decline that is greater than the majority of states across the nation. This suggests potentially serious issues in the pipeline of prospective teachers in the Commonwealth.

### **Demand for Teachers**

The number of students enrolled in early education (EE) through 12<sup>th</sup> grade in Pennsylvania public schools influences the demand for teachers. There has been—and will continue to be—a decline in the number of EE-12 students enrolled across the state. The declines will be greatest for rural districts, thus rural districts will experience a greater decrease in the demand for teachers than elsewhere in the state.

In addition, the ratio of students to teachers slightly impacts the demand for teachers. There have been slight declines in the student-teacher ratio over the past 6 years. These declines were similar for urban and rural districts and will continue over the next decade for most districts. This will minimally increase the demand for teachers in most districts across the state.

Finally, teacher attrition in Pennsylvania is lower than in most other states and the attrition rates for Pennsylvania rural districts (6.4 percent in 2012-13 and 4.7 percent in 2016-17) have been lower than for urban districts (6.7 percent in 2012-13 and 5.5 percent in 2016-17). An increase in the percentage of those eligible to retire—especially in rural districts—will likely result in slight increases in teacher attrition in the next decade.

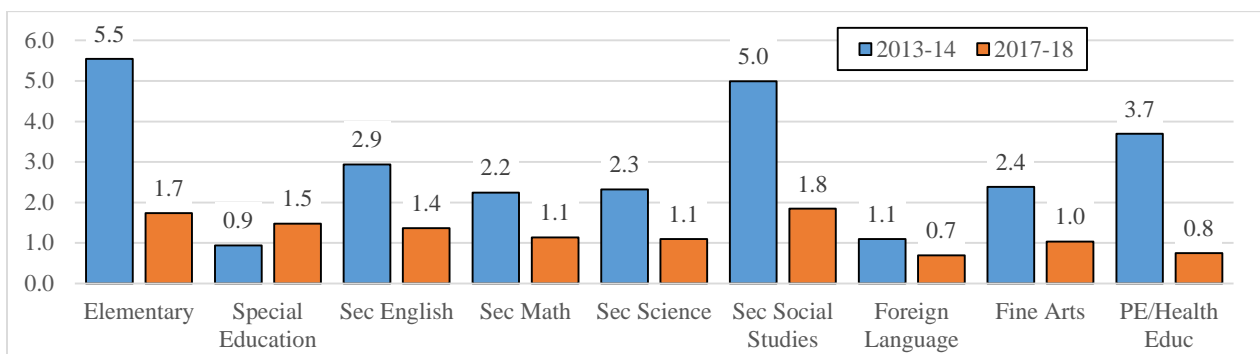
In sum, this study suggests the demand for teachers will increase slightly over the next decade. However, this trend will have a marginal effect on the balance between the supply and demand for teachers in Pennsylvania relative to the effects of the supply of teachers.

## Estimates of Teacher Shortages

There is no commonly accepted definition of a teacher shortage. One measure is a comparison of the supply of teachers to the demand for teachers. As further evidence, researchers often examine changes in the qualifications of teachers as evidence of the degree to which the supply of teachers is sufficient to meet the demand for teachers.

As shown in Figure 1, the ratio of new Instructional I licenses granted by PDE to the number of beginning teachers hired in the same subject area has declined substantially across all subject areas with the exception of special education.

Figure 1: Ratio of Number of In-State New Instructional I Certificates To the Number of Beginning Teachers Hired by Major Subject Area (2013-14 and 2017-18)



Data Source: PDE Aggregate Licensure files and Educator Employment Files; Calculations by researchers

The declines over time and very low ratios strongly suggest the pool of prospective teachers from which districts hire beginning teachers has become too small to meet the demand for beginning teachers. Evidence that this reduced supply is impacting district hiring practices is supported by the dramatic increase of more than 400 percent in the number of teachers on emergency permits from the 2011-12 to 2017-18 academic years.

## Conclusions on Supply, Demand, and Shortages

At best, there will be a small increase in the supply of teachers over the next 5 to 10 years. There will likely be little change in the demand for teachers as declining student

enrollments that lead to a decrease in the demand for teachers are offset by increased attrition of teachers due to retirement and declining student-teacher ratios.

There is a shortage of teachers in Pennsylvania as evidenced by the ratio of newly prepared teachers to the number of beginning teachers hired, the dramatic increase in the number of teachers employed on long-term emergency permits, press reports, responses to surveys, and districts' indications of shortage areas. The shortage is much more acute in specific subject areas and for specific areas of the state. The subject areas include special education, English Language Learner in urban areas, secondary math, and secondary science (physics, chemistry, and other advanced courses). To a lesser extent, evidence also suggests there may be shortages for secondary social studies, foreign language, physical/health education, and fine arts (music and art).

With respect to location, there are shortages in some of the large city districts and in some rural districts. In particular, there is evidence of current shortages in districts in the Philadelphia Metro, North Central, and South Central regions of the state. There is also evidence that many rural districts are experiencing difficulty in finding a sufficient supply of teachers in a wide array of subject areas. These shortages are projected to, at best, persist over time.

### **Potential Causes and Policy Considerations**

The primary cause of the shortage in Pennsylvania is the insufficient supply of individuals willing to enter the teaching profession. There are myriad underlying factors influencing this trend, but there has yet to emerge a clear research consensus about all of the factors. One factor that clearly influences the supply of teachers is compensation (Borman & Dowling, 2008). Recent research suggests Pennsylvania teacher salaries have declined relative to alternative occupations (Allegretto & Mishel, 2018; Baker, 2020). Moreover, evidence also



suggests recent legislative changes to the pension system for teachers would serve to reduce rather than increase entry into the teaching profession (Keefe, 2018).

In addition, the cost of higher education in Pennsylvania is greater than in almost every other state and the costs continue to increase (Cooper, 2017). In making decisions about career choices, individuals make an economic calculation about future salary and the increasing level of debt needed to obtain a degree coupled with pay schedules that are not competitive with other occupations may be swaying them to enter alternative occupations (Boe & Gilford, 1992). Policymakers could address this issue using multiple strategies, including reduced tuition for education majors, loan forgiveness programs that incentivize teaching for up to 5 years, and increasing teacher salaries to make loan repayment easier.

Certification rules have also been identified by superintendents and TPP personnel as problematic. Thus, policymakers should conduct a complete review of the certification process and remove unnecessary barriers that prevent entry into the teaching profession. In particular, policymakers should consider creating certification spans of Early Childhood through grade six and grade six through high school to better align with how schools are organized. Policymakers may also want to review the rules governing how TPPs operate. The goal should be to prepare effective teachers. Rather than continually adding additional rules and regulations, PDE might consider allowing more freedom and flexibility to TPPs in return for greater oversight and accountability.

Finally, policymakers should focus on additional and improved data collection regarding educator supply, demand, and shortages. Current data do not allow for the accurate identification of supply and demand nor patterns of mobility, particularly with respect to teachers from the different TPPs. In addition, PDE should annually administer a detailed survey of districts about

teacher supply, demand, quality, and shortages. This would provide much more detailed and useful information for policymakers.

The final policy suggestion is for state leaders to highlight the benefits of entering the teaching profession. With encouraging words, state leaders can positively impact the number of individuals considering the education profession as a career.

### **Introduction**

Researchers and policymakers widely recognize teachers are the single most important in-school factor influencing a variety of student academic and non-academic outcomes (Opper, 2012). Indeed, well-prepared, experienced, and effective teachers improve both academic and socio-emotional outcomes (Kraft, 2019), and are critical to ensuring students are prepared to be successful for life after high school (Chetty, Friedman, & Rockoff, 2011). Not only do teachers influence postsecondary transitions and success, quality teachers also improve student socio-emotional ability and resiliency well after primary education, and, moreover, offset several factors associated with disadvantaged backgrounds (Chetty, et al., 2011; Murray, & Pianta, 2007; Wang, Brinkworth, & Eccles, 2012). In short, quality teachers affect a wide range of outcomes for students. Unfortunately, however, not all students have access to such teachers.

A large body of research has, in fact, demonstrated students most in need of high-quality teachers are the least likely to have access to them (Clotfelter, Ladd, & Vigdor, 2005; Goldhaber, Lavery, & Theobald, 2015; Lankford, Loeb, & Wyckoff, 2002). For example, students of color in low-income schools are between three and 10 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, Butler, Cowen, Streams, & Toma, 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). Efforts to address the issue, including alternative pathways, bonus pay, and training subsidies, have received little attention from researchers (Gagnon & Mattingly, 2015), and existing evidence suggests such efforts have met with only mixed results at best (Adamson & Darling-Hammond, 2012; Gagnon & Mattingly, 2015).

This lack of access to well-qualified teachers is influenced by the shortage of teachers in particular schools and subject areas that are, in turn, influenced by systematic patterns in applicant preferences, hiring practices, mobility, and attrition (Simon & Johnson, 2015). Even prior to the recent decline in the production of teachers across the nation and in Pennsylvania, there have been persistent shortages of certified STEM and special education teachers across all schools (Boe & Cook, 2006; Simon & Johnson, 2015). Such shortages have been exacerbated in high-poverty schools by high rates of teacher attrition (Goldhaber, Lavery, & Theobald, 2015; Sutchter, Darling-Hammond, & Carver-Thomas, 2019), and in rural schools by difficulty in attracting applicants (Gagnon & Mattingly, 2015; Monk, 2007).

While Pennsylvania has rarely experienced anything other than isolated teacher shortages, recent evidence suggests a growing number of districts face a shortage of teachers. 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 (Mansfield, 2019; McDevitt, 2019; VanAsdalan, 2019). Indeed, the Pennsylvania Department of Education has designated a number of districts and subject areas as having a shortage of teachers (U.S. Department of Education, n.d.). While these listings have shown shortages of teachers have

typically plagued urban areas, more recent listings of districts and intermediate units (IUs) designated as experiencing a shortage of teachers suggests rural districts are now experiencing a shortage of teachers. For example, as reported by PDE to the U.S. Department of Education (n.d.), only two of the eight districts listed as having a shortage of teachers in 2014-15 were rural. In 2016-17, 16 of the 33 districts listed as having a teacher shortage were rural. Similarly, in their list of IUs experiencing a shortage of teachers for the 2014-15 school year, PDE reported three rural IUs, five urban IUs, and one IU with a mix of urban and rural districts. In 2016-17, PDE reported six rural IUs, six urban IUs, and two IUs with a mix of urban and rural districts were experiencing a shortage of teachers.

Specific to rural districts, two issues stand out. First, research has found rural schools have difficulty in attracting applicants because lower funding levels often lead to lower pay—a clear obstacle to luring applicants to vacant positions (Fowles, et al, 2014; Gagnon & Mattingly, 2015). In fact, because their salaries are lower than other districts, rural districts would have disproportionately benefitted from Governor Wolf’s recent proposal to increase the minimum teacher salary to \$45,000 (Patriot News, 2019).

Second, graduates from teacher preparation programs (TPP) have a strong preference for working in districts near their home or near their TPP (Boyd, Lankford, Loeb, & Wyckoff, 2005; Krieg, Theobald & Goldhaber, 2016; Strauss, 1999). 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 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). Further, many rural districts are in areas of the state with limited access to TPPs. As shown later in this study, a number of districts are in regions in which few, if any, individuals

obtain initial licensure each year in subjects such as mathematics, science, fine arts, and foreign language, and for courses such as physics and chemistry. In comparison, evidence suggests most urban districts are in regions that tend to have greater numbers of individuals obtaining licensure in all subject areas. Thus, in Pennsylvania, extant evidence suggests rural school districts may face greater barriers than urban districts in recruiting and hiring well-prepared teachers.

These trends suggest teacher shortages are now impacting rural areas of the Commonwealth at least to the same degree as urban areas. In short, there is ample evidence to warrant the investigation of current and projected teacher shortages across the Commonwealth, and, in particular, rural areas of the Commonwealth that may not have previously experienced shortage of teachers.

### **Goals and Objectives**

This project addresses five important issues related to teacher supply and demand in Pennsylvania. First, this study examines the historical supply of teachers. The analysis of supply includes an examination of:

- Individuals retained in the teaching profession from the prior year;
- Newly licensed teachers from Pennsylvania TPPs;
- Newly licensed teachers from TPPs outside of Pennsylvania;
- Other newly hired teachers, such as returning teachers and teachers transferring from positions in a private school; and,
- Teachers on emergency permits.

When possible and appropriate, data are presented for both rural and urban districts as well as by region of the state and subject area.

Second, this study examines historical patterns of the demand for teachers. Specifically, the study examines the following elements of the demand for teachers:

- The number of K-12 students enrolled;
- Student-teacher ratios; and,
- Number of vacated positions needed to be filled (teacher attrition).

Again, when possible and appropriate, data for both rural and urban districts as well as by region of the state and subject area are presented.

Third, this study investigates the shortage of teachers in the Commonwealth using three strategies:

- Comparing the supply of newly licensed teachers to the number of beginning teachers hired in districts;
- Examining the trends in the number and percentage of teachers on emergency permits; and,
- Examining the perceptions of principals and superintendents about the degree of difficulty in hiring well-qualified teachers in a wide array of teaching positions across all three school levels.

Finally, existing data are used to make projections about the future supply, demand, and surplus/shortage of teachers through 2026 for each district in the Commonwealth.

The remainder of this study begins with a review of definitions and methods of identification and then proceeds to data and methods. This is followed by the four main sections of the study: supply, demand, estimates of the shortage, and future projections. The study concludes with policy implications.

## **Definitions**

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

### **School Level**

School level is used to identify three levels of 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**

The supply of teachers is defined as the pool of all individuals eligible to be hired as a teacher in a Pennsylvania public school. There are five sources of the supply of teachers, each of which is described below.

- 1) In-State Beginning Teachers: beginning teachers who obtained their teaching license (either an Instructional I license or an emergency permit) from a Pennsylvania TPP;
- 2) Out-of-State Beginning Teachers: beginning teachers who obtained their teaching license from a TPP located in another state or from an online program whose headquarters is not in Pennsylvania;
- 3) Returning (Reserve Pool) Teachers: teachers who previously taught in a Pennsylvania public school and are returning to teaching in a Pennsylvania public school after an absence from teaching in a Pennsylvania public school for at least one year;
- 4) Out-of-State Transfer Teachers: teachers who previously taught in a state other than Pennsylvania and are entering a teaching position in a Pennsylvania public school; and,
- 5) Private School Transfer Teachers; teachers who previously taught in a private school in Pennsylvania and are transferring to teach in a Pennsylvania public school.

## **Instructional I License**

Instructional I licenses are granted to individuals completing their teacher preparation program (either in Pennsylvania, in another state, or in another country) and to individuals transferring into a Pennsylvania public school from another state or country and have two or fewer years of teaching experience.

## **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 from the public school entity and completion of conditions set by the Department. (PDE website <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.

## **Beginning Teacher**

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

## **Newly Hired Teacher**

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

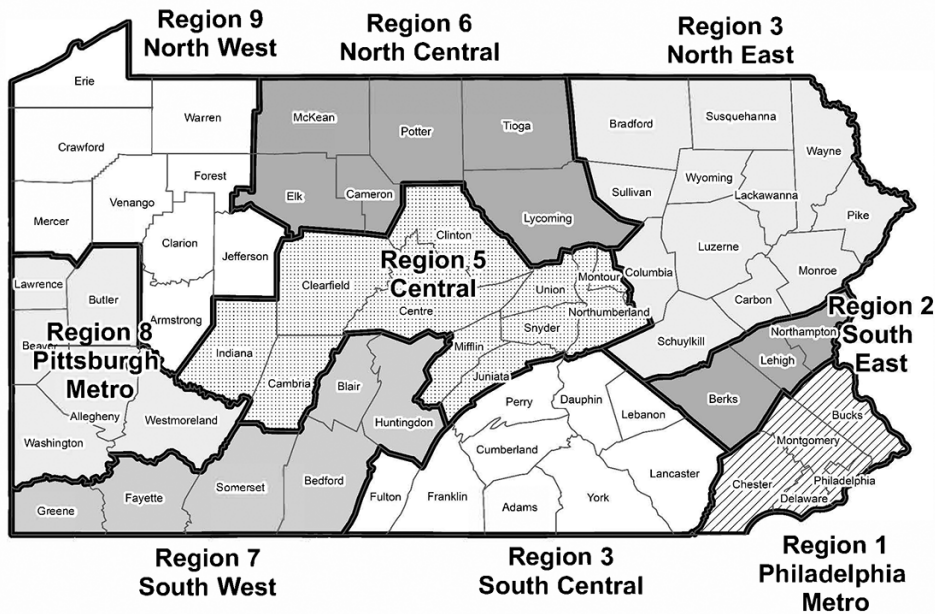


school in year X-1. A newly hired teacher could be a beginning teacher, a teacher returning to the profession after leaving teaching, a teacher transferring into a Pennsylvania public school from a Pennsylvania private school, or a teacher transferring into a Pennsylvania public school from another state. 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. As noted elsewhere, the data do not allow the researchers to accurately identify the specific origin of many newly hired teachers.

### **Pennsylvania Regions**

This report presents information by region in Pennsylvania. The study's researchers created nine regions of the state. These regions included the Philadelphia Metropolitan Statistical Area (hereafter referred to as Philadelphia Metro), South East, North East, South Central, Central, North Central, South West, Pittsburgh Metro, and North West. These regions and the counties that constitute the regions are displayed in Figure 2.

Figure 2: Pennsylvania Regions and Their Counties



## Data

The majority of the data used in this study was from PDE. A few other data sets were also used. Each data set is described below.

### 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 to the study's researchers have a unique identifier that is common across school years that allowed for the calculation of retention and attrition. The identifiers in the files located on the PDE website are not common across years.

The files indicate each unique educator with an identification number as well as their first, last, and middle name. The data also identify the employing school and district for each educator using both the names and identifying numbers used by PDE. In addition, the data

include 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 provided the teacher employment files for the 2012-13 through 2017-18 school years, which allowed for the calculation of teacher attrition from 2012-13 to 2013-14, 2013-14 to 2014-15, 2014-15 to 2015-16, 2015-16 to 2016-17, and 2016-17 to 2017-18.

### **Individual Teacher Licensure Data**

These data were provided by PDE and include each license obtained by an individual, the level of the license (emergency permit, Instructional I license, Instructional II license), and, in some cases, the TPP that recommended the person for licensure. More specifically, the data identify if a person holds an Instructional I and/or Instructional "Mathematics 7-12 (6800)" license or any other license granted by PDE. The data do not, however, include all individuals obtaining licensure from PDE. According to PDE, state statute only allows PDE to provide licensure data on those individuals who obtain employment in a Pennsylvania public school. Thus, this data set cannot be used to calculate the total number of licenses granted in a particular subject area in a particular year. This limited nature of the licensure data makes it impossible to accurately estimate the number of teachers who obtain licensure but do not find employment in a Pennsylvania public school. In short, the limited nature of the data ensures researchers cannot

accurately estimate the reserve pool of teachers—a critical component of estimating the supply and shortage of teachers.

### **Aggregate Instructional I Licensure Data for Teachers**

Because the individual licensure data could not be used to produce an accurate count of individuals obtaining initial Instructional I licenses, this study relies on data on aggregate counts of initial Instructional I licenses granted by PDE. The data are aggregated by TPP and for the entire Commonwealth. There are also counts of individuals obtaining licensure by subject area. All of the data can be found in the PDE Act 82 report located at:

<https://www.education.pa.gov/DataAndReporting/Pages/Act82.aspx>.

### **Aggregate Out-of-State Instructional I Licensure Data for Teachers**

Because the individual certification data file does not include a TPP for all individuals in the data set, it is impossible to accurately count the number of out-of-state teachers. Thus, this study relies on Act 82 data, which include counts of out-of-state teachers. The data can be found at: <https://www.education.pa.gov/DataAndReporting/Pages/Act82.aspx>.

### **Emergency Permit Data**

This study also relies on the Act 82 data to identify the number of individual teachers on an emergency certificate for each district, subject area, and for the Commonwealth. The data can be found at: <https://www.education.pa.gov/DataAndReporting/Pages/Act82.aspx>.

### **Title II TPP Enrollment and Completion Data**

To compare enrollment in and completion of TPPs, this study relied on the U.S. Department of Education Title II data. These data include information about the number of individuals enrolled in TPPs in each state, and the number of TPP completers in each state. The

data are the most accurate available (Cowan, Goldhaber, Hayes, & Theobald, 2016). The data for all states can be found at: <https://title2.ed.gov/Public/Home.aspx>.

### **SAT Intended Major for Pennsylvania**

An additional source of data that can inform perspectives on the future supply of newly licensed teachers is the number and percentage of students taking the SAT who declared education as their intended college major. When students take the SAT, they are also invited to complete a survey about their personal information and goals about college. This information is available at: <https://reports.collegeboard.org/sat-suite-program-results>.

### **Shortage Designation Data**

Each year, state education agencies submit designated shortage areas and districts designated as having a shortage of educators to the U.S. Department of Education. States collect the data through the use of surveys of districts. The data include specific positions and subject areas for which there is a shortage of educators. The data can be found at:

<https://tsa.ed.gov/#/home/>.

### **Student Enrollment**

Student enrollment data were obtained from the PDE website. The data include 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 the study. The data can be found at:

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

### **Student Enrollment Projections**

PDE also makes district-level enrollment projections through the coming decade. Based on data covering birth cohorts and other measures, the data project the number of students enrolled in each district. The data can be found at:

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

The methodology used to make the projections can be found at:

<https://www.education.pa.gov/Documents/Data%20and%20Statistics/Enrollment/Enrollment%20Projections/Enrollment%20Projections%20Model.pdf>.

## **District Type**

District type is included in many of the district-level data files on the PDE website. The data identify districts as public districts, Career and Technology Centers, Charter Schools, and State Schools (for special education students or incarcerated students).

## **School Level**

School level was determined by the grade configuration and school level designations included in the school-level data on the *Future Ready Index* website from PDE. This information can be found at: <https://futurereadypa.org/Home/DataFiles>.

## **Methods**

This section describes the methods used to identify various types of teachers and to make the different calculations. 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 the tables or figures. The methods below include both how the study's researchers constructed certain pieces of data as well as the methods used to analyze data.

## **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. This calculation was performed six times across seven academic years: 2011-12 to 2012-13, 2012-13 to 2013-14, 2013-14 to 2014-15, 2014-15 to 2015-16, 2015-16 to 2016-17, and 2016-17 to 2017-18.

**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. As noted elsewhere, the data do not allow the researchers to accurately identify the specific origin of many newly hired teachers.

Unfortunately, the data provided by PDE did not allow for the accurate decomposition of newly hired teachers into these five specific sources. There were three primary issues with the PDE data that prevented the researchers from accurately identifying the source of each newly hired teacher. First, a substantial percentage of teachers obtaining Instructional I licenses did not have any TPP name listed in the data file. Thus, the data did not definitively identify whether a person obtained their initial license after completing an in-state or out-of-state TPP. Thus, while the data can be used to identify a beginning teacher, the data cannot be used to accurately determine if individuals are beginning teachers from a Pennsylvania TPP or an out-of-state TPP.

Second, the educator employment data only included employment information from the 2012-13 through 2017-18 academic years. This makes the identification of returning teachers incredibly difficult. For example, the individual in row one in Table 1 would be a returning

teacher because she taught in a Pennsylvania public district in 2011-12, did not teach at all in 2012-13, and then returned to teaching in a Pennsylvania public district in 2013-14. Likewise, the individual in row three would be considered a returning teacher because she was employed in a Pennsylvania school district in 2011-12, left the Pennsylvania public system to teach in a Pennsylvania private school, then returned to teach in a Pennsylvania district in 2013-14. Yet, because PDE did not provide employment data for 2011-12, it is impossible to identify either individuals as a returning teacher.

Further, reliance on years of teaching experience does not necessarily help to identify teachers returning to the profession. For example, 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 2 or 3 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 2 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 3 years of teaching experience.

Another issue with the data was that they 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 rows four through eight, each of the teachers could have a reported 2013-14 years of experience as 1, 2, or 3. 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 1: Hypothetical Teacher Employment Patterns

	Employed in		Experience 2013-14	Returning Teacher
	2011-12	2012-13		
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

Because the PDE data provided did not allow for the accurate identification of either “out-of-state” teachers or “returning” teachers, this study collapsed both sets of teachers into one group of teachers labelled as “other” teachers.

The study’s researchers performed simple descriptive statistics to analyze the data.

**Beginning teachers.** To identify teachers as beginning teachers, the researchers relied on PDE employment data from 2012-13 through 2017-18. 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 2 to reveal these issues. The first column includes a teacher identifier, the next six columns contain the original experience data for each of 6 academic years, and the final six columns contain the modified experience data for the same 6 academic years.

The first of the two major errors with the experience data was that there was data entry error. For example, the years of experience entry for teacher 32 in Table 2 was incorrect for the 2017-18 academic year. The data for the 4 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. According to Dr. Joe Clapper (2020), 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 to not recognize an individual’s experience in another district. Thus, the individual’s historic record of years of experience over a 5-year time span could be 1, 2, 3, 9, 10 (see teacher 21 below in Table 2), where the individual changed districts after year 3 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 205 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 3 or 4 consecutive years of employment, the prior entries were simply data error. Such errors are not easily resolved.

To remove errors, the researchers took a number of steps. When 3 or more consecutive years of teacher experience were correct and represented the end years of the data, such as for

Teacher 32 in Table 2, the researchers 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 used.

Unfortunately, because there is only had 6 years of data, the researchers were forced to make many assumptions in rectifying erroneous teacher experience data. However, Dr. Fuller has over 20 years of experience in working with individual teacher experience files in Texas, New Mexico, and Ohio. Based on his expertise—which has been reviewed by other academics and accepted in court cases—the researchers strongly agree the revised data are far more accurate than the original data.

Table 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
203		9	11	3	4	5		1	2	3	4	5
204		12	2	3	4	5		1	2	3	4	5

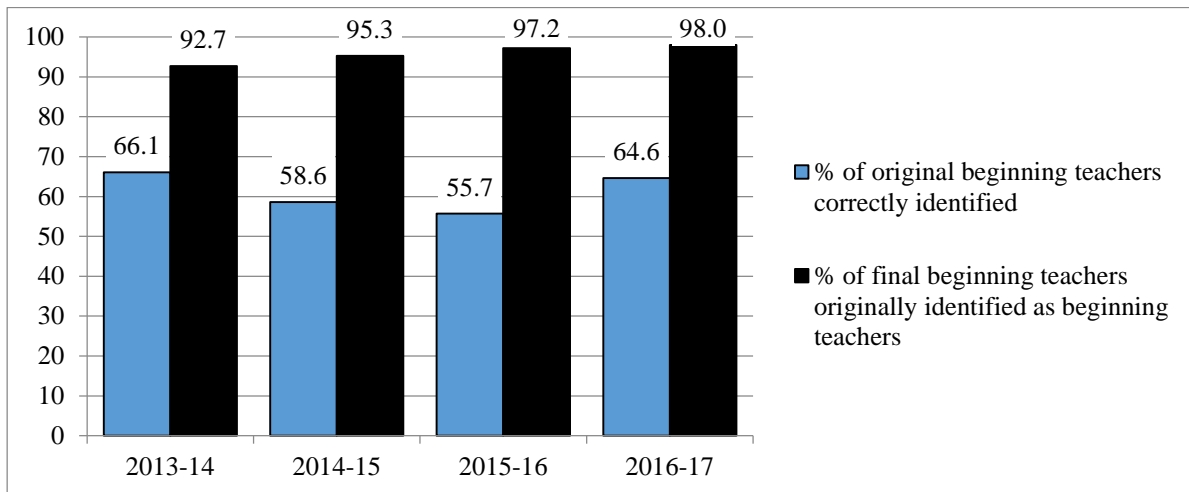
Source: PDE Educator Employment Data

Figure 2 below documents the changes the researchers made to the teacher experience data. The researchers found between 55.7 percent (in the 2015-16 academic year) and 66.1 percent (in the 2013-14 academic year) of the teachers originally identified as beginning teachers using PDE data did, in fact, meet the criteria for being identified as a beginning teacher. For the

approximately 35 to 45 percent of teachers incorrectly identified as beginning teachers using PDE data, an individual had more than one academic year in which s/he was listed as having 1 year of education experience. For example, Teacher 44 in Table 2 above is identified as a beginning teacher twice—both in the 2013-14 and 2014-15 academic years. Clearly this could not be the case, thus the researchers changed the data to reflect that the teacher was very likely a beginning teacher in the 2013-14 academic year and then was in their second year in 2014-15.

The number of teachers incorrectly identified as beginning teachers in each year, starting with 2013-14, were; 9,353; 11,755; 12,025; and 7,303.

Figure 2: Accuracy of Identification of Beginning Teachers



Data Source: PDE teacher employment data; Calculations by researchers

The study’s researchers performed simple descriptive statistics to analyze the data.

**Initial Instructional I Licensed Teachers.** PDE provided two files to the researchers—one at the individual teacher level and one aggregated at the preparation program level.

The individual teacher file included all educators obtaining any type of licensure from PDE. Employees of PDE noted that the accuracy of the data increased over time such that the most recent data, in their opinion, were the most accurate. The file included the type of license

(Instructional I, Instructional II, and emergency permits), the date when the license was granted by PDE, and the TPP completed by the individual. However, there was a substantial amount of missing data about the TPP completed by individuals. This missing data were more prevalent in earlier years when the data were, according to PDE, not as accurate. The individual level data provided by PDE was problematic in that state statute does not allow the release of records on individuals obtaining licensure who do not gain employment in a Pennsylvania public school. So, for example, if policymakers wanted to know the number and percentage of TPP graduates who did not obtain employment in a Pennsylvania school as one measure of the reserve pool of teachers, they would ask a researcher to calculate this by merging teacher employment data onto the complete list of individuals who obtained licensure. The number of individuals for whom there was no employment data could be considered members of the reserve pool since they would be eligible to teach in a Pennsylvania public school but, for whatever reason, chosen not to. Texas and other states collect and make available such data. In fact, when in Texas, Dr. Fuller used such data to provide reports to the Texas Legislature on the reserve pool of teachers as one element of the supply of teachers in that state. In Pennsylvania, researchers cannot currently estimate the reserve pool because, according to PDE, state statute prohibits them from sharing the complete set of individuals who obtain licensure each year.

Thus, the researchers relied primarily on the data that were aggregated at the TPP level. This data file included the following information: TPP name, year, credential, credential type (Instructional I, Instructional II, emergency permit), and the number of credentials associated with the TPP. The file included all credentials obtained from 2011-12 through 2017-18. The file did not include information about English as a Second Language credentials.

The study's researchers performed simple descriptive statistics to analyze the data.

**Other teachers.** “Other” teachers in this study included three categories of teachers: those who entered a Pennsylvania public school from out-of-state, either from a public or private school; those who transferred from a Pennsylvania private school into a Pennsylvania public school; or those who resumed their teaching careers in a Pennsylvania public school after taking a hiatus from teaching in a Pennsylvania public school. Teachers in the “other” category do not include teachers who were on sabbatical leave as teachers on sabbatical were counted as employed. The study’s researchers performed simple descriptive statistics to analyze the data.

**Out-of-State Teachers.** Because of the aforementioned issues with the individual teacher licensure data, this study relied on the aggregate data on out-of-state teachers provided in the Act 82 data referenced above. The study’s researchers performed simple descriptive statistics to analyze the data.

**Enrollment in TPPs by state.** Data for all states were downloaded into Excel for the 2008-09 through 2016-17 academic years. In order to remove the influence of outlier years, the study’s researchers averaged the number of TPP enrollees for each state for the 2008-09, 2009-10, and 2010-11 academic years as well as for the 2014-15, 2015-16, and 2016-17 academic years. The difference in the two averages was then calculated for each state, with the earliest average being subtracted from the most recent average.

**TPP Completers by state.** Data for all states was downloaded into Excel for the 2008-09 through 2016-17 academic years. In order to remove the influence of outlier years, the study’s researchers averaged the number of TPP completers for each state for the 2008-09, 2009-10, and 2010-11 academic years as well as for the 2014-15, 2015-16, and 2016-17 academic years. The difference in the two averages was then calculated for each state, with the earliest average being subtracted from the most recent average.

**SAT Intended Major.** Data from the “College-Bound Seniors” report for Pennsylvania was downloaded from The College Board website or entered by hand from information on The College Board website. The researchers performed simple descriptive statistics to analyze the data.

## **Demand for Teachers**

**Student Enrollment.** Student enrollment data were downloaded from the PDE website for the 2011-12 through 2017-18 school years. All years of data were merged together using the unique AUN number 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 year X and dividing by the number of teacher FTEs in that district in year X. The number of students was downloaded from the PDE website. The number of teacher FTEs was calculated by summing all of the teacher FTEs 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. In these calculations, substitute teachers were considered employed. Most of the analyses of teacher attrition were based on descriptive statistics.

In addition, this study includes a statistical analysis of teacher attrition. When an outcome variable such as teacher attrition is binary, in that a teacher either remains in the teaching profession or does not, then one of the appropriate statistical approaches is logistic regression analysis. In logistic regression analysis, the outcome variable is binary (1=teacher leaves the

profession and 0=teacher remains in the profession) and the results are provided in odds ratios. These odds ratios indicate if a factor—such as being employed in a rural district—is associated with leaving the profession.

Thus, to determine if rural teachers were more likely to leave the profession than urban teachers, the study’s researchers used logistic regression analysis. To isolate the effect that working in a rural district had on the odds of leaving the profession, the analysis controlled for the effects of personal characteristics (age, gender, race, salary, and years of education experience), the total number of students enrolled in a district, the percentage of students participating in the federal free-/reduced-price meals program, the location of districts in the Philadelphia and Pittsburgh Metro areas, and an indicator if an educational organization was a charter school. Also included was an indicator of whether the teacher is employed in a rural district to identify the relationship between working in a rural district and the odds of leaving the teaching profession. Because the relationship between teaching experience and attrition is not linear, the analysis included both teaching experience and teaching experience squared. Teacher salaries were also included in the analysis, but instead of including the salaries reported in the teacher employment files from PDE, the study’s researchers adjusted the salaries using the comparable wage index (CWI) developed by Lori Taylor (see Taylor & 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 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. The list of comparable occupations is included in Taylor and Fowler (2006) on pages A-5 through A-11. See Taylor and Fowler (2006) for how the CWI operates in the analysis below. Finally, all teachers employed in Pennsylvania public school districts in the 2012-13 through 2016-17 school years were included in the analysis.

### **Shortage of Teachers**

Unfortunately, there is no commonly accepted definition of a shortage of teachers. In almost all cases, districts find an adult to serve as the teacher of record for classrooms. In such instances, shortage is only defined by the qualifications of the adults serving as teachers. For example, districts may hire an individual on an emergency permit or may place a teacher in an assignment that is out of their licensure area. In rare instances, districts cannot find anyone to fill an open position and must resort to increasing class sizes.

Most commonly, a shortage of teachers is evidenced by reports of difficulties in hiring appropriately qualified individuals for vacant teaching positions and changes in the observable qualifications of teachers, such as if their license matches their teaching assignment.

**Comparison of Initial Licenses and Beginning Teachers.** In this study, the shortage of teachers was measured using three strategies. First, researchers compared the number of new in-state Instructional I licenses granted by PDE to the number of beginning teachers hired each year. In times of a surplus of teachers, the ratio of newly granted Instructional I licenses to the number of beginning teachers is much greater than one-to-one. In times of shortage, this ratio gets smaller. This strategy aligns with basic economic and human capital theory in that the greater number of applicants for a position, the more selective the organization can be and the better the fit between the chosen candidate and the organization (Boe & Cook, 2006; Boe & Gilford, 1992; Sutchter, et al., 2019). The greater selectivity and better fit are associated with an

increase in the quality of the individual hired and greater odds of retaining the individual (Boe & Cook, 2006).

**Emergency Permits.** The second strategy was to examine trends in the use of emergency permits. As described later 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 license 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 teachers exists in the trends in any shortages of teachers (Sutcher, et al., 2019).

**Designated Shortage Areas.** The third strategy was to examine the subject areas designated as having a shortage area by PDE as well as the districts and IUs designated as having a shortage of teachers by PDE. Increases or decreases in these designations can signal changes in the shortages of teachers across years.

**Survey of Administrators.** The fourth strategy was to obtain the opinions of superintendents and principals about the difficulty level of hiring teachers in their districts and schools. To do so, the researchers surveyed approximately 450 superintendents and 3,250 principals across the Commonwealth. Researchers also attended a meeting at IU10 and conducted a focus group with 11 superintendents. IU10 was chosen as part of another study focusing on the perceptions of rural superintendents and teacher shortages.

After a review of similar surveys used in other states and research on the topic, the researchers designed the survey. School and district administrators reviewed the initial draft and suggested changes. After these changes were made, the survey was distributed through email by the Pennsylvania Principals Association and the Pennsylvania Association of School

Administrators. Respondents were asked to respond to the prompt using a link that took them to the surveys, which were created using SurveyMonkey. The first survey was administered in February 2018 and the second survey was administered in December 2018.

Both surveys were distributed to approximately 2,500 principals and approximately 450 superintendents and charter CEOs. Unfortunately, the response rate for both surveys was rather low. In the spring, 120 individuals responded to the survey, which prompted the researchers to administer the survey a second time. In the fall, an additional 218 individuals responded to the survey. The respondents represented 181 identifiable districts from across the Commonwealth. An additional 72 individuals did not identify a district. Fifty-nine districts had more than one respondent with 41 of the districts having two respondents, 11 districts with three respondents, six districts with four respondents, and one district with five respondents. At the individual level, the response rate is difficult to quantify because the study researchers did not have access to the email lists. However, an estimate would be a response rate of 10 percent.

With respect to locale, 132 respondents were employed in 72 unique rural districts while 206 respondents were employed in 105 unique urban districts. Thus, about 40 percent of the represented districts were rural, which is about the same percentage of rural districts in the state if charter schools are included in the analysis. Because charter CEOs and principals were included in the survey sample, this is the appropriate comparison to make.

### **Projections of Supply, Demand, and Shortages**

Determining the student-teacher ratio (STR) at the school level, while feasible for past years, could not be calculated for projected years. Some districts have multiple schools at each level (e.g. 12 Elementary, 4 Middle School, 2 High School) as well as inconsistent grade spans by school level (e.g. High School A enrolls students in grades 9-12 and High School B enrolls

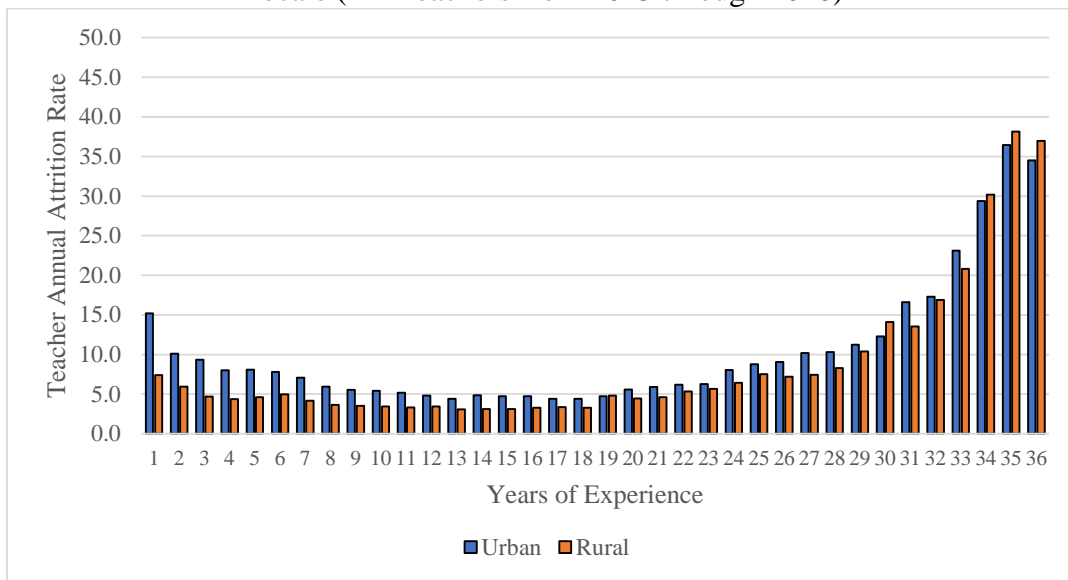
students in grades 7-12). Given that projected cohort numbers are only by year for each district, creating a student-teacher ratio by school-level would result in bias because the allocation of projected students to each school in the district cannot be determined in the absence of uniform grade-level breakdowns across the district. Assuming standardized grade levels would result in Type 1 error, meaning a higher likelihood of projecting a shortage of staff when there would be none given a reduced student population span on which to calculate the STR. As a result of this impasse, scientific protocol is to bias estimations in the direction of Type 2 error, or a more conservative estimate of shortages and demand levels. As a result, the decision was made to use the span of movement allowed by teacher licensure rather than school-level assignment as the range of STR, given identifying a shortage of Middle School math teachers could be remedied with less barriers by moving a 7-12 certified High School math teacher down grades, which would not require a new hire and thereby not be calculated as a need in the demand pool, favoring Type 2 errors over Type 1.

**Assumptions Underlying Projections.** The reader should note these projections are based to some degree on the prior 5 years of Pennsylvania teacher trends, and contain several assumptions that may influence results. The researchers on this study have prepared Excel files that include all data for each district. Readers may contact the primary author for a copy of the Excel files, which include all projected data for each school district from 2017-18 to 2025-26.

As with all projections, the results presented in this study should be interpreted in light of the assumptions in calculating the estimates. Indeed, different sets of assumptions would certainly yield different estimates of the shortage of teachers in Pennsylvania. Following is a description of the data used, and the associated assumptions that underlie the estimates.

First, the study’s researchers used the assumption that teachers retire when they are first eligible to retire—a minimum of age 55 and 30 years of education experience. This assumption was based on a presentation made by a member of PDE on April 3, 2018. In the presentation entitled, “Teacher Certifications and Projections,” data were presented concerning teacher attrition and retirement that suggested the data should be analyzed based on the assumption that individuals 55 years old or older with at least 30 years of experience will retire. The analysis of data, however, reveals this to not be the case for either urban or rural teachers as shown in Figure 3 below.

Figure 3: Annual Teacher Attrition Rate by Years of Education Experience and Geographic Locale (All Teachers from 2013 through 2018)



Data Source: PDE Educator Employment Files; Calculations by researchers

Thus, the assumption employed in this study slightly overestimates the loss of teachers experienced by districts. In other words, the estimates slightly underestimate the future demand for teachers. However, the differences are slight and likely have only a minimal effect on the overall estimates of the shortage of teachers. In retrospect, the researchers would have used a different combination of age and experience to assume retirement. Again, the difference in the results would likely be rather small.

Second, the student-to-teacher ratios employed in estimating the number of teaching positions districts should employ were calculated by averaging the district-level student-teacher ratios from 2011-12 through 2016-17. Because it is impossible to predict how student-teacher ratios might change, this study employed the average 2011-12 through 2016-17 student-teacher ratios as a constant in the estimates through 2025-26. Given that student-teacher ratios tend to be declining very slowly over time for many districts, the predictions in this study likely slightly underestimate the future demand for teachers.

Third, this study used historical student enrollment data from the PDE as well as projections of student enrollment by district from PDE (located on the PDE website). The PDE student enrollment projections relied on birth cohorts and used a relatively sophisticated statistical methodology to project future district enrollment. However, as noted by the Pennsylvania Department of Education (n.d), the projected student enrollment estimates were subject to limitations based on both internal and external factors. Internal factors included local policies related to the age of admittance to kindergarten, special education evaluations, local Career and Technology Center enrollments, and the number of special education providers in the area. Externally, shifts in migration patterns and housing trends may further bias estimates. The major limitation with the student enrollment projections was the estimates do not account for student enrollment in schooling options other than traditional public school districts. Specifically, these other schooling options included Career and Technology Centers, home schooling, private schools, special education schools, charter schools, consortium-operated alternative high schools, and/or juvenile correctional institutions (PDE, n.d.). Because this study used these estimates that do not account for enrollment in other schooling options, the estimates of the number of teachers required to maintain the student-teacher ratio are likely overestimated

in districts located in areas with a high number of other schooling options, given that some proportion of incoming birth cohorts will not attend the traditional public school districts included in the estimates. Indeed, in areas with substantial numbers of students enrolled in these other schooling options, such as in the greater Philadelphia and Pittsburgh Metro areas, the estimates of the number of teachers needed to maintain historical student-teacher ratios may be overstated. Some of this error will be offset by different student-teacher ratios in these other schooling options, particularly those in cyber charter schools, home school options, or juvenile correctional institutions.

In conclusion, this study's estimates of the number of teachers needed to maintain historical student-teacher ratios, and, thus, estimates of the shortage of teachers were over-estimates. In short, the estimates likely over-estimate the demand for teachers. Unfortunately, the researchers of this study do not have access to the individual student-level data that would be required to determine to what degree the estimates are too high. As such, readers should focus more on the general direction and rate of changes in student enrollment, teachers employed, and shortages of teachers and recognize these limitations will be more acute in particular school districts and in particular areas of the state. While the study's researchers acknowledge they have over-estimated the shortage of teachers – especially in urban areas – the researchers are confident that the estimates below indicate a continued shortage of teachers in the Commonwealth over the coming years.

### **Teacher Supply in Pennsylvania**

The first purpose of this section is to document the overall supply of teachers in Pennsylvania. The overall supply of teachers for a given year is composed of two primary

sources of supply: teachers retained in the profession from the prior year – designated as retained teachers – and newly hired 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.

A newly hired teacher is defined as an individual employed as a teacher in a Pennsylvania public school in year X who was *not* employed as a teacher in any Pennsylvania public school in year X-1. There are multiple types of newly hired teachers as described below.

- 1) In-State Beginning Teachers: beginning teachers who obtained their teaching license from a Pennsylvania TPP;
- 2) Out-of-State Beginning Teachers: beginning teachers who obtained their teaching license from a TPP located in another state, another country, or from an online program whose headquarters are not in Pennsylvania;
- 3) Returning Teachers: teachers who previously taught in a Pennsylvania public school and are returning to teaching in a Pennsylvania public school after an absence from teaching in a Pennsylvania public school for at least 1 year;
- 4) Out-of-State Transfer Teachers: teachers who previously taught in a state other than Pennsylvania or in another country and who are entering a teaching position in a Pennsylvania public school; and,
- 5) Private School Transfer Teachers: teachers who previously taught in a private school in Pennsylvania, another state, or another country, and are transferring to a Pennsylvania public school to teach.



## **Retained Teachers**

Relative to other states, teacher retention in Pennsylvania is quite high (Carver-Thomas, & Darling-Hammond, 2017). Indeed, Pennsylvania is one of only a few states for which at least 95 percent of surveyed teachers indicated their intent to return to teaching (Carver-Thomas, & Darling-Hammond, 2017).

Tables 3 and 4 below document the statewide teacher retention rates in the profession and in the same district for rural and urban teachers by years of experience. Disaggregating the data by years of experience is important given that research has consistently shown the least and most experienced teachers are at the highest risk of leaving the profession (Borman & Dowling, 1008; Nguyen, Pham, Springer, & Crouch, 2019). In both analyses, districts are identified as rural based on the designation for each district by the Center for Rural Pennsylvania.

As shown in Table 3, 94.4 percent of rural teachers returned to the teaching profession in the next year. In comparison, 93.7 percent of urban teachers returned to the teaching profession in the next year. With respect to a 5-year time frame, almost 82 percent of rural teachers remained in the teaching profession over a 5-year time span, while about 81 percent of urban teachers remained in the teaching profession over 5 years. Thus, rural and urban teachers in Pennsylvania have similar retention rates.

However, when examining retention by years of experience in Table 3, rural teachers with 10 or fewer years of education experience generally had greater retention rates in the profession than their urban peers. There were only marginal differences in retention rates between rural and urban teachers with between 11 and 20 years of experience. Interestingly, for teachers with greater than 20 years of experience, rural teachers had slightly lower retention rates than their urban peers.

Table 3: Number and Percentage of Rural and Urban Teachers Retained in the Teaching Profession by Years of Experience (2013-2018)

Years Experience	Rural Status	Number of Teachers in Cohorts				Percent Remaining in Teaching			
		Yr 2	Yr 3	Yr 4	Yr 5	Yr 2	Yr 3	Yr 4	Yr 5
1 Year	Rural	4,920	4,126	3,124	2,153	92.5	89.6	87.5	85.9
	Urban	8,742	6,887	5,149	3,369	86.6	83.9	81.8	80.1
Diff: Rural - Urban		-3,822	-2,761	-2,025	-1,216	5.9	5.7	5.7	5.8
2 Years	Rural	6,260	4,928	3,667	2,273	94.6	91.5	89.7	87.1
	Urban	10,218	8,017	5,747	3,665	92.9	89.8	87.6	84.3
Diff: Rural - Urban		-3,958	-3,089	-2,080	-1,392	1.7	1.8	2.1	2.8
3 Years	Rural	6,491	5,151	3,707	2,347	95.3	92.8	90.1	86.9
	Urban	11,145	8,727	6,488	4,289	93.3	90.1	85.4	82.5
Diff: Rural - Urban		-4,654	-3,576	-2,781	-1,942	2.0	2.6	4.7	4.5
4 Years	Rural	6,895	5,428	4,046	2,978	96.0	92.2	89.6	86.8
	Urban	12,465	10,060	7,801	5,914	94.3	89.7	84.6	82.0
Diff: Rural - Urban		-5,570	-4,632	-3,755	-2,936	1.7	2.5	5.0	4.8
5 Years	Rural	7,499	6,111	5,000	3,651	95.3	92.0	89.8	88.0
	Urban	13,635	11,274	9,344	6,949	94.3	89.2	85.8	83.4
Diff: Rural - Urban		-6,136	-5,163	-4,344	-3,298	0.9	2.9	4.0	4.6
6 to 10 Years	Rural	46,215	38,160	29,108	19,523	96.2	93.3	91.2	89.0
	Urban	81,332	67,386	52,323	35,793	94.9	91.3	88.4	86.2
Diff: Rural - Urban		-35,117	-29,226	-23,215	-16,270	1.3	2.1	2.8	2.8
11 to 15 Years	Rural	41,844	32,947	24,363	16,148	96.6	94.1	91.9	89.7
	Urban	76,967	61,603	46,431	31,354	96.0	92.8	90.1	87.7
Diff: Rural - Urban		-35,123	-28,656	-22,068	-15,206	0.6	1.3	1.8	1.9
16 to 20 Years	Rural	32,849	25,248	18,013	11,306	96.5	93.4	90.4	86.9
	Urban	58,618	45,397	32,819	20,944	95.8	92.1	88.5	85.0
Diff: Rural - Urban		-25,769	-20,149	-14,806	-9,638	0.7	1.2	1.9	1.8
21 to 25 Years	Rural	19,833	15,419	11,236	7,267	94.4	89.1	83.6	77.7
	Urban	32,681	25,288	18,604	12,332	93.8	87.7	81.8	75.9
Diff: Rural - Urban		-12,848	-9,869	-7,368	-5,065	0.6	1.4	1.8	1.8
26 to 30 Years	Rural	12,757	10,153	7,537	4,974	90.4	81.2	72.7	63.4
	Urban	19,645	15,622	11,656	7,768	90.3	81.0	71.6	61.7
Diff: Rural - Urban		-6,888	-5,469	-4,119	-2,794	0.0	0.3	1.1	1.7
31 to 35 Years	Rural	7,149	5,827	4,542	3,257	76.5	55.5	38.1	24.2
	Urban	10,060	8,206	6,442	4,573	77.8	58.5	41.4	29.1
Diff: Rural - Urban		-2,911	-2,379	-1,900	-1,316	-1.3	-3.0	-3.3	-4.9
36 to 40 Years	Rural	2,182	1,854	1,456	1,024	61.0	39.5	26.9	16.6
	Urban	3,527	2,979	2,379	1,703	64.9	43.6	28.8	18.9
Diff: Rural - Urban		-1,345	-1,125	-923	-679	-3.9	-4.1	-1.9	-2.3
41 to 49 Years	Rural	335	272	203	145	60.9	39.0	24.1	14.5
	Urban	791	646	507	352	66.4	45.0	31.0	22.2
Diff: Rural - Urban		-456	-374	-304	-207	-5.5	-6.1	-6.8	-7.7
All Years	Rural	195,229	155,624	116,002	77,046	94.4	89.9	86.0	81.9
	Urban	339,826	272,092	205,690	139,005	93.7	88.8	84.4	80.6
Diff: Rural - Urban		-144,597	-116,468	-89,688	-61,959	0.7	1.1	1.6	1.3

Data Source: PDE Educator Employment Files; Calculations by researchers

Not surprisingly, as shown in Table 4, retention rates in the same district were lower than retention rates in the same profession since teachers may switch employment from one district to another but remain in the teaching profession. Overall, about 93 percent of Pennsylvania teachers remained in the same district from one year to the next year while about 78 percent remained in the same district after 5 years. Note that most of the exodus of teachers from a district is due to leaving the teaching profession rather than moving from one district to another.

Across all years of experience, the rates of retention in the same district were very similar for both rural and urban teachers. Indeed, the differences across years 2 through 5 were less than 1.5 percentage points. However, this masks real differences by years of experience. With respect to beginning, the rates of retention in the same district were at least 5 percentage points greater for rural teachers than for urban teachers. The rates of retention in the same district for rural teachers were, in fact, greater than those for urban teachers for teachers with 5 or fewer years of experience. For teachers with between 6 and 30 years of experience, the differences in retention rates were only marginal. Finally, for teachers with greater than 30 years of experience, the retention rates were lower for rural teachers than for urban teachers.

Table 4: Number and Percentage of Rural and Urban Teachers Retained in the Same District by Years of Experience (2013-2018)

Years Experience	Rural Status	Number of Teachers in Cohorts				Percent Remaining in Same District			
		Yr 2	Yr 3	Yr 4	Yr 5	Yr 2	Yr 3	Yr 4	Yr 5
1 Year	Rural	4,920	4,126	3,124	2,153	87.7	80.8	75.5	71.0
	Urban	8,742	6,887	5,149	3,369	81.6	74.6	69.4	65.8
Diff: Rural - Urban		-3,822	-2,761	-2,025	-1,216	6.1	6.3	6.1	5.2
2 Years	Rural	6,260	4,928	3,667	2,273	90.4	84.0	79.7	75.0
	Urban	10,218	8,017	5,747	3,665	89.0	82.6	78.6	72.9
Diff: Rural - Urban		-3,958	-3,089	-2,080	-1,392	1.4	1.3	1.1	2.1
3 Years	Rural	6,491	5,151	3,707	2,347	91.8	86.9	81.6	77.1
	Urban	11,145	8,727	6,488	4,289	90.2	84.4	77.4	72.5
Diff: Rural - Urban		-4,654	-3,576	-2,781	-1,942	1.7	2.5	4.2	4.6
4 Years	Rural	6,895	5,428	4,046	2,978	93.4	87.0	82.8	78.3
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6 to 10 Years	Rural	46,215	38,160	29,108	19,523	94.9	91.0	88.0	85.3
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11 to 15 Years	Rural	41,844	32,947	24,363	16,148	96.1	93.2	90.7	88.1
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26 to 30 Years	Rural	12,757	10,153	7,537	4,974	90.3	81.1	72.5	63.2
	Urban	19,645	15,622	11,656	7,768	90.3	80.9	71.5	61.6
Diff: Rural - Urban		-6,888	-5,469	-4,119	-2,794	0.0	0.2	1.0	1.6
31 to 35 Years	Rural	7,149	5,827	4,542	3,257	76.5	55.4	38.1	24.2
	Urban	10,060	8,206	6,442	4,573	77.8	58.4	41.3	29.0
Diff: Rural - Urban		-2,911	-2,379	-1,900	-1,316	-1.3	-3.0	-3.2	-4.8
36 to 40 Years	Rural	2,182	1,854	1,456	1,024	61.0	39.5	26.9	16.6
	Urban	3,527	2,979	2,379	1,703	64.9	43.6	28.8	18.9
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41 to 49 Years	Rural	335	272	203	145	60.9	39.0	24.1	14.5
	Urban	791	646	507	352	66.4	45.0	31.0	22.2
Diff: Rural - Urban		-456	-374	-304	-207	-5.5	-6.1	-6.8	-7.7
All Years	Rural	195,229	155,624	116,002	77,046	93.4	88.0	83.4	78.8
	Urban	339,826	272,092	205,690	139,005	92.7	87.0	82.0	77.8
Diff: Rural - Urban		-144,597	-116,468	-89,688	-61,959	0.7	0.9	1.4	1.0

Data Source: PDE Educator Employment Files; Calculations by researchers

Table 5 displays teacher retention rates by region and locale for the 2013-14 through 2017-18 academic years. The rates refer to the percentage of teachers returning to the profession from one academic year to the next academic year. For example, the 90.8 percent retention for the Philadelphia Metro region in 2013-14 indicates that 90.8 percent of the teachers employed in the Philadelphia Metro region in the 2012-13 academic year returned to the teaching profession in Pennsylvania in the 2013-14 academic year.

Table 5: Percentage of Teachers Returning to the Profession in the Following Year by Region and Locale (2013-14 through 2017-18)

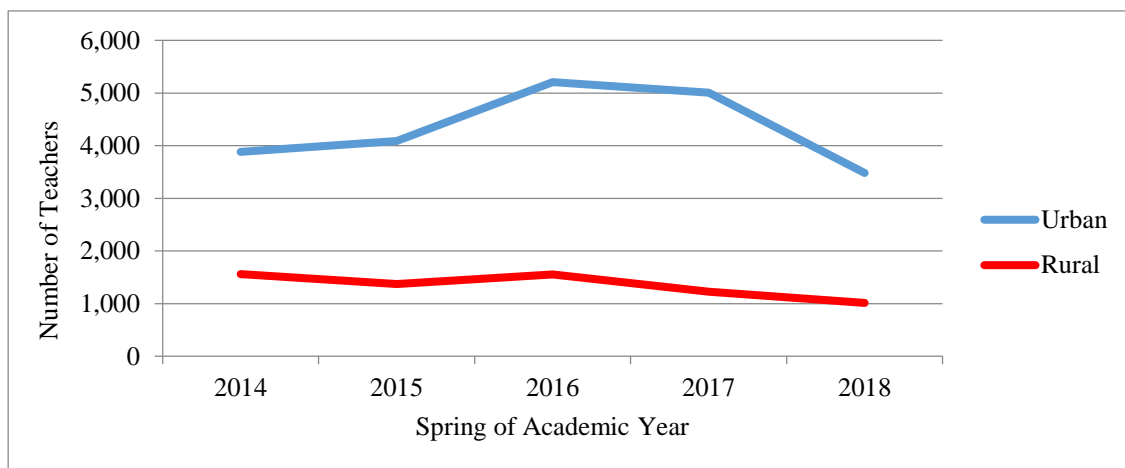
Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	90.7	92.0	89.1	92.1	92.0	1.3
	Rural	96.0	96.0	96.3	93.8	94.2	-1.8
	Total	90.8	92.1	89.1	92.1	92.0	1.3
South East	Urban	94.0	91.9	94.1	94.3	94.3	0.4
	Rural	94.1	93.7	94.8	95.6	95.1	1.0
	Total	94.0	92.1	94.2	94.5	94.4	0.4
North East	Urban	95.1	93.1	95.4	95.7	96.3	1.1
	Rural	93.0	95.6	94.9	95.3	94.9	1.9
	Total	93.9	94.5	95.1	95.4	95.5	1.6
South Central	Urban	93.3	92.7	93.8	93.9	93.8	0.5
	Rural	93.3	93.1	94.3	94.4	95.1	1.8
	Total	93.3	92.8	93.9	94.0	94.1	0.8
Central	Urban	92.2	93.0	94.3	93.1	94.5	2.3
	Rural	92.2	93.8	94.3	93.8	95.2	3.0
	Total	92.2	93.6	94.3	93.6	95.0	2.8
North Central	Urban	91.4	91.6	91.8	94.4	94.6	3.2
	Rural	94.3	94.5	94.8	95.1	94.4	0.1
	Total	93.7	93.9	94.1	94.9	94.4	0.8
South West	Urban	94.0	94.1	96.5	95.0	95.6	1.6
	Rural	94.0	92.9	93.7	94.8	95.1	1.1
	Total	94.0	93.1	94.1	94.9	95.2	1.2
Pittsburgh Metro	Urban	93.7	91.2	94.2	95.1	95.2	1.5
	Rural	93.6	95.6	94.8	95.6	95.6	2.0
	Total	93.7	91.8	94.2	95.2	95.2	1.5
North West	Urban	93.6	91.8	94.1	93.1	92.9	-0.7
	Rural	93.6	90.9	94.4	95.0	95.0	1.4
	Total	93.6	91.2	94.3	94.4	94.3	0.7
Commonwealth	Urban	92.5	92.0	92.1	93.6	93.5	1.1
	Rural	93.4	93.7	94.5	94.8	95.1	1.7
	Total	92.7	92.5	92.7	93.9	93.9	1.2

Data Source: PDE employment files; Calculations by researchers

## Newly Hired Teachers

Given that not all teachers return to the profession or the same district from one year to the next, districts typically seek to fill vacant or newly created teaching positions unless there is a decline in student enrollment. Districts can address vacant positions by either creating larger class sizes so that an additional teacher is not needed or by hiring a teacher who was not employed in the district in the previous year. As shown in Figure 4, urban school districts in Pennsylvania hired between 3,483 and 5,208 teachers in each of the last 5 academic years while rural school districts hired between 1,016 and 1,557 teachers in each of the last 5 academic years. While there was a substantial increase, and then decrease, for urban districts, there was only a slight increase for rural districts between 2014 and 2016.

Figure 4: Number of Newly Hired Teachers by Rural and Urban Districts (2013-14 to 2017-18)



Data Source: PDE Educator Employment Files; Calculations by researchers

The rather large increase for urban districts from 2014-15 to 2015-16 was due to 978 new teachers hired by 10 districts (Philadelphia, Butler Area, Easton Area, East Allegheny, Woodland Hills, Central Bucks, Freedom Area, Allentown City, Panther Valley, and Pittsburgh). The maintenance of the high level of newly hired teachers from 2015-16 to 2016-17 was due entirely

to the Philadelphia school district hiring 1,655 new teachers—an increase of 978 teachers over the prior year.

### **Sources of Newly Hired Teachers**

As mentioned previously, newly hired teachers can come from multiple sources. These sources are described below.

- 1) In-State Beginning Teachers: beginning teachers who obtained their teaching license from a Pennsylvania TPP;
- 2) Out-of-State Beginning Teachers: beginning teachers who obtained their teaching license from a TPP located in another state or from an online program whose headquarters in not in Pennsylvania;
- 3) Returning (Reserve Pool) Teachers: teachers who previously taught in a Pennsylvania public school and are returning to teaching in a Pennsylvania public school after an absence from teaching in a Pennsylvania public school for at least one year;
- 4) Out-of-State Transfer Teachers: teachers who previously taught in a state other than Pennsylvania and are entering a teaching position in a Pennsylvania public school; and,
- 5) Private School Transfer Teachers: teachers who previously taught in a private school in Pennsylvania and are transferring to teach in a Pennsylvania public school.

Unfortunately, as described in the methods section, the data provided by PDE did not allow for the accurate decomposition of newly hired teachers into these five specific sources.

Because the PDE data provided did not allow for the accurate identification of either “out-of-state” teachers or “returning” teachers, this study collapsed both sets of teachers into one group of teachers labelled as “other” teachers. Following is an attempt to estimate the number

and percentage of out-of-state teachers and returning teachers using the imperfect data, but the reader should be cautioned that the results are purely estimates rather than accurate calculations.

**Sources of newly hired teachers by locale.** In Table 6 below, all newly hired teachers are decomposed into two sources – beginning teachers and other teachers – for both rural and urban districts. For rural districts, about 50 percent of newly hired teachers were beginning teachers while the remaining 50 percent were other teachers. In the 2013-14 school year, rural districts hired 846 beginning teachers. By the 2017-18 school year, rural districts hired only 518 beginning teachers. This was a nearly 39 percent drop in the number of beginning teachers hired by rural districts. With respect to other teachers, rural districts hired 714 teachers in 2013-14 and hired 498 other teachers in 2017-18. This was slightly greater than a 30 percent decrease in the number of other teachers hired.

The trends were different for urban districts. With respect to beginning teachers, urban districts hired 1,882 individuals in 2013-14 and 1,569 individuals in 2017-18. This was almost a 17 percent decrease in the number of beginning teachers hired. Alternatively, urban districts hired 1,998 other teachers in 2013-14 and a nearly identical 1,914 individuals in 2017-18. This was only a 4 percent decline in the number of teachers hired.

Table 6: Number and Percentage of Beginning and “Other” Teachers Hired by Geographic Locale (2013-14 through 2017-18)

Source of Supply	2013-14		2014-15		2015-16		2016-17		2017-18	
	N	%	N	%	N	%	N	%	N	%
Urban										
Beginning	1,882	48.5	2,021	49.4	2,010	38.6	2,053	41.0	1,569	45.0
Other	1,998	51.5	2,068	50.6	3,198	61.4	2,952	59.0	1,914	55.0
Total	3,880	100.0	4,089	100.0	5,208	100.0	5,005	100.0	3,483	100.0
Rural										
Beginning	846	54.2	730	53.2	730	46.9	596	48.7	518	51.0
Other	714	45.8	641	46.8	827	53.1	629	51.3	498	49.0
Total	1,560	100.0	1,371	100.0	1,557	100.0	1,225	100.0	1,016	100.0

Data Source: PDE Educator Employment Files; Calculations by researchers



Table 7 presents the percentage of newly hired teachers identified as beginning teachers by geographic locale and subject area for the 2013-14 through 2017-18 school years. The final column provides a trend across all 5 academic years to provide information about if the sources of newly hired teachers have changed over time.

Of the 10 subject areas, there were declines in the percentage of newly hired teachers who were identified as beginning teachers for five subject areas—mathematics, science, foreign language, fine arts, and special education. There was a particular steep decline of 14 percentage points for foreign language teachers. For an additional four subject areas—elementary, English Language Arts, social studies, and physical/health education—there was essentially no change over time. Finally, there was an increase in the percentage of newly hired teachers who were beginning teachers over the 5 academic years. Thus, except for the ELL area, the percentage of newly hired teachers who were beginning teachers declined or remained stagnate.

With respect to urban districts, there were declines in the percentage of newly hired teachers identified as beginning teachers in four subject areas—mathematics, science, foreign language, and special education. There were only marginal changes for an additional five subject areas: elementary, English Language Arts, social studies, fine arts, and physical/health education. The only increase for urban districts was the number of beginning ELL teachers.

Finally, with respect to rural districts, there were declines in the percentage of newly hired teachers identified as beginning teachers in six subject areas—elementary, English Language Arts, science, foreign language, fine arts, and special education. There were steep declines of 10 percentage points in English Language Arts, nearly 16 percentage points in foreign language, and 20 percentage points in fine arts. Thus, the source of newly hired teachers changed dramatically in these three subject areas for rural districts. While there was no change

for mathematics, there was an increase in the reliance of rural districts to procure newly hired teachers in science, social studies, physical/health education, and ELL.

Thus, over time, rural districts relied on beginning teachers as a source of newly hired teachers to a greater degree than urban districts. This may reflect the fact that few rural teachers quit the profession and, those that do, tend to quit because they choose to retire.

Table 7: Statewide Percentage of Newly Hired Teachers Identified as Beginning Teachers by Subject Area and Geographic Locale and (2013-14 through 2017-18)

Subject Area	Locale	Academic Year					Trend 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Elementary Teachers	Urban	42.9	47.0	38.5	42.0	41.5	-1.4
	Rural	52.4	55.2	45.3	49.9	48.9	-3.5
	Total	45.0	48.5	39.6	43.1	42.6	-2.4
English Language Arts	Urban	41.2	44.8	34.6	39.3	40.8	-0.4
	Rural	52.4	48.6	38.0	47.4	42.2	-10.2
	Total	43.7	45.5	35.3	40.4	41.1	-2.6
Mathematics	Urban	49.1	39.4	40.7	42.0	42.7	-6.4
	Rural	55.5	52.8	39.2	44.4	55.2	-0.2
	Total	50.4	41.8	40.5	42.3	44.5	-5.9
Science	Urban	51.6	51.5	41.2	45.6	44.6	-7.0
	Rural	51.0	52.4	36.7	55.4	56.4	5.3
	Total	51.5	51.7	40.4	47.1	46.1	-5.3
Social Studies	Urban	47.9	46.9	34.5	43.0	45.1	-2.8
	Rural	54.0	46.9	41.3	48.3	61.7	7.7
	Total	49.3	46.9	35.7	43.7	47.5	-1.8
Foreign Language	Urban	54.4	49.3	46.4	40.1	40.9	-13.5
	Rural	58.9	50.0	50.0	60.6	43.3	-15.6
	Total	55.3	49.4	46.9	42.3	41.3	-14.0
Fine Arts	Urban	49.6	55.8	52.1	48.5	50.9	1.2
	Rural	66.9	59.7	55.7	53.5	46.7	-20.3
	Total	53.5	56.3	52.6	49.2	50.1	-3.4
Physical/Health Education	Urban	47.3	44.0	48.1	51.1	45.1	-2.1
	Rural	47.9	57.4	54.7	57.4	58.9	11.0
	Total	47.4	46.0	49.1	51.9	48.3	1.0
Special Education	Urban	49.7	48.6	40.9	38.1	40.6	-9.1
	Rural	56.8	53.4	57.5	43.2	51.9	-4.9
	Total	51.4	49.7	44.4	39.1	43.0	-8.4
English Language Learner Courses	Urban	22.9	26.3	20.7	27.9	27.0	4.1
	Rural	11.1	0.0	27.3	0.0	18.2	7.1
	Total	20.5	24.1	21.3	26.5	26.0	5.5

Data source: PDE teacher employment data; Calculations by researchers

The following sections examine the pool from which beginning teachers are hired by describing trends in both in-state and out-of-state initial licenses granted from 2011-12 through 2017-18. The following analysis documents the number of “other” teachers hired by region and locale for major subject areas for the 2013-14 through 2017-18 school years.

**Newly hired teachers: Initially licensed teachers.** The pool from which districts draw their beginning teachers is comprised primarily from individuals obtaining an Instructional I license—either from an in-state or out-of-state TPP. In addition, districts may hire individuals on an emergency permit to temporarily fill a position for which they cannot find an individual with an Instructional I license. PDE provided both individual level and district level data on emergency permits. The individual data, however, did not match the aggregated district data. Indeed, after multiple attempts, the researchers consistently found the individual certification data severely under-counted the aggregate district data. Because the individual data for emergency certificates appeared inaccurate, the researchers could not identify the number of beginning teachers with an emergency permit.

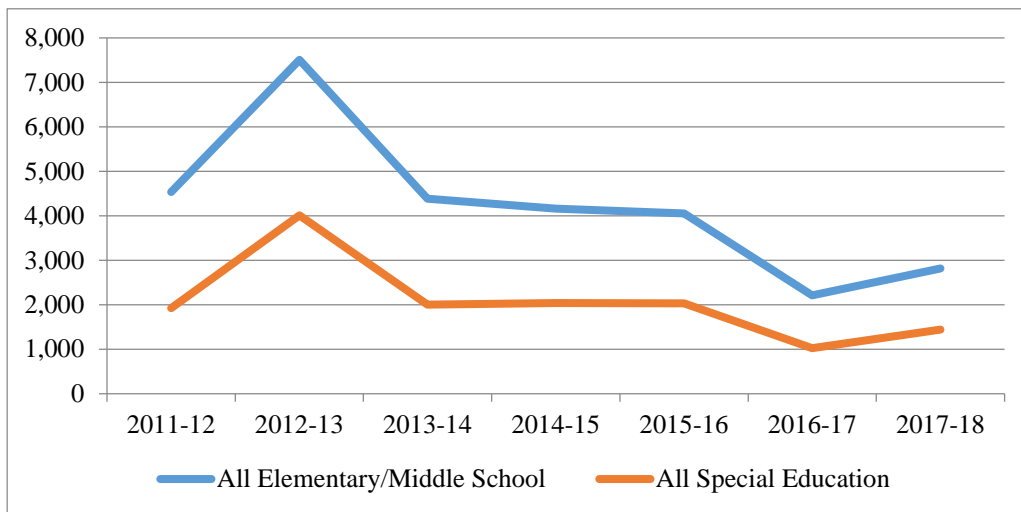
The sub-sections below present the number of Instructional I licenses granted each year from in-state TPPs and then from out-of-state TPPs from 2011-12 through 2017-18.

*In-state Instructional I licenses.* This section presents information on the number of Instructional I licenses granted to individuals completing an in-state TPP. The data is presented by subject area because the number of initial Instructional I licenses varies dramatically by subject area.

Figure 5 displays the number of newly licensed elementary teachers and PK-12 special education teachers. The numbers of licenses granted for both groups of individuals increased dramatically from 2011-12 to 2012-13, then decreased by approximately 50 percent from 2012-

13 to 2013-14. From 2013-14 through 2015-16, there was a slight decline in the number of newly licensed teachers for each group. From 2016 to 2017, there was another approximately 50 percent decline in the number of newly licensed teachers—from around 4,000 to about 2,200 for elementary teachers and from around 2,000 special education teachers to about 1,000 special education teachers. There was a rather substantial increase from 2011-12 to 2012-13 for two reasons, both of which include changes to certification rules for teachers. Specifically, 2012-13 was the last year individuals could obtain a K-6 license or a K-12 special education license. The licensure specialist at Penn State reported that many students accelerated their completion of licenses before these rule changes took effect.

Figure 5: Statewide Number of Newly Licensed Elementary Level and PK-12 Special Education Teachers by Subject Area (2011-12 to 2017-18)

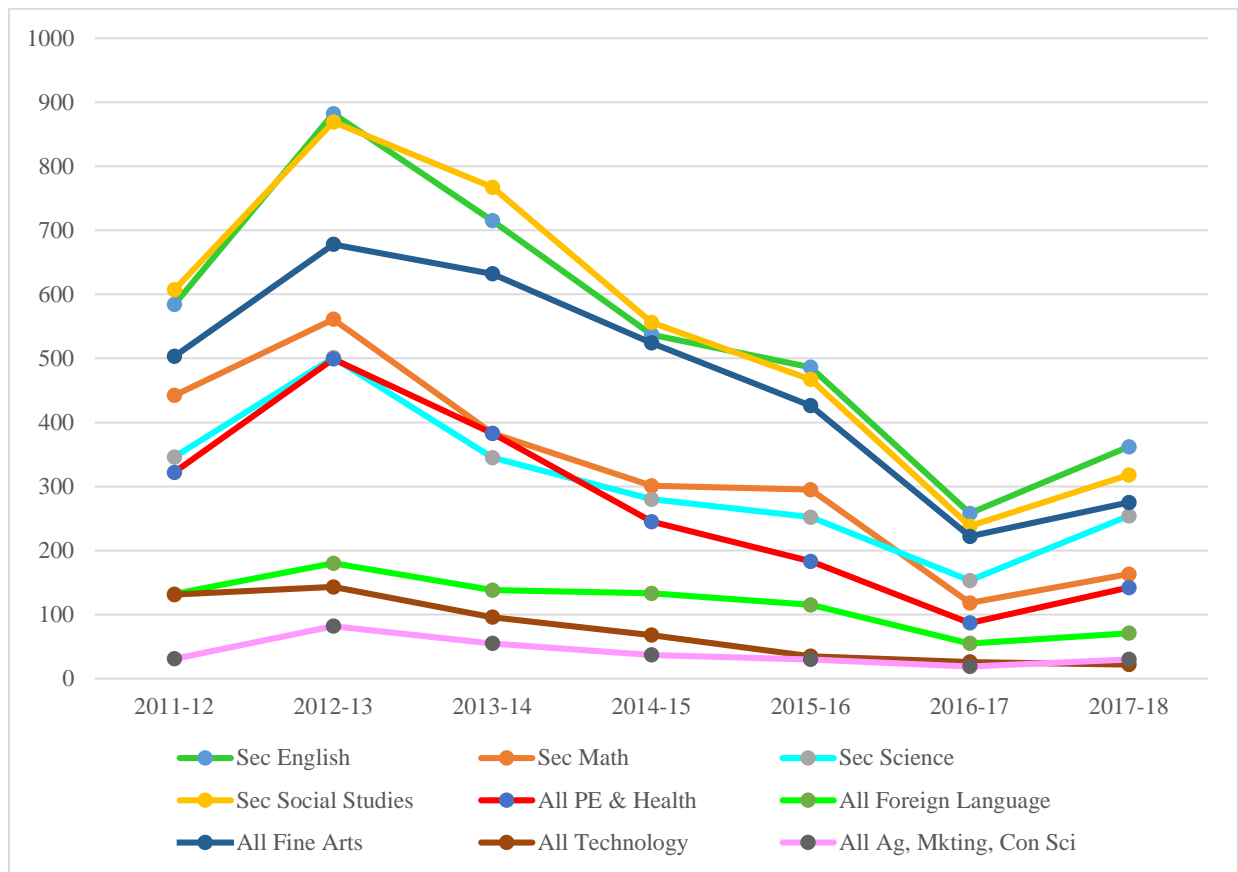


Source: PDE Aggregate Licensure File

Similar trends appear for the number of newly licensed secondary level and PK-12 subject area teachers as shown in Figure 6 below. Specifically, there were similarly large increases from 2011-12 to 2012-13 for all subject areas. However, rather than a dramatic decrease from 2012-13 to 2013-14 as in the previous figure, there was a steady decline in production over the next three years through 2016-17. The declines were most dramatic for

English Language Arts and social studies—two subject areas that traditionally have rarely ever been mentioned as having a shortage of teachers relative to demand. From 2016-17 to 2017-18, there were small but relevant increases in the number of newly licensed teachers for all groups included in the analysis.

Figure 6: Statewide Number of Newly Licensed Secondary Level and PK-12 Teachers By Subject Area (2011-12 to 2017-18)



Source: PDE Aggregate Licensure File

*Spatial distribution of in-state Instructional I licenses by locale.* One important aspect of the supply of newly licensed 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 in the Commonwealth is portrayed below.

As shown in Figure 7, TPPs are not distributed equally across the state. Forty-six TPPs (about 40 percent) are located in the Philadelphia Metro or the South East regions while another 17 TPPs (about 15 percent) are located in the Pittsburgh Metro area. In contrast, there are only three TPPs (2.6 percent) located in the South West region and another three TPPs (2.6 percent) in the North Central portion of the Commonwealth. Overall, 31 of the 115 TPPs (27.2 percent) were in rural areas with 10 of the rural TPPs located in the Central region of the Commonwealth. No other region had more than four TPPs located in a rural area.

Figure 7: Number of Teacher Preparation Programs by Region and Geographic Locale

<b>9</b>	<b>North West</b>	<b>6</b>	<b>North Central</b>	<b>3</b>	<b>North East</b>
	Rural: 4 Urban: 4		Rural: 3 Urban: 0		Rural: 3 Urban: 8
		<b>5</b>	<b>Central</b>		
<b>8</b>	<b>Pittsburgh Metro</b>		Rural: 10 Urban: 0		<b>Philly Suburbs</b>
	Rural: 4 Urban: 14			<b>2</b>	Rural: 0 Urban: 11
		<b>4</b>	<b>South Central</b>		
<b>7</b>	<b>South West</b>		Rural: 3 Urban: 12		<b>1 Philly Metro</b>
	Rural: 4 Urban: 0				Rural: 0 Urban: 35

Source: Aggregate PDE Licensure File

Unfortunately, the data necessary to complete an accurate analysis of the patterns of placement of all TPP graduates and an analysis of the TPPs of all beginning teachers across the state are not available. However, as shown in Table 8, TPP data do exist for the vast majority of beginning teachers. In 2013-14, TPP information existed for slightly more than 62 percent of beginning teachers. By 2017, this percentage increased to almost 75 percent.

Table 8: Number and Percentage of Beginning Teachers with Information about TPP

Teacher Group	2013-14		2014-15		2015-16		2016-17	
	N	%	N	%	N	%	N	%
Beginning Teachers	3,809	100.0	3,737	100.0	3,688	100.0	3,635	100.0
TPP Name	2,367	62.3	2,629	70.4	2,714	73.6	2,723	74.9
No TPP Name	1,442	38.0	1,108	29.6	974	26.4	912	25.1
In-State TPP Name	2,240	94.6	2,520	95.9	2,577	95.0	2,551	93.7
Out-of-State TPP Name	117	5.4	109	4.1	137	5.0	172	6.3

Source: PDE Licensure File; Calculations by researchers

Based on the limited data from PDE, the following analyses examine where beginning teachers from TPPs in the nine regions obtained jobs across the Commonwealth (Table 9). The region in which the TPP is located is displayed in the first column. The percentage of beginning teachers from the TPPs in the region obtaining jobs in each of the nine regions is displayed in each column. For example, 85.3 percent of the beginning teachers from TPP in the Philadelphia Metro region obtained their first teaching position in a district in the Philadelphia Metro region. The region in which the TPPs are located and the same region for the placement of the beginning teachers is highlighted in yellow.

The highest percentage (85.3 percent) was for the Philadelphia Metro region. Three other regions had percentages greater than 50 percent: South Central (72.8 percent), Pittsburgh (63.3 percent), and North West (56.7 percent). The lowest percentage was for the Central region (23.5 percent). This is due primarily because of the wide dispersion of graduates of the Penn State TPP throughout the Commonwealth. Two other regions, North Central (30.9 percent) and South East (31.7 percent), also had percentages below 35 percent. For TPPs in the North East, an additional 29.4 percent obtained positions in the North East region. This is likely explained by two of the three programs, Mansfield University and Lycoming College, being located very close to the border between the North Central and North East regions as well as the third TPP, University of Pittsburgh-Bradford, being located close to the border between the North Central and North West

regions. With respect to the South West region, nearly one-half of graduates obtain employment in the Pittsburgh region rather than the South West region. This is likely due to the proximity of the Pittsburgh region relative to the South West TPPs and the greater demand for new teachers in the Pittsburgh region.

Table 9: Percentage of Beginning Teachers from TPP Regions Placed in School District Regions for Beginning Teachers in 2013-14 through 2016-17

TPP Location in State	Number of Tchrs	School District Location in State								
		Philly Metro	South East	North East	South Central	Central	North Central	South West	Pittsburgh	North West
Philadelphia Metro	3,088	<b>85.3</b>	4.4	2.5	6.2	0.5	0.1	0.3	0.6	0.1
South East	651	<b>25.2</b>	<b>48.5</b>	8.9	<b>16.0</b>	0.9	0.2	0.2	0.2	0.0
North East	900	<b>20.2</b>	<b>15.2</b>	<b>44.0</b>	<b>14.6</b>	3.0	2.4	0.1	0.1	0.3
South Central	1,429	<b>13.2</b>	5.6	3.7	<b>72.8</b>	1.8	0.3	1.8	0.5	0.2
Central	1,364	<b>15.3</b>	5.4	5.4	<b>16.2</b>	<b>23.5</b>	3.5	<b>12.2</b>	<b>12.2</b>	6.4
North Central	136	8.1	2.9	<b>29.4</b>	<b>15.4</b>	8.1	<b>30.9</b>	2.2	0.7	2.2
South West	82	3.7	1.2	0.0	6.1	8.5	0.0	<b>31.7</b>	47.6	1.2
Pittsburgh	1,264	5.0	1.4	1.2	6.0	5.5	1.1	8.0	<b>63.3</b>	8.5
North West	580	1.6	0.5	1.2	7.6	8.1	5.7	2.4	<b>16.2</b>	<b>56.7</b>
Pennsylvania	9,494	<b>36.5</b>	8.1	7.6	<b>19.3</b>	5.6	1.8	3.7	<b>11.9</b>	5.7

Data Source: PDE Aggregate teacher production files and PDE employment files; Calculations by researchers

Table 10 employs the opposite approach by showing the percentage of beginning teachers hired in each region and the percentage of those teachers who were prepared by a TPP in the nine regions displayed in columns. The percentages of beginning teachers hired in a region who were prepared at TPPs in the same region are highlighted in yellow. For example, 76.0 percent of the beginning teachers hired in the Philadelphia Metro region were from TPPs in the Philadelphia Metro region. The highest percentage was for the Philadelphia Metro region (76.0 percent) while the lowest percentage was 7.5 percent for the South West region. For all but three of the regions (South East, North Central, and South West), at least 55 percent of the beginning teachers were from TPPs located in the same region. Nearly 50 percent of the beginning teachers hired in the South East region were from Central region TPPs. Penn State, located in the Central region, is relatively close to many of the larger school districts in the South West region. Moreover, the



data file provided by PDE assigns all Penn State TPP graduates to the Penn State Main Campus even though not all students matriculated at the main campus. Thus, the percentages for the Central region are inaccurate to some degree. The North Central region hired only 24.9 percent of beginning teachers from North East TPPs. The remainder of beginning teachers were primarily from the three surrounding regions—Central, North East, and North West. Given there are no TPPs located in the middle of the North Central region, districts appear to hire teachers from surrounding regions.

Table 10: Percentage of Beginning Teachers from TPP Regions Placed in School District Regions for Beginning Teachers in 2013-14 through 2016-17

School District Location in State	Number of Tchrs	TPP Location in State								
		Philly Metro	South East	North East	South Central	Central	North Central	South West	Pittsburgh	North West
Philadelphia Metro	3,463	<b>76.0</b>	4.7	5.3	5.5	6.0	0.3	0.1	1.8	0.3
South East	768	<b>17.7</b>	<b>41.1</b>	17.8	10.4	9.5	0.5	0.1	2.3	0.4
North East	720	<b>10.8</b>	8.1	<b>55.0</b>	7.4	<b>10.1</b>	5.6	0.0	2.1	1.0
South Central	1,832	<b>10.4</b>	5.7	7.2	<b>56.8</b>	<b>12.1</b>	1.1	0.3	4.1	2.4
Central	528	2.8	1.1	5.1	4.9	<b>60.6</b>	2.1	1.3	<b>13.1</b>	8.9
North Central	169	2.4	0.6	<b>13.0</b>	3.0	<b>28.4</b>	<b>24.9</b>	0.0	8.3	<b>19.5</b>
South West	348	2.9	0.3	0.3	7.5	<b>47.7</b>	0.9	<b>7.5</b>	<b>29.0</b>	4.0
Pittsburgh	1,128	1.6	0.1	0.1	0.6	<b>14.8</b>	0.1	3.5	<b>70.9</b>	8.3
North West	538	0.7	0.0	0.6	0.6	<b>16.2</b>	0.6	0.2	<b>20.1</b>	<b>61.2</b>
Pennsylvania	10,352	<b>31.8</b>	8.7	<b>11.9</b>	<b>17.2</b>	<b>13.5</b>	1.5	3.5	<b>13.6</b>	<b>28.1</b>

Data Source: PDE Aggregate teacher production files and PDE employment files; Calculations by researchers

*Spatial distribution of in-state Instructional I licenses by year and licensure area.* This section presents the number of Instructional I licenses obtained from Pennsylvania TPPs by the region of Pennsylvania and locale (rural and urban) in map form for the 2017-18 academic year and in table form for 2011-12 through 2017-18. Because specific licensure areas changed over the time period in question, all licenses are aggregated into the following subject areas: elementary, PK-12 special education, secondary English Language Arts, secondary mathematics, secondary science, secondary social studies, secondary foreign language, PK-12 fine arts, and PK-12 physical education/health education. There is a focus on specific licenses within the area

of science because of the important differences across the specific science licenses. Data on English Language Learner Instructional I licenses were not provided.

Regarding the tables, the first column indicates the nine regions of the state while the second column identifies the locale—rural or urban—of the TPPs preparing the teachers. The next seven columns display the number of individuals obtaining the specific license from the 2011-12 academic year through the 2017-18 academic year. The last two columns include the numeric and percentage changes in the number of individuals obtaining licenses from 2011-12 to 2017-18. In addition, the final column of each table is color-coded with green shading indicating an increase, red shading indicating a decrease, or no shading indicating either no increase or fewer than 10 licenses granted.

*Elementary education.* Figure 8 documents the spatial distribution of the number of individuals obtaining an Instructional I license in elementary education in 2018. About 47 percent of such licenses were from urban TPPs in the regions of Philadelphia Metro, Pittsburgh Metro, and South East. In contrast, only about 9 percent of elementary education licenses were from rural TPPs in the North East, North Central, and South West regions.

Figure 8: Number of Elementary Instructional I Licenses by Region and Geographic Locale (2018)

9	North West	6	North Central	3	North East	
	Rural: 80 Urban: 57		Rural: 25 Urban: 0		Rural: 150 Urban: 61	
		5	Central			
8	Pittsburgh Metro				South East	
	Rural: 152 Urban: 177		Rural: 284 Urban: 0	2	Rural: 0 Urban: 169	
			4	South Central		
7	South West				1	Philly Metro
	Rural: 23 Urban: 0		Rural: 10 Urban: 301		Rural: 0 Urban: 661	

Source: Aggregate PDE Licensure File

As shown in Table 11, there were substantial decreases in the number of elementary education Instructional I licenses granted. Specifically, there was an overall decrease of about 43 percent in the number of licenses issued, with a 46 percent decrease for rural TPPs and a 41 percent decrease for urban TPPs. Three regions—North East, North Central, and North West—experienced at least 50 percent decreases. In addition, three regions—South East, South Central, and Central—had decreases between 35 and 39 percent.

Table 11: Supply of Newly Licensed Elementary Education Teachers by Region and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Change: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	1,108	2,065	756	880	852	451	661	-447	-40.3
	Rural	na	na	na	na	na	na	na	na	na
	Total	1,108	2,065	756	880	852	451	661	-447	-40.3
South East	Urban	262	465	237	211	247	109	169	-93	-35.5
	Rural	0	0	0	0	0	0	0	0	na
	Total	262	465	237	211	247	109	169	-93	-35.5
North East	Urban	140	282	139	123	125	54	61	-79	-56.4
	Rural	289	322	261	202	223	87	150	-139	-48.1
	Total	429	604	400	325	348	141	211	-218	-50.8
South Central	Urban	490	622	452	385	362	191	301	-189	-38.6
	Rural	22	55	11	9	19	13	10	-12	-54.5
	Total	512	677	463	394	381	204	311	-201	-39.3
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	466	741	439	442	348	259	284	-182	-39.1
	Total	466	741	439	442	348	259	284	-182	-39.1
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	55	90	36	34	35	24	25	-30	-54.5
	Total	55	90	36	34	35	24	25	-30	-54.5
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	39	30	45	22	14	25	23	-16	-41.0
	Total	39	30	45	22	14	25	23	-16	-41.0
Pittsburgh Metro	Urban	268	423	205	199	228	193	177	-91	-34.0
	Rural	335	536	239	251	231	90	152	-183	-54.6
	Total	603	959	444	450	459	283	329	-274	-45.4
North West	Urban	140	213	111	98	77	45	57	-83	-59.3
	Rural	145	219	104	98	91	73	80	-65	-44.8
	Total	285	432	215	196	168	118	137	-148	-51.9
Total	Urban	2,408	4,070	1,900	1,896	1,891	1,043	1,426	-982	-40.8
	Rural	1,351	1,993	1,135	1,058	961	571	724	-627	-46.4
	Total	3,759	6,063	3,035	2,954	2,852	1,614	2,150	-1,609	-42.8

Data Source: PDE Licensure File; Calculations by researchers

*PK-12 special education.* Figure 9 documents the spatial distribution of the number of individuals obtaining an Instructional I license in PK-12 special education in 2018. A similar pattern emerges for special education Instructional I licenses. Indeed, about 46 percent of Instructional I licenses in special education were granted to individuals from urban TPPs in the regions of Philadelphia Metro, Pittsburgh Metro, and South East. In contrast, just 10.5 percent of

special education Instructional I licenses were granted to individuals from rural TPPs in the North East, North Central, and South West regions. Of note is that fewer than 26 licenses were granted in the North Central and South West regions combined.

Figure 9: Number of PK-12 Special Education Instructional I Licenses by Region and Geographic Locale (2018)

9	North West	6	North Central	3	North East
	Rural: 89 Urban: 48		Rural: 15 Urban: 0		Rural: 117 Urban: 73
		5	Central		
8	Pittsburgh Metro		Rural: 120 Urban: 0		South East
	Rural: 132 Urban: 105			2	Rural: 0 Urban: 87
		4	South Central		
7	South West		Rural: 2 Urban: 169		1
	Rural: 19 Urban: 0				Philly Metro
					Rural: 0 Urban: 466

Source: Aggregate PDE Licensure File

As shown in Table 12, there were dramatic increases in the number of special education Instructional I licenses granted from 2011-12 through 2017-18. This contrasts with all other subject areas in that there were decreases for all other subject areas. Across the Commonwealth, there was an overall increase of about 614 percent in the number of licenses issued with a 384 percent increase for rural TPPs and an 848 percent decrease for urban TPPs. All but the North Central and South West experienced dramatic increases in the number of special education licenses granted. For the North Central region, the number of licenses granted increased from zero in 2011-12 to 15 in 2017-18. Similarly, the number of licenses granted in the South West region increased from zero in 2011-12 to 19 in 2017-18.

Table 12: Supply of Newly Licensed Special Education Teachers  
by Region and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Change: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	25	141	463	558	636	321	466	441	1,764.0
	Rural	na	na	na	na	na	na	na	na	na
	Total	25	141	463	558	636	321	466	441	1,764.0
South East	Urban	2	47	116	107	137	62	87	85	4,250.0
	Rural	0	0	0	0	0	0	0	0	na
	Total	2	47	116	107	137	62	87	85	4,250.0
North East	Urban	36	88	124	115	108	49	73	37	102.8
	Rural	37	95	224	179	163	72	117	80	216.2
	Total	73	183	348	294	271	121	190	117	160.3
South Central	Urban	0	66	153	183	189	109	169	169	na
	Rural	0	0	0	0	0	0	2	2	na
	Total	0	66	153	183	189	109	171	171	na
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	40	127	213	226	181	101	120	80	200.0
	Total	40	127	213	226	181	101	120	80	200.0
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	0	4	23	22	23	16	15	15	na
	Total	0	4	23	22	23	16	15	15	na
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	0	16	42	26	15	18	19	19	na
	Total	0	16	42	26	15	18	19	19	na
Pittsburgh Metro	Urban	27	108	172	178	166	96	105	78	288.9
	Rural	10	76	219	257	224	91	132	122	1,220.0
	Total	37	184	391	435	390	187	237	200	540.5
North West	Urban	10	63	125	90	81	34	48	38	380.0
	Rural	15	48	112	99	109	59	89	74	493.3
	Total	25	111	237	189	190	93	137	112	448.0
Total	Urban	100	513	1,153	1,231	1,317	671	948	848	848.0
	Rural	102	366	833	809	715	357	494	392	384.3
	Total	202	879	1,986	2,040	2,032	1,028	1,442	1,240	613.9

Data Source: PDE Licensure File; Calculations by researchers

Secondary English language arts. As shown in Figure 10, almost 55 percent of Instructional I English Language Arts licenses were obtained by individuals from urban TPPs as compared to only about 7.7 percent from rural TPPs. Only one individual obtained this license in the North Central region, only 15 obtained the license in the North Central region, and only six individuals obtained this license in the South East region.

Figure 10: Number of Secondary English Language Arts Instructional I Licenses by Region and Geographic Locale (2018)

<b>9</b>	<b>North West</b>	<b>6</b>	<b>North Central</b>	<b>3</b>	<b>North East</b>
	Rural: 12 Urban: 12		Rural: 1 Urban: 0		Rural: 27 Urban: 15
		<b>5</b>	<b>Central</b>		
<b>8</b>	<b>Pittsburgh Metro</b>		Rural: 57 Urban: 0		<b>Sout East</b>
	Rural: 16 Urban: 51			<b>2</b>	Rural: 0 Urban: 24
		<b>4</b>	<b>South Central</b>		
<b>7</b>	<b>South West</b>		Rural: 5 Urban: 49		<b>1</b>
	Rural: 6 Urban: 0				<b>Philly Metro</b>
					Rural: 0 Urban: 167

Source: Aggregate PDE Licensure File

As shown in Table 13, the number of instructional I licenses granted in secondary English Language Arts declined by about 24 percent from the 2011-12 to 2017-18 academic year. The decline for rural TPPs was substantially greater than for urban TPPs—42 percent to 15 percent, respectively. Interestingly, there was only a negligible decline in the Philadelphia Metro region while there were declines of at least 17 percent in the other eight regions.

Table 13: Supply of Newly Licensed Secondary English Language Arts Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	169	314	277	245	242	127	167	-2	-1.2
	Rural	na	na	na	na	na	na	na	na	na
	Total	169	314	277	245	242	127	167	-2	-1.2
South East	Urban	43	72	59	59	52	21	24	-19	-44.2
	Rural	0	0	0	0	0	0	0	0	na
	Total	43	72	59	59	52	21	24	-19	-44.2
North East	Urban	26	39	22	24	21	7	15	-11	-42.3
	Rural	28	34	31	20	24	16	27	-1	-3.6
	Total	54	73	53	44	45	23	42	-12	-22.2
South Central	Urban	76	108	113	88	66	28	49	-27	-35.5
	Rural	3	7	3	6	8	6	5	2	66.7
	Total	79	115	116	94	74	34	54	-25	-31.6
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	107	160	153	91	85	53	57	-50	-46.7
	Total	107	160	153	91	85	53	57	-50	-46.7
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	8	4	8	8	6	1	1	-7	-87.5
	Total	8	4	8	8	6	1	1	-7	-87.5
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	9	6	12	4	4	1	6	-3	-33.3
	Total	9	6	12	4	4	1	6	-3	-33.3
Pittsburgh Metro	Urban	44	113	99	80	86	46	51	7	15.9
	Rural	37	43	57	32	39	16	16	-21	-56.8
	Total	81	156	156	112	125	62	67	-14	-17.3
North West	Urban	14	28	20	18	17	5	12	-2	-14.3
	Rural	21	31	31	30	9	11	12	-9	-42.9
	Total	35	59	51	48	26	16	24	-11	-31.4
Total	Urban	372	674	590	514	484	234	318	-54	-14.5
	Rural	213	285	295	191	175	104	124	-89	-41.8
	Total	585	959	885	705	659	338	442	-143	-24.4

Data Source: PDE Licensure File; Calculations by researchers

Secondary mathematics. As shown in Figure 11, almost 46 percent of Instructional I mathematics licenses were obtained by individuals from urban TPPs as compared to only 7.4 percent in from rural TPPs. In the North East region, only 17 individuals obtained a secondary mathematics license (11 from rural TPPs). In the rural regions, only seven individuals obtained a secondary mathematic Instructional I license in the North Central region and only four



individuals did so in the South West region. In contrast, 44 individuals did so in the Central region, with most completing their program at Penn State.

Figure 11: Number of Secondary Mathematics Instructional I Licenses by Region and Geographic Locale of TPP (2018)

<b>9</b>	<b>North West</b>	<b>6</b>	<b>North Central</b>	<b>3</b>	<b>North East</b>
	Rural: 15 Urban: 9		Rural: 7 Urban: 0		Rural: 11 Urban: 6
		<b>5</b>	<b>Central</b>		
<b>8</b>	<b>Pittsburgh Metro</b>				<b>South East</b>
	Rural: 15 Urban: 18		Rural: 44 Urban: 0	<b>2</b>	Rural: 0 Urban: 34
			<b>4</b>	<b>South Central</b>	
<b>7</b>	<b>South West</b>				<b>1</b>
	Rural: 4 Urban: 0		Rural: 4 Urban: 46		<b>Philly Metro</b>
					Rural: 0 Urban: 84

Source: Aggregate PDE Licensure File

As shown in Table 14, the number of all Instructional I licenses granted in secondary mathematics declined by about 34 percent from the 2011-12 to 2017-18 academic year. The decline for rural TPPs was substantially greater than for urban TPPs, 43 percent and 29 percent, respectively.

There were declines in all but one region, the South East, which experienced a slight increase of 17 percent. The greatest declines of around 45 percent occurred in the North East region, Central region, Pittsburgh Metro region, and the North West region. In the North Central and South West regions, fewer than 110 licenses were granted in each of the 7 academic years and both experienced declines in the number of licenses granted.

Table 14: Supply of Newly Licensed Secondary Mathematics Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Change: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	129	241	194	167	170	71	84	-45	-34.9
	Rural	na	na	na	na	na	na	na	na	na
	Total	129	241	194	167	170	71	84	-45	-34.9
South East	Urban	29	52	55	56	39	21	34	5	17.2
	Rural	0	0	0	0	0	0	0	0	na
	Total	29	52	55	56	39	21	34	5	17.2
North East	Urban	11	22	16	12	18	3	6	-5	-45.5
	Rural	20	31	36	25	36	15	11	-9	-45.0
	Total	31	53	52	37	54	18	17	-14	-45.2
South Central	Urban	55	81	115	82	85	37	46	-9	-16.4
	Rural	5	9	4	1	8	3	4	-1	-20.0
	Total	60	90	119	83	93	40	50	-10	-16.7
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	78	81	77	56	55	28	44	-34	-43.6
	Total	78	81	77	56	55	28	44	-34	-43.6
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	8	5	8	5	2	3	7	-1	-12.5
	Total	8	5	8	5	2	3	7	-1	-12.5
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	9	6	8	2	8	6	4	-5	-55.6
	Total	9	6	8	2	8	6	4	-5	-55.6
Pittsburgh Metro	Urban	41	68	42	42	33	25	18	-23	-56.1
	Rural	22	29	24	26	25	10	15	-7	-31.8
	Total	63	97	66	68	58	35	33	-30	-47.6
North West	Urban	13	17	16	16	19	5	9	-4	-30.8
	Rural	32	25	28	23	24	9	15	-17	-53.1
	Total	45	42	44	39	43	14	24	-21	-46.7
Total	Urban	278	481	438	375	364	162	197	-81	-29.1
	Rural	174	186	185	138	158	74	100	-74	-42.5
	Total	452	667	623	513	522	236	297	-155	-34.3

Data Source: Aggregate PDE Licensure File; Calculations by researchers

Secondary science. As shown in Figure 12, almost 42 percent of Instructional I secondary science licenses were obtained by individuals from urban TPPs as compared to only about 8.8 percent from rural TPPs. In the North Central region, only seven individuals obtained a secondary science license and only one individual did so in the South West region.

Figure 12: Number of Secondary Science Instructional I Licenses by Region and Geographic Locale (2018)

9	North West	6	North Central	3	North East
	Rural: 16 Urban: 17		Rural: 7 Urban: 0		Rural: 20 Urban: 15
		5	Central		
8	Pittsburgh Metro		Rural: 47 Urban: 0	2	South East
	Rural: 22 Urban: 17				Rural: 0 Urban: 36
		4	South Central		
7	South West		Rural: 5 Urban: 36	1	Philly Metro
	Rural: 1 Urban: 0				Rural: 0 Urban: 80

Source: Aggregate PDE Licensure File

As shown in Table 15, the number of Instructional I licenses granted in secondary science declined by about 9 percent from the 2011-12 to 2017-18 academic year. There was no decline for rural TPPs while there was a 13 percent decline for urban regions.

Declines and increases were mixed across regions. Four regions experienced a decline (Philadelphia Metro, Central, South West, and Pittsburgh Metro) while four regions (South East, North East, South Central, and North West) experienced increases. The remaining region—North Central—had a very slight increase. However, in the North Central region, the total number of licenses was less than 10 for six of the seven academic years, thus the change in this region was neutral relative to the other regions. The greatest increase—63.6 percent—was for the South East region. However, the increase was only an additional 14 licenses from 2011-12 to 2017-18. The greatest increase for rural TPPs was in the North East region where the 11 additional licenses granted translated into a 122 percent increase.

Table 15: Supply of Newly Licensed Secondary Science Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	118	204	176	153	133	69	80	-38	-32.2
	Rural	na	na	na	na	na	na	na	na	na
	Total	118	204	176	153	133	69	80	-38	-32.2
South East	Urban	22	36	39	35	23	18	36	14	63.6
	Rural	0	0	0	0	0	0	0	0	na
	Total	22	36	39	35	23	18	36	14	63.6
North East	Urban	17	23	20	14	11	9	15	-2	-11.8
	Rural	9	26	17	16	14	5	20	11	122.2
	Total	26	49	37	30	25	14	35	9	34.6
South Central	Urban	30	48	65	49	37	17	36	6	20.0
	Rural	6	5	3	5	6	0	5	-1	-16.7
	Total	36	53	68	54	43	17	41	5	13.9
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	53	64	50	48	43	25	47	-6	-11.3
	Total	53	64	50	48	43	25	47	-6	-11.3
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	5	11	5	2	3	2	7	2	40.0
	Total	5	11	5	2	3	2	7	2	40.0
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	7	13	4	6	9	10	1	-6	-85.7
	Total	7	13	4	6	9	10	1	-6	-85.7
Pittsburgh Metro	Urban	31	52	44	25	19	24	17	-14	-45.2
	Rural	21	28	28	15	33	9	22	1	4.8
	Total	52	80	72	40	52	33	39	-13	-25.0
North West	Urban	13	23	20	11	7	9	17	4	30.8
	Rural	17	32	23	18	18	12	16	-1	-5.9
	Total	30	55	43	29	25	21	33	3	10.0
Total	Urban	231	386	364	287	230	146	201	-30	-13.0
	Rural	118	179	130	110	126	63	118	0	0.0
	Total	349	565	494	397	356	209	319	-30	-8.6

Data Source: Aggregate PDE Licensure File; Calculations by researchers

Secondary social studies. As shown in Figure 13, almost 48 percent of Instructional I social studies licenses were obtained by individuals from urban TPPs as compared to only about 8.3 percent from rural TPPs. In the North Central area, only nine individuals obtained a secondary social studies license, and no one obtained the license in the South West region.

Figure 13: Number of Secondary Social Studies Instructional I Licenses by Region and Geographic Locale

<b>9</b>	<b>North West</b>	<b>6</b>	<b>North Central</b>	<b>3</b>	<b>North East</b>
	Rural: 15 Urban: 13		Rural: 9 Urban: 0		Rural: 22 Urban: 12
		<b>5</b>	<b>Central</b>		
<b>8</b>	<b>Pittsburgh Metro</b>		Rural: 41 Urban: 0		<b>South East</b>
	Rural: 26 Urban: 32			<b>2</b>	Rural: 0 Urban: 27
		<b>4</b>	<b>South Central</b>		
<b>7</b>	<b>South West</b>		Rural: 14 Urban: 44		<b>1</b>
	Rural: 0 Urban: 0				<b>Philly Metro</b>
					Rural: 0 Urban: 119

Source: Aggregate PDE Licensure File

As shown in Table 16, the number of Instructional I licenses granted in secondary social studies declined by about 38 percent from the 2011-12 to 2017-18 academic year. Overall, 232 fewer licenses were granted in 2017-18 than in 2011-12. There were relatively similar declines for urban TPPs (39 percent) and rural TPPs (37 percent).

With respect to region, the greatest declines were around 50 percent for the Pittsburgh Metro region and the North East region. Four other regions (South East, South Central, Central, and North West) experienced declines of around 40 percent. The rural North Central region experienced a 50 percent increase, but the number of new licenses was only three. The rural South West region experienced a 100 percent decline from four licenses granted in 2011-12 to zero licenses granted in 2017-18.

Table 16: Supply of Newly Licensed Secondary Social Studies Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	156	253	262	219	174	97	119	-37	-23.7
	Rural	na	na	na	na	na	na	na	na	na
	Total	156	253	262	219	174	97	119	-37	-23.7
South East	Urban	46	73	73	59	45	19	27	-19	-41.3
	Rural	0	0	0	0	0	0	0	0	na
	Total	46	73	73	59	45	19	27	-19	-41.3
North East	Urban	33	52	32	23	28	8	12	-21	-63.6
	Rural	32	54	35	34	19	14	22	-10	-31.3
	Total	65	106	67	57	47	22	34	-31	-47.7
South Central	Urban	87	127	126	80	68	30	44	-43	-49.4
	Rural	9	6	13	11	9	2	14	5	55.6
	Total	96	133	139	91	77	32	58	-38	-39.6
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	69	94	96	77	68	34	41	-28	-40.6
	Total	69	94	96	77	68	34	41	-28	-40.6
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	6	11	6	6	7	5	9	3	50.0
	Total	6	11	6	6	7	5	9	3	50.0
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	4	12	10	8	9	6	0	-4	-100.0
	Total	4	12	10	8	9	6	0	-4	-100.0
Pittsburgh Metro	Urban	59	112	78	54	60	34	32	-27	-45.8
	Rural	58	54	71	56	42	22	26	-32	-55.2
	Total	117	166	149	110	102	56	58	-59	-50.4
North West	Urban	25	33	36	11	14	9	13	-12	-48.0
	Rural	22	43	39	25	22	4	15	-7	-31.8
	Total	47	76	75	36	36	13	28	-19	-40.4
Total	Urban	406	650	607	446	389	197	247	-159	-39.2
	Rural	200	274	270	217	176	87	127	-73	-36.5
	Total	606	924	877	663	565	284	374	-232	-38.3

Data Source: Aggregate PDE Licensure File; Calculations by researchers

Foreign language. As shown in Figure 14, about 55 percent of Instructional I foreign language licenses were obtained by individuals from urban TPPs as compared to only about 45 percent from rural TPPs. Only the Philadelphia Metro region produced more than 11 new Instructional I licenses. The North Central region produced no new Instructional I licenses in foreign language and the South West region produced only four.

Figure 14: Number of Secondary Foreign Language Instructional I Licenses by Region and Geographic Locale

9	North West	6	North Central	3	North East	
	Rural: 4 Urban: 1		Rural: 0 Urban: 0		Rural: 5 Urban: 2	
		5	Central			
8	Pittsburgh Metro				South East	
	Rural: 5 Urban: 1		Rural: 11 Urban: 0	2	Rural: 0 Urban: 8	
				4	South Central	
7	South West				1	Philly Metro
	Rural: 4 Urban: 0		Rural: 3 Urban: 8		Rural: 0 Urban: 19	

Data Source: Aggregate PDE Licensure File; Calculations by researchers

As shown in Table 17, the number of Instructional I licenses granted in foreign language declined by about 42 percent from the 2011-12 to 2017-18 academic year. Overall, 52 fewer licenses were granted in 2017-18 than in 2011-12. The decline for urban TPPs was 53 percent, which was greater than the 20 percent decline for rural TPPs.

With respect to region, the greatest declines were almost 73 percent for the Pittsburgh Metro region and almost 60 percent for the Philadelphia Metro region. The other four regions with a sufficient number of licenses granted to establish a trend all experienced rather substantial declines of at least 25 percent. These included the South East, North East, South Central, and Central regions. The only region with an increase was the South West region, but the increase was only from two licenses granted in 2011-12 to four licenses granted in 2017-18.

Table 17: Supply of Newly Licensed Foreign Language Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	47	62	44	43	31	25	19	-28	-59.6
	Rural	na	na	na	na	na	na	na	na	na
	Total	47	62	44	43	31	25	19	-28	-59.6
South East	Urban	10	14	8	8	12	1	8	-2	-20.0
	Rural	0	0	0	0	0	0	0	0	na
	Total	10	14	8	8	12	1	8	-2	-20.0
North East	Urban	2	6	8	4	1	0	2	0	0.0
	Rural	6	9	5	5	5	4	5	-1	-16.7
	Total	8	15	13	9	6	4	7	-1	-12.5
South Central	Urban	14	26	24	14	16	4	8	-6	-42.9
	Rural	2	3	1	3	4	1	3	1	50.0
	Total	16	29	25	17	20	5	11	-5	-31.3
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	15	21	21	20	12	8	11	-4	-26.7
	Total	15	21	21	20	12	8	11	-4	-26.7
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	0	0	0	2	3	1	0	0	na
	Total	0	0	0	2	3	1	0	0	na
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	2	2	0	0	0	0	4	2	100.0
	Total	2	2	0	0	0	0	4	2	100.0
Pittsburgh Metro	Urban	10	10	9	15	12	3	1	-9	-90.0
	Rural	12	8	4	4	6	3	5	-7	-58.3
	Total	22	18	13	19	18	6	6	-16	-72.7
North West	Urban	0	2	3	3	4	0	1	1	na
	Rural	3	9	4	5	3	3	4	1	33.3
	Total	3	11	7	8	7	3	5	2	66.7
Total	Urban	83	120	96	87	76	33	39	-44	-53.0
	Rural	40	52	35	39	33	20	32	-8	-20.0
	Total	123	172	131	126	109	53	71	-52	-42.3

Data Source: Aggregate PDE Licensure File; Calculations by researchers

Fine arts. As shown in Figure 15, about 62 percent of Instructional I fine arts licenses were obtained by individuals from urban TPPs as compared to only about 38 percent from rural TPPs. The distribution of the production of licenses, however, was inequitable across regions. Indeed, 75 percent of all Instructional I licenses were produced in four regions, Philadelphia



Metro, South East, South Central, and Central. Only nine licenses were granted in the North East region, and there were no licenses granted in the South West region.

Figure 15: Number of Secondary Fine Arts Instructional I Licenses by Region and Geographic Locale

9	<b>North West</b>	6	<b>North Central</b>	3	<b>North East</b>
	Rural: 9 Urban: 12		Rural: 18 Urban: 0		Rural: 3 Urban: 6
		5	<b>Central</b>		
8	<b>Pittsburgh Metro</b>				<b>South East</b>
	Rural: 3 Urban: 18		Rural: 65 Urban: 0	2	Rural: 0 Urban: 23
				4	<b>South Central</b>
7	<b>South West</b>				
	Rural: 0 Urban: 0		Rural: 6 Urban: 54		<b>1</b> <b>Philly Metro</b>
					Rural: 0 Urban: 58

Data Source: Aggregate PDE Licensure File; Calculations by researchers

As shown in Table 18, the number of Instructional I licenses granted in fine arts declined by about 45 percent from the 2011-12 to 2017-18 academic year. Overall, 228 fewer licenses were granted in 2017-18 than in 2011-12. The decline for urban TPPs was 48 percent, which was slightly greater than the 40 percent decline for rural TPPs.

With respect to region, four regions experienced a decline of at least 50 percent—Philadelphia Metro, South East, Pittsburgh Metro, and the North West region. Four other regions—North East, South Central, Central, and North Central—experienced declines of at least 15 percent. The remaining region—South West—had no individuals obtain a license between 2012-13 and 2017-18.

Table 18: Supply of Newly Licensed Fine Arts Teachers  
by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	133	202	163	142	137	59	58	-75	-56.4
	Rural	na	na	na	na	na	na	na	na	na
	Total	133	202	163	142	137	59	58	-75	-56.4
South East	Urban	55	64	63	51	42	25	23	-32	-58.2
	Rural	0	0	0	0	0	0	0	0	na
	Total	55	64	63	51	42	25	23	-32	-58.2
North East	Urban	9	14	24	14	15	5	6	-3	-33.3
	Rural	2	2	4	4	2	1	3	1	50.0
	Total	11	16	28	18	17	6	9	-2	-18.2
South Central	Urban	69	104	89	75	54	25	54	-15	-21.7
	Rural	3	6	4	4	2	0	6	3	100.0
	Total	72	110	93	79	56	25	60	-12	-16.7
Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	93	114	117	93	68	40	65	-28	-30.1
	Total	93	114	117	93	68	40	65	-28	-30.1
North Central	Urban	0	0	0	0	0	0	0	0	na
	Rural	25	38	26	32	12	11	18	-7	-28.0
	Total	25	38	26	32	12	11	18	-7	-28.0
South West	Urban	0	0	0	0	0	0	0	0	na
	Rural	2	0	0	0	0	0	0	-2	-100.0
	Total	2	0	0	0	0	0	0	-2	-100.0
Pittsburgh Metro	Urban	34	53	61	41	45	27	18	-16	-47.1
	Rural	31	29	37	28	12	9	3	-28	-90.3
	Total	65	82	98	69	57	36	21	-44	-67.7
North West	Urban	30	36	30	28	20	13	12	-18	-60.0
	Rural	17	16	14	12	17	7	9	-8	-47.1
	Total	47	52	44	40	37	20	21	-26	-55.3
Total	Urban	330	473	430	351	313	154	171	-159	-48.2
	Rural	173	205	202	173	113	68	104	-69	-39.9
	Total	503	678	632	524	426	222	275	-228	-45.3

Data Source: Aggregate PDE Licensure File; Calculations by researchers

*Physical and health education.* As shown in Figure 16, about 40 percent of Instructional I physical or health education licenses were obtained by individuals from urban TPPs as compared to about 60 percent from rural TPPs. The distribution of the production of licenses, however, was inequitable across regions. Specifically, almost 80 percent of all Instructional I licenses were produced in three regions—Philadelphia Metro, North East, and Central. There were zero

licenses granted for the South East and South West regions, and fewer than 10 licenses granted in the South Central, North Central, and North West regions.

Figure 16: Number of Secondary Physical and Health Education Instructional I Licenses by Region and Geographic Locale

9	North West	6	North Central	3	North East
	Rural: 0 Urban: 8		Rural: 1 Urban: 0		Rural: 29 Urban: 3
		5	Central		
8	Pittsburgh Metro		Rural: 38 Urban: 0		2
	Rural: 14 Urban: 0				South East
					Rural: 0 Urban: 0
		4	South Central		
7	South West		Rural: 3 Urban: 3		1
	Rural: 0 Urban: 0				Philly Metro
					Rural: 0 Urban: 43

Data Source: Aggregate PDE Licensure File; Calculations by researchers

As shown in Table 19, the number of Instructional I licenses granted in physical or health education declined by about 56 percent from the 2011-12 to 2017-18 academic year. Overall, 180 fewer licenses were granted in 2017-18 than in 2011-12. The decline for urban TPPs was 57 percent, which was similar to the 55 percent decline for rural TPPs.

With respect to region, five regions experienced a decline of at least 50 percent, Philadelphia Metro, Central, North Central, Pittsburgh Metro, and North West. The North East region experienced a decline of 49 percent while the remaining regions, South East and South West, did not have any individuals obtaining an Instructional I license in either physical education or health education.

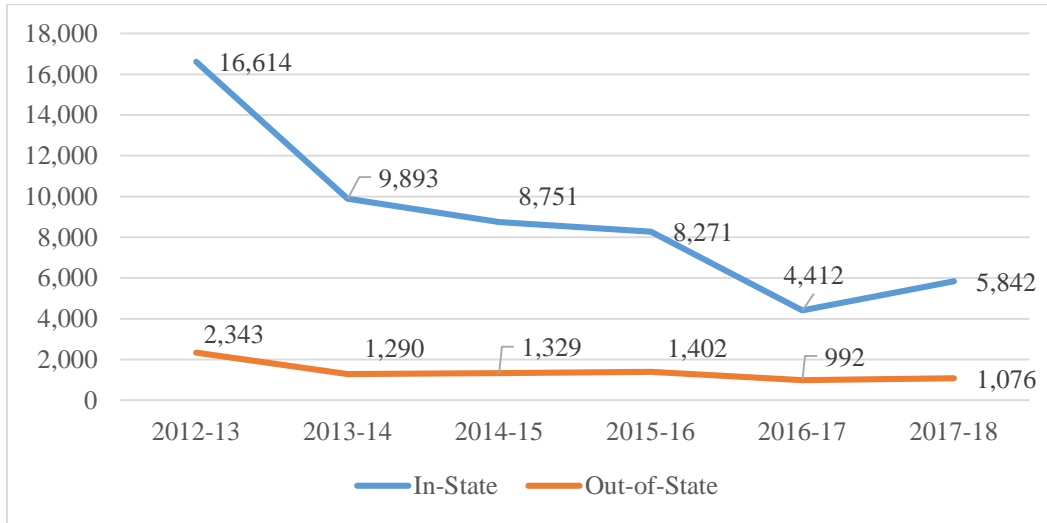
Table 19: Supply of Newly Licensed Physical and Health Education Teachers by Licensure Area and Locale of Preparation Program (2012-2018)

Region	Locale	Academic Year							Chg: 2018-2012	
		2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	#	%
Philadelphia Metro	Urban	91	133	98	74	48	16	43	-48	-52.7
	Rural	na	na	na	na	na	na	na	na	Na
	Total	91	133	98	74	48	16	43	-48	-52.7
South East	Urban	0	0	0	0	0	0	0	0	Na
	Rural	0	0	0	0	0	0	0	0	Na
	Total	0	0	0	0	0	0	0	0	Na
North East	Urban	13	12	9	5	6	2	3	-10	-76.9
	Rural	50	99	85	43	37	22	29	-21	-42.0
	Total	63	111	94	48	43	24	32	-31	-49.2
South Central	Urban	6	13	14	11	5	5	3	-3	-50.0
	Rural	0	0	0	0	0	0	3	3	Na
	Total	6	13	14	11	5	5	6	0	0.0
Central	Urban	0	0	0	0	0	0	0	0	Na
	Rural	82	132	83	62	53	27	38	-44	-53.7
	Total	82	132	83	62	53	27	38	-44	-53.7
North Central	Urban	0	0	0	0	0	0	0	0	Na
	Rural	5	9	4	3	2	0	1	-4	-80.0
	Total	5	9	4	3	2	0	1	-4	-80.0
South West	Urban	0	0	0	0	0	0	0	0	Na
	Rural	0	0	0	0	0	0	0	0	Na
	Total	0	0	0	0	0	0	0	0	Na
Pittsburgh Metro	Urban	0	0	0	0	0	0	0	0	Na
	Rural	52	83	68	34	26	14	14	-38	-73.1
	Total	52	83	68	34	26	14	14	-38	-73.1
North West	Urban	23	18	22	13	6	1	8	-15	-65.2
	Rural	0	0	0	0	0	0	0	0	Na
	Total	23	18	22	13	6	1	8	-15	-65.2
Total	Urban	133	176	143	103	65	24	57	-76	-57.1
	Rural	189	323	240	142	118	63	85	-104	-55.0
	Total	322	499	383	245	183	87	142	-180	-55.9

Data Source: Aggregate PDE Licensure File; Calculations by researchers

*Out-of-state Instructional I licenses.* As shown in Figure 17, the number of new Instructional I licenses declined from 2012-13 through 2016-17 for both in-state and out-of-state teachers. While the decline for out-of-state Instructional I licenses declined by 57 percent, this decline was dwarfed by the nearly 75 percent decline for in-state Instructional I licenses.

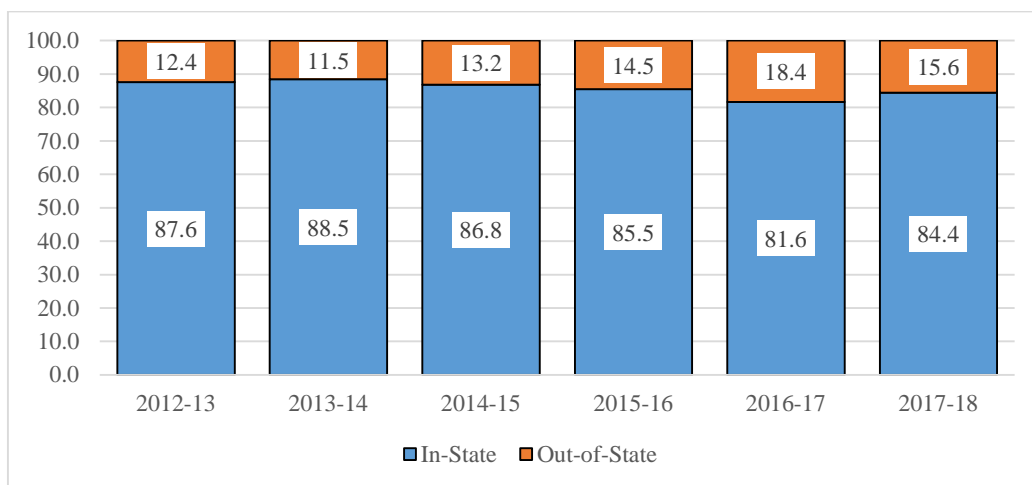
Figure 17: Number of In-State and Out-of-State Instructional I Licenses Granted by PDE (2012-13 to 2017-18)



Data Source: Aggregate PDE Licensure File; Calculations by researchers

Because the decline was smaller for out-of-state Instructional I licenses than for in-state Instructional I licenses, the percentage of all new Instructional I licenses granted to individuals from out-of-state increased through 2016-17, as shown in Figure 18. From 2016-17 to 2017-18, the trend reversed as the number of Instructional I licenses granted to in-state individuals rebounded by 32 percent.

Figure 18: Percentage of Instructional I Licenses Granted to Individuals from In-State and Out-of-State by PDE (2012-13 to 2017-18)



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

Although between 12 and 18 percent of new Instructional I licenses were granted to individuals from out-of-state, not all out-of-state individuals necessarily entered teaching in Pennsylvania public schools. Unfortunately, the individual teacher licensure files do not include sufficient information to identify if every beginning teacher hired in a particular year was from an in-state or out-of-state TPP. In short, there was missing information in the data provided by PDE. Specifically, in the 2013-14 academic year, there were data on in-state status for 62 percent of the beginning teachers hired. This percentage increased to 70 percent in 2014-15, 73 percent in 2015-16, and 75 percent in 2016-17. This could not be calculated for any other years.

Despite the lack of data, analyses by the researchers using individual teacher employment records suggests a substantial percentage of individuals from out-of-state with new Instructional I licenses do not take positions as teachers in Pennsylvania public schools. Indeed, as shown in Table 20, the average percentage of beginning teachers from out-of-state for all districts across all 4 years was about 5 percent. This is substantially lower than the percentage of individuals from out-of-state obtaining new Instructional I licenses. The percentages varied by district locale, with urban districts having a greater percentage than rural districts in 3 of the 4 years. Across all 4 years, the percentage of beginning teachers from out-of-state in urban districts was 5.4 percent, while the percentage for rural districts was 4.3 percent. Thus, out-of-state teachers are a greater source of supply for urban districts than for rural districts.

Table 20: Number and Percentage of Beginning Teachers from Out-of-State by Year and Locale of District (2013-14 through 2016-17)

Locale of District	Academic Year								All Years	
	2013-14		2014-15		2015-16		2016-17		Total	Average
	N	%	N	%	N	%	N	%	N	%
Urban	94	5.4	83	4.1	111	5.3	145	6.7	433	5.4
Rural	23	3.6	26	4.3	26	4.2	27	4.9	102	4.3
All Districts	117	5.0	109	4.1	137	5.1	172	6.3	535	5.1

Data Source: PDE Employment file and PDE Licensure File; Calculations by researchers

Table 21 documents the numbers of Instructional I licenses granted to individuals from out-of-state by subject area. Because the categories reported by PDE overlap, the researchers could not simply add the number of licenses across subject areas. Indeed, in the data file, a number of individuals were represented by multiple lines. For all subject areas, the number of Instructional I licenses granted to individuals from out-of-state declined from 2011-12 through 2017-18. The greatest declines were for all elementary and middle school subjects (-64.3 percent) and special education (-73.5 percent). The smallest decline was for Secondary English Language Arts at -15.5 percent. The declines for the remainder of the subject areas ranged from -24.4 percent for fine arts to -45.2 percent for secondary mathematics.

Table 21: Number of Out-of-State Instructional I Licenses Granted by PDE by Year and Subject Area (2011-12 to 2017-18)

Level and Subject Area	Academic Year							Chg: 2018 - 2012	
	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	N	%
All Elementary/Middle School	559	1049	301	408	491	343	375	-184	-32.9
All Special Education	216	521	227	226	193	137	138	-78	-36.1
Secondary English	222	181	199	209	201	150	153	-69	-31.1
Secondary Mathematics	101	146	92	96	118	60	80	-21	-20.8
Secondary Science	67	119	93	87	100	76	87	20	29.9
Secondary Social Studies	104	114	129	108	97	73	95	-9	-8.7
All PE & Health	50	54	61	63	44	38	33	-17	-34.0
All Foreign Language	27	47	71	41	39	27	35	8	29.6
All Fine Arts	90	82	88	69	100	73	62	-28	-31.1
All Technology	5	5	6	2	4	1	0	5	-100.0
All Ag, Mkting, Consumer Sci	349	480	446	395	398	274	330	-19	-5.4

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

Table 22 provides data on the percentage of all new Instructional I licenses granted that were obtained by out-of-state educators by subject area. In 2011-12, out-of-state individuals were at least 10 percent of the newly granted Instructional I licenses for seven of the 11 subject areas. The highest percentage was 14.5 percent for secondary English Language Arts while the lowest

percentage was 2.7 percent for fine arts. By 2018, at least 10 percent of new Instructional I licenses were granted to out-of-state individuals for nine of the 11 subject areas. Moreover, the percentage was greater than 20 percent for five subject areas: secondary English Language Arts, secondary mathematics, secondary science, secondary social studies, and combined agriculture, marketing, and consumer science. Nearly one-third of all new secondary social studies Instructional I licenses were granted to out-of-state individuals in 2018.

There were increases in the percentage of Instructional I licenses granted to out-of-state individuals for 10 of the 11 subject areas. The greatest increases were for secondary social studies (19.1 percentage points) and combined agriculture, marketing, and consumer science (16.4 percentage points). The only decrease was for fine arts (-2.7 percentage points). Thus, over time, out-of-state individuals increasingly have become a greater source of the supply of new teachers to Pennsylvania districts.

Table 22: Percentage of All New Instructional I Licenses  
Granted to Out-of-State Educators by Subject Area (2012-2018)

Level and Subject Area	Academic Year							CHG 18-13
	2012	2013	2014	2015	2016	2017	2018	
All Elementary/Middle School	8.4	13.1	9.0	12.1	14.7	17.5	14.9	6.5
All Special Education	11.4	9.4	11.8	15.5	15.0	19.5	16.9	5.5
Secondary English	14.5	18.9	12.8	15.8	18.4	20.3	21.2	6.7
Secondary Mathematics	12.2	16.3	15.8	18.0	21.9	26.7	21.4	9.2
Secondary Science	11.8	10.9	12.8	14.0	14.6	20.4	20.2	8.4
Secondary Social Studies	13.6	20.6	33.8	23.6	25.3	32.9	32.7	19.1
All PE & Health	10.3	9.7	13.7	20.5	19.4	30.4	19.3	9.0
All Foreign Language	12.6	10.7	12.2	11.6	19.0	24.7	18.4	5.8
All Fine Arts	2.7	7.2	10.9	5.4	18.2	6.7	0.0	-2.7
All Technology	7.1	11.2	9.9	9.8	8.6	11.6	8.9	1.7
All Ag, Mkting, Consumer Sci	9.5	12.2	17.1	16.7	23.0	27.9	25.9	16.4

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

### Supply of Teachers to School Districts: Other Teachers

As described above, the category of “other” teachers in this study includes three categories of teachers: those entering a Pennsylvania public school from out-of-state, either from



a public or private school; those transferring from a Pennsylvania private school into a Pennsylvania public school; or those resuming their teaching careers in a Pennsylvania public school after taking a hiatus from teaching in a Pennsylvania public school. Other teachers do not include teachers who were on sabbatical leave as teachers on sabbatical were counted as employed.

**Elementary teachers.** As shown in Table 23, there was an overall decline in the number of “other” teachers of about 6 percent. There was essentially no change in the number of teachers in urban districts while there was a 36 percent decline in the number of “other” teachers in rural districts.

Of the nine regions, five had decreases in the number of newly hired “other” teachers, two (South East and Central) had relatively no change over time, and the remaining two (Philadelphia Metro and South Central) had increases. For four regions (North East, North Central, South West, and North West), the declines exceeded 30 percent.

With respect to urban districts, three of the seven regions with sufficient sample sizes of teachers had an increase in “other” teachers, while the other four regions had a decrease in such teachers. The South Central region had the greatest increase at around 14 percent, while the North West region had the greatest decrease at almost 71 percent.

With respect to rural districts, all eight regions experienced a decrease in “other” teachers. The two regions with the greatest decreases were the South West region, with a 56 percent decline, and the North East region, with a 47 percent decline.

Table 23: Number of Newly Hired “Other” Elementary Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	558	575	734	868	601	44	8.1
	Rural	na	na	na	na	na	na	Na
	Total	558	575	734	868	602	44	7.9
South East	Urban	102	104	165	123	106	4	3.9
	Rural	12	10	7	7	7	-5	-41.7
	Total	114	114	172	130	113	-1	-0.9
North East	Urban	36	51	51	30	29	-7	-19.4
	Rural	58	37	53	39	31	-27	-46.6
	Total	94	88	104	69	60	-34	-36.2
South Central	Urban	128	116	174	150	146	18	14.1
	Rural	34	29	38	35	30	-4	-11.8
	Total	162	145	212	185	176	14	8.6
Central	Urban	25	9	20	24	23	-2	-8.0
	Rural	34	32	43	29	34	0	0.0
	Total	59	41	63	53	57	-2	-3.4
North Central	Urban	6	7	6	4	2	-4	Na
	Rural	10	14	11	13	9	-1	-10.0
	Total	16	21	17	17	11	-5	-31.3
South West	Urban	8	9	12	8	2	-6	Na
	Rural	41	35	58	20	18	-23	-56.1
	Total	49	44	70	28	20	-29	-59.2
Pittsburgh Metro	Urban	195	192	393	177	175	-20	-10.3
	Rural	24	20	10	14	6	-18	-75.0
	Total	219	212	403	191	181	-38	-17.4
North West	Urban	24	18	11	16	7	-17	-70.8
	Rural	43	35	41	27	29	-14	-32.6
	Total	67	53	52	43	36	-31	-46.3
Total	Urban	1080	1081	1565	1399	1091	11	1.0
	Rural	258	212	262	185	165	-93	-36.0
	Total	1338	1293	1827	1584	1256	-82	-6.1

Data Source: PDE Educator Employment File; Calculations by researchers

**Secondary English Language Arts.** As shown in Table 24, there was an overall decline in the number of “other” teachers of about 15 percent. There was a 14 percent decline in the number of “other” teachers in urban districts while there was a 20 percent decline in the number of “other” teachers in rural districts.

Across all nine regions, seven had enough “other” teachers to assess trends over time. Six regions, South East, North West, South Central, Central, Pittsburgh Metro, and North West, experienced declines of at least 10 percent. The remaining region, Philadelphia Metro, had about the same number of newly hired “other” teachers in 2013-14 and 2017-18, but experienced substantially greater numbers of newly hired “other” teachers in the intervening years.

With respect to urban districts, there were seven regions with a sufficient number of “other” teachers to calculate a change over time. There was insufficient data for the North Central and South West regions. Of the seven regions for which trends were calculated, six of the regions experienced a decrease in the number of “other” teachers hired. The Philadelphia Metro region, however, experienced essentially no change in the number of “other” teachers hired.

With respect to rural districts, only three regions had a sufficient number of teachers to assess changes in the number of “other” teachers hired over time. All three regions—North East (-40 percent), Central (-14 percent), and North West (18 percent)—experienced a decline in the number of “other” teachers hired.

Table 24: Number of Newly Hired “Other” Secondary English Language Arts Teachers By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	155	198	182	304	158	1	1.3
	Rural	na	na	na	na	na	na	na
	Total	157	198	182	304	158	1	0.6
South East	Urban	51	30	64	47	35	-16	-31.4
	Rural	6	4	4	1	2	-4	na
	Total	57	34	68	48	37	-20	-35.1
North East	Urban	15	10	26	8	9	-6	-40.0
	Rural	25	8	19	11	15	-10	-40.0
	Total	40	18	45	19	24	-16	-40.0
South Central	Urban	45	46	44	45	40	-5	-11.1
	Rural	7	7	10	11	7	0	na
	Total	52	53	54	56	47	-5	-9.6
Central	Urban	11	3	4	4	6	-5	-45.5
	Rural	14	23	14	13	12	-2	-14.3
	Total	25	26	18	17	18	-7	-28.0
North Central	Urban	1	2	1	0	1	0	na
	Rural	4	2	4	4	4	0	na
	Total	5	4	5	4	5	0	na
South West	Urban	1	4	0	1	0	-1	na
	Rural	5	9	12	10	11	6	na
	Total	6	13	12	11	11	5	na
Pittsburgh Metro	Urban	52	43	105	37	39	-13	-25.0
	Rural	5	6	4	3	2	-3	na
	Total	57	49	109	40	41	-16	-28.1
North West	Urban	10	6	9	4	6	-4	-40.0
	Rural	11	12	35	6	9	-2	-18.2
	Total	21	18	44	10	15	-6	-28.6
Total	Urban	341	341	431	449	293	-48	-14.1
	Rural	79	72	106	60	63	-16	-20.3
	Total	420	413	537	509	356	-64	-15.2

Data Source: PDE Educator Employment File; Calculations by researchers

**Secondary mathematics.** As shown in Table 25, there was an overall 12 percent decline in the number of “other” teachers of about 3 percent. There was about a 5 percent decrease in the number of “other” teachers in urban districts while there was a 43 percent decline in the number of “other” teachers in rural districts.

Across all regions, seven had sufficient numbers of newly hired “other” teachers to assess changes over time. Five of the regions experienced declines—South East, North East, Central, Pittsburgh Metro, and North West. The declines were particularly large in the Central and North West regions—about 63 percent in both cases. The other two regions—South East (33.3 percent) and South Central (6.3 percent)—experienced increases in the number of newly hired “other” teachers.

Table 25: Number of Newly Hired “Other” Secondary Mathematics Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	132	177	142	249	124	-7	-6.1
	Rural	na	na	na	na	na	na	na
	Total	132	177	142	249	124	-7	-5.3
South East	Urban	14	23	37	22	24	10	71.4
	Rural	4	5	1	2	0	-4	na
	Total	18	28	38	24	24	6	33.3
North East	Urban	6	8	18	9	7	1	na
	Rural	13	7	12	14	10	-3	-23.1
	Total	19	15	30	23	17	-2	-10.5
South Central	Urban	26	23	37	29	29	3	11.5
	Rural	6	8	8	4	5	-1	na
	Total	32	31	45	33	34	2	6.3
Central	Urban	9	3	7	4	5	-4	na
	Rural	10	12	7	9	2	-8	-80.0
	Total	19	15	14	13	7	-12	-63.2
North Central	Urban	1	2	0	0	1	0	na
	Rural	2	1	2	2	1	-1	na
	Total	3	3	2	2	2	-1	na
South West	Urban	1	0	1	2	0	-1	na
	Rural	8	8	6	10	6	-2	na
	Total	9	8	7	12	6	-3	na
Pittsburgh Metro	Urban	42	58	68	20	36	-6	-14.3
	Rural	2	2	2	3	1	-1	na
	Total	44	60	70	23	37	-7	-15.9
North West	Urban	8	12	7	13	2	-6	na
	Rural	8	8	38	6	4	-4	na
	Total	16	20	45	19	6	-10	-62.5
Total	Urban	239	306	317	348	228	-11	-4.6
	Rural	53	51	76	50	30	-23	-43.4
	Total	292	357	393	398	258	-34	-11.6

Data Source: PDE Educator Employment File; Calculations by researchers

With respect to urban districts, there was a sufficient sample of teachers to see trends in only four regions. Of these four regions, there were decreases in two (Philadelphia Metro and Pittsburgh Metro) and increases in two (South East and South Central). This generally tracks the changes in student enrollment in urban districts by region.

With respect to rural districts, there was a sufficient number of newly hired “other” teachers in just two regions—North East and Central. In both regions, there was a decrease in the number of “other” teachers hired. The decline was 23 percent for the North East region and 80 percent for the Central region.

**Secondary science.** As shown in Table 26, there was an overall slight decline in the number of “other” teachers of about 3 percent. There was a 9 percent decline in the number of “other” teachers in urban districts while there was a 49 percent decline in the number of “other” teachers in rural districts.

Across all regions, six had sufficient numbers of newly hired “other” teachers to assess changes over time. Three of the regions experienced declines—Philadelphia Metro, North East, and Central. The other three regions—South East, South Central, and Pittsburgh Metro—experienced increases in the number of newly hired “other” teachers.

Of the nine regions, only five had sufficient numbers of newly hired “other” teachers in urban districts to calculate changes over time. Two of the regions—Philadelphia Metro and North East—had declines in the number of “other” teachers while two regions—South East and South Central—had increases in the number of “other” teachers. The declines were 7 and 10 percent, respectively. The increases were 85 and 36 percent, respectively.

With respect to rural districts, only two regions had sufficient numbers of “other” teachers to assess changes over time. The North East experienced a decline of nearly 79 percent

in the number of newly hired “other” teachers, while the Central region experienced a decline of almost 55 percent.

Table 26: Number of Newly Hired “Other” Secondary Science Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	103	115	104	141	95	-8	-7.8
	Rural	na	na	na	na	na	na	na
	Total	103	115	104	141	95	-8	-7.8
South East	Urban	13	8	25	14	24	11	84.6
	Rural	3	5	2	2	2	-1	na
	Total	16	13	27	16	26	10	62.5
North East	Urban	10	7	13	3	9	-1	-10.0
	Rural	19	7	10	5	4	-15	-78.9
	Total	29	14	23	8	13	-16	-55.2
South Central	Urban	22	22	29	21	30	8	36.4
	Rural	3	3	1	1	3	0	na
	Total	25	25	30	22	33	8	32.0
Central	Urban	4	2	2	1	5	1	na
	Rural	11	6	10	4	5	-6	-54.5
	Total	15	8	12	5	10	-5	-33.3
North Central	Urban	0	0	1	1	0	0	na
	Rural	2	4	2	3	2	0	na
	Total	2	4	3	4	2	0	na
South West	Urban	0	0	1	2	0	0	na
	Rural	4	7	5	12	5	1	na
	Total	4	7	6	14	5	1	na
Pittsburgh Metro	Urban	24	48	70	32	34	10	41.7
	Rural	2	3	4	0	0	-2	na
	Total	26	51	74	32	34	8	30.8
North West	Urban	6	2	3	2	2	-4	na
	Rural	3	3	27	5	3	0	na
	Total	9	5	30	7	5	-4	na
Total	Urban	182	204	248	217	199	17	9.3
	Rural	47	39	62	33	24	-23	-48.9
	Total	229	243	310	250	223	-6	-2.6

Data Source: PDE Educator Employment File; Calculations by researchers

**Secondary social studies.** As shown in Table 27, there was an overall 10 percent decline in the number of “other” teachers. There was a 1 percent increase in the number of “other”

teachers in urban districts while there was a 55 percent decline in the number of “other” teachers in rural districts.

Only six regions had sufficient data to identify trends. Of those six regions, three had no change in the number of newly hired “other” teachers (Philadelphia Metro, South Central, and Pittsburgh Metro). However, the Philadelphia Metro region hired substantially greater numbers of “other” teachers in 2014-15, 2015-16, and 2016-17. The remaining three regions (North East, Central, and North West) experienced declines of at least 33 percent.

With respect to urban districts, only three regions had sufficient data to calculate changes. Both the Philadelphia and Pittsburgh Metro regions had no change while the South Central region had an increase of about 8 percent. However, as with subject areas, there was a dramatic increase in the number of newly hired “other teachers” in the years between the 2013-14 and 2017-18 academic years.

With respect to rural districts, there was a decline in the number of newly hired “other” teachers in the North East region. This was the only region with a sufficient number of teachers to assess changes over time.



Table 27: Number of Newly Hired “Other” Secondary Social Studies Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	71	105	89	145	72	1	1.4
	Rural	na	na	na	na	na	na	na
	Total	71	105	89	145	72	1	1.4
South East	Urban	5	8	32	18	16	11	na
	Rural	1	3	0	1	1	0	na
	Total	6	11	32	19	17	11	na
North East	Urban	7	6	14	10	0	-7	na
	Rural	10	11	10	7	5	-5	-50.0
	Total	17	17	24	17	5	-12	-70.6
South Central	Urban	24	22	21	21	26	2	8.3
	Rural	6	2	5	5	3	-3	na
	Total	30	24	26	26	29	-1	-3.3
Central	Urban	5	0	5	0	3	-2	na
	Rural	4	9	5	7	3	-1	na
	Total	9	9	10	0	6	-3	-33.3
North Central	Urban	0	0	0	7	0	0	na
	Rural	2	0	1	3	1	-1	na
	Total	2	0	1	3	1	-1	na
South West	Urban	3	0	0	1	1	-2	na
	Rural	6	6	1	3	2	-4	na
	Total	9	6	1	4	3	-6	na
Pittsburgh Metro	Urban	29	33	60	25	30	1	3.4
	Rural	4	3	0	2	2	-2	na
	Total	33	36	60	27	32	-1	-3.0
North West	Urban	6	4	3	4	4	-2	na
	Rural	7	0	22	1	1	-6	na
	Total	13	4	25	5	5	-8	-61.5
Total	Urban	150	178	224	223	152	2	1.3
	Rural	40	34	44	30	18	-22	-55.0
	Total	190	212	268	253	170	-20	-10.5

Data Source: PDE Educator Employment File; Calculations by researchers

**PK-12 Foreign language.** As shown in Table 28, there was an overall 15 percent decline in the number of “other” teachers. There was an almost 13 percent decline in the number of “other” teachers in urban districts while there was a 26 percent decline in the number of “other” teachers in rural districts.

Of the six regions with sufficient data to assess changes, four experienced declines in the number of newly hired “other” teachers. These four regions were Philadelphia Metro, North East, Pittsburgh Metro, and North West, and all of them experienced declines of at least 11 percent. The Philadelphia Metro data are misleading, however, because the number of newly hired “other” teachers hired in the middle 3 years were substantially greater than in the first and last year.

With respect to urban districts, there were only three regions with sufficient data to assess trends over time—Philadelphia Metro, South Central, and Pittsburgh Metro. In Philadelphia and Pittsburgh Metro regions, there were declines in the number of newly hired “other” teachers while there was an increase in such teachers in the South Central region. The analysis for Philadelphia Metro, however, masks the 100 percent increase from 2015-16 to 2016-17 and the subsequent 56 percent decrease from 2016-17 to 2017-18.

With respect to rural districts, none of the regions had sufficient data to assess trends over time. Surprisingly, even when adding the number of newly hired teachers across all five academic years, only the North East and North West regions hired 20 or more “other” teachers in rural districts.

Table 28: Number of Newly Hired “Other” PK-12 Foreign Language Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	61	70	60	123	53	-7	-13.1
	Rural	na	na	na	na	na	na	na
	Total	61	70	60	123	54	-7	-11.5
South East	Urban	5	8	15	13	7	2	na
	Rural	0	1	1	0	0	0	na
	Total	5	9	16	13	7	2	na
North East	Urban	4	4	9	4	2	-2	na
	Rural	8	5	4	3	1	-7	na
	Total	12	9	13	7	3	-9	-75.0
South Central	Urban	12	7	16	12	14	2	16.7
	Rural	2	5	4	3	2	0	na
	Total	14	12	20	15	16	2	14.3
Central	Urban	2	0	3	6	1	-1	na
	Rural	3	3	2	2	5	2	na
	Total	5	3	5	8	6	1	na
North Central	Urban	0	0	0	0	0	0	na
	Rural	1	1	0	0	0	-1	na
	Total	1	1	0	0	0	-1	na
South West	Urban	1	0	2	0	0	-1	na
	Rural	2	8	1	2	1	-1	na
	Total	3	8	3	2	1	-2	na
Pittsburgh Metro	Urban	18	13	28	10	14	-4	-22.2
	Rural	2	0	0	1	3	1	na
	Total	20	13	28	11	17	-3	-15.0
North West	Urban	1	3	1	0	0	-1	na
	Rural	5	1	9	1	4	-1	na
	Total	6	4	10	1	4	-2	-33.3
Total	Urban	104	105	134	167	91	-13	-12.5
	Rural	23	24	21	13	17	-6	-26.1
	Total	127	129	155	180	108	-19	-15.0

Data Source: PDE Educator Employment File; Calculations by researchers

**PK-12 Fine arts.** As shown in Table 29, there was an overall 14 percent decline in the number of “other” teachers. For urban districts, there was an almost 17 percent decline in the number of “other” teachers while there was a very slight three percent increase in the number of “other” teachers in rural districts.

Of the five regions with sufficient data to assess changes, the Philadelphia Metro and North East regions experienced declines of greater than 30 percent in the number of newly hired “other” teachers. The Philadelphia Metro data are misleading, however, because the number of newly hired “other” teachers hired in the middle 3 years were substantially greater than in the first and last year. The other three regions, South East, South Central, and Pittsburgh Metro, all experienced increases of at least 22 percent in the number of newly hired “other” teachers.

With respect to urban districts, only four regions had sufficient data to assess changes over time. Of these four, Philadelphia Metro experienced a decline in the number of newly hired “other” teachers while the other three regions—South East, South Central, and Pittsburgh Metro—all experienced increases of at least 22 percent. The Philadelphia Metro data, however, are misleading because there was a large increase in the number of newly hired teachers from 2013-14 through the next 3 years, then a large decrease.

With respect to rural districts, there were no regions for which there were sufficient data to assess changes over time. In fact, only four regions—North East, South Central, South West, and North West—hired 30 or more “other” teachers in fine arts across the 5 academic years.

Table 29: Number of Newly Hired “Other” PK-12 Fine Arts Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	115	156	160	226	79	-36	-33.9
	Rural	na	na	na	na	na	na	na
	Total	115	156	160	226	79	-36	-31.3
South East	Urban	15	14	30	24	20	5	33.3
	Rural	1	3	0	3	2	1	na
	Total	16	17	30	27	22	6	37.5
North East	Urban	8	7	12	6	4	-4	na
	Rural	9	5	9	12	7	-2	na
	Total	17	12	21	18	11	-6	-35.3
South Central	Urban	20	20	27	16	25	5	25.0
	Rural	6	7	9	6	5	-1	na
	Total	26	27	36	22	30	4	15.4
Central	Urban	7	1	1	6	4	-3	na
	Rural	4	2	5	9	7	3	na
	Total	11	3	6	15	11	0	na
North Central	Urban	2	0	1	0	0	-2	na
	Rural	4	0	2	4	1	-3	na
	Total	6	0	3	4	1	-5	na
South West	Urban	1	1	0	1	0	-1	na
	Rural	5	6	8	8	7	2	na
	Total	6	7	8	9	7	1	na
Pittsburgh Metro	Urban	35	29	65	36	43	8	22.9
	Rural	5	4	1	2	2	-3	na
	Total	40	33	66	38	45	5	12.5
North West	Urban	5	4	1	2	1	-4	na
	Rural	5	4	13	2	6	1	na
	Total	10	8	14	4	7	-3	na
Total	Urban	208	232	297	317	173	-35	-16.8
	Rural	39	31	47	46	40	1	2.6
	Total	247	263	344	363	213	-34	-13.8

Data Source: PDE Educator Employment File; Calculations by researchers

**PK-12 Physical and health education.** As shown in Table 30, there was an overall 17 percent decline in the number of “other” teachers. For urban districts, there was an almost 19 percent decline in the number of “other” teachers while there was an 8 percent decline in the number of “other” teachers in rural districts.

Of the five regions with sufficient data to assess changes, the Philadelphia Metro, South East, and North East regions experienced declines of at least 8 percent in the number of newly hired “other” teachers in physical/health education. The Philadelphia Metro data are misleading, however, because the numbers of newly hired “other” teachers beginning employment in the middle 3 years were substantially greater than in the first and last year. The other two regions, South Central and Pittsburgh Metro, both experienced increases in the number of newly hired “other” teachers.

With respect to urban districts, the Philadelphia Metro and South East regions experienced declines in the number of newly hired “other” teachers in physical/health education. As mentioned above, the Philadelphia Metro data are misleading because the numbers in the middle 3 years were substantially greater than in the first and last year. The other two regions, South Central and Pittsburgh Metro, experienced increases in the number of newly hired “other” teachers.

Finally, with respect to rural districts, none of the regions had sufficient data to assess changes over time. Only rural districts in the North West region hired more than 30 “other” teachers in physical/health education.

Table 30: Number of Newly Hired “Other” PK-12 Physical/Health Education Teachers By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	72	133	129	150	39	-33	-45.8
	Rural	na	na	na	na	na	na	na
	Total	72	133	129	150	39	-33	-45.8
South East	Urban	15	8	25	14	12	-3	-20.0
	Rural	0	2	1	0	1	1	na
	Total	15	10	26	14	13	-2	-13.3
North East	Urban	8	9	9	5	7	-1	na
	Rural	4	5	4	10	4	0	na
	Total	12	14	13	15	11	-1	-8.3
South Central	Urban	13	10	12	14	17	4	30.8
	Rural	5	4	1	3	2	-3	na
	Total	18	14	13	17	19	1	5.6
Central	Urban	3	1	1	0	3	0	na
	Rural	2	3	2	3	2	0	na
	Total	5	4	3	3	5	0	na
North Central	Urban	0	0	0	1	0	0	na
	Rural	2	1	2	1	2	0	na
	Total	2	1	2	2	2	0	na
South West	Urban	0	1	1	0	0	0	na
	Rural	5	2	5	4	2	-3	na
	Total	5	3	6	4	2	-3	na
Pittsburgh Metro	Urban	13	15	43	21	20	7	53.8
	Rural	4	1	5	2	2	-2	na
	Total	17	16	48	23	22	5	29.4
North West	Urban	1	0	1	3	3	2	na
	Rural	3	6	14	2	8	5	na
	Total	4	6	15	5	11	7	na
Total	Urban	125	178	221	207	101	-24	-19.2
	Rural	25	23	34	26	23	-2	-8.0
	Total	150	201	255	233	124	-26	-17.3

Data Source: PDE Educator Employment File; Calculations by researchers

**PK-12 special education.** As shown in Table 31, there was an overall 4 percent increase in the number of “other” teachers. For urban districts, there was an eight percent increase in the number of “other” teachers, while there was an 11 percent decline in the number of “other” teachers in rural districts.

Of the nine regions with sufficient data to assess changes in the number of newly hired “other” teachers in special education, four experienced declines, one (Philadelphia Metro) experienced no change, and four experienced increases. The four with declines – North East, Central, North Central, and South West – were predominantly rural.

With respect to urban districts, there were sufficient data to assess changes over time for eight of the nine regions. Only the South West region did not have enough teachers. Two of the regions – Central and North Central – experienced declines, while five regions – South East, North East, South Central, Pittsburgh Metro, and North East – experienced increases. The North Central region had a 100 percent decline from 11 newly hired “other” special education teachers in the 2013-14 school year to zero such teachers in 2017-18. The North East had the greatest increase at 80 percent. Philadelphia Metro had only a very slight decline. However, the region did experience a 56 percent increase from 2015-16 to 2016-17 and then a 39 percent decrease in the following year.

With respect to rural districts, five had enough data to assess changes over time—North East, South Central, Central, South West, and North West. Of these five, three experienced declines (North East, Central, and South West) while two experienced increases (South Central and North West).



Table 31: Number of Newly Hired “Other” PK-12 Special Education Teachers  
By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	366	310	378	589	362	-4	-1.4
	Rural	na	na	na	na	na	na	na
	Total	366	310	378	589	362	-4	-1.4
South East	Urban	79	82	115	104	92	13	16.5
	Rural	8	10	8	6	4	-4	na
	Total	87	92	123	110	96	9	10.3
North East	Urban	20	48	58	43	36	16	80.0
	Rural	45	35	36	40	24	-21	-46.7
	Total	65	83	94	83	60	-5	-7.7
South Central	Urban	89	99	100	120	114	25	28.1
	Rural	35	37	23	59	41	6	17.1
	Total	124	136	123	179	155	31	25.0
Central	Urban	11	6	15	7	6	-5	-45.5
	Rural	39	26	30	80	27	-12	-30.8
	Total	50	32	45	87	33	-17	-34.0
North Central	Urban	11	7	5	5	0	-11	-100.0
	Rural	4	10	6	11	11	7	na
	Total	15	17	11	16	11	-4	-26.7
South West	Urban	3	3	15	8	4	1	na
	Rural	29	19	18	15	22	-7	-24.1
	Total	32	22	33	23	26	-6	-18.8
Pittsburgh Metro	Urban	114	102	215	136	137	23	20.2
	Rural	5	18	10	12	10	5	na
	Total	119	120	225	148	147	28	23.5
North West	Urban	11	11	11	14	13	2	18.2
	Rural	17	26	47	26	21	4	23.5
	Total	28	37	58	40	34	6	21.4
Total	Urban	703	665	912	1026	762	59	8.4
	Rural	183	184	178	249	162	-21	-11.5
	Total	886	849	1090	1275	924	38	4.3

Data Source: PDE Educator Employment File; Calculations by researchers

**PK-12 English Language Learner.** As shown in Table 32, there was an almost 6 percent increase in the number of newly hired “other” English Language Learner teachers. For urban districts, there was a 20 percent increase in the number of “other” teachers while there was a 44 percent decline in the number of “other” teachers in rural districts.

Table 32: Number of Newly Hired “Other” PK-12 English Language Learner Teachers By Region and Locale (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18	
		2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Philadelphia Metro	Urban	21	24	40	52	27	6	28.6
	Rural	na	na	na	na	na	na	na
	Total	21	24	40	52	27	6	28.6
South East	Urban	13	7	15	15	16	3	23.1
	Rural	1	1	0	1	0	-1	na
	Total	14	8	15	16	16	2	14.3
North East	Urban	1	6	6	0	6	5	na
	Rural	1	2	2	1	0	-1	na
	Total	2	8	8	1	6	4	na
South Central	Urban	8	13	11	6	8	0	na
	Rural	12	2	5	3	3	-9	-75.0
	Total	20	15	16	9	11	-9	-45.0
Central	Urban	0	0	0	1	0	0	na
	Rural	1	1	0	1	4	3	na
	Total	1	1	0	2	4	3	na
North Central	Urban	0	0	0	0	0	0	na
	Rural	0	1	0	0	1	1	na
	Total	0	1	0	0	1	1	na
South West	Urban	0	0	0	0	0	0	na
	Rural	0	0	0	0	1	1	na
	Total	0	0	0	0	1	1	na
Pittsburgh Metro	Urban	9	5	9	6	7	-2	na
	Rural	0	0	1	0	0	0	na
	Total	9	5	10	6	7	-2	na
North West	Urban	2	1	7	0	1	-1	na
	Rural	1	0	0	0	0	-1	na
	Total	3	1	7	0	1	-2	na
Total	Urban	54	56	88	80	65	11	20.4
	Rural	16	7	8	6	9	-7	-43.8
	Total	70	63	96	86	74	4	5.7

Data Source: PDE Educator Employment File; Calculations by researchers

Only three regions had enough teachers to assess changes over time, and, of these three, two regions experienced increases – Philadelphia Metro and South East. The South Central region experienced a decline. The decline in the South Central region was largely due to the decline in rural districts.

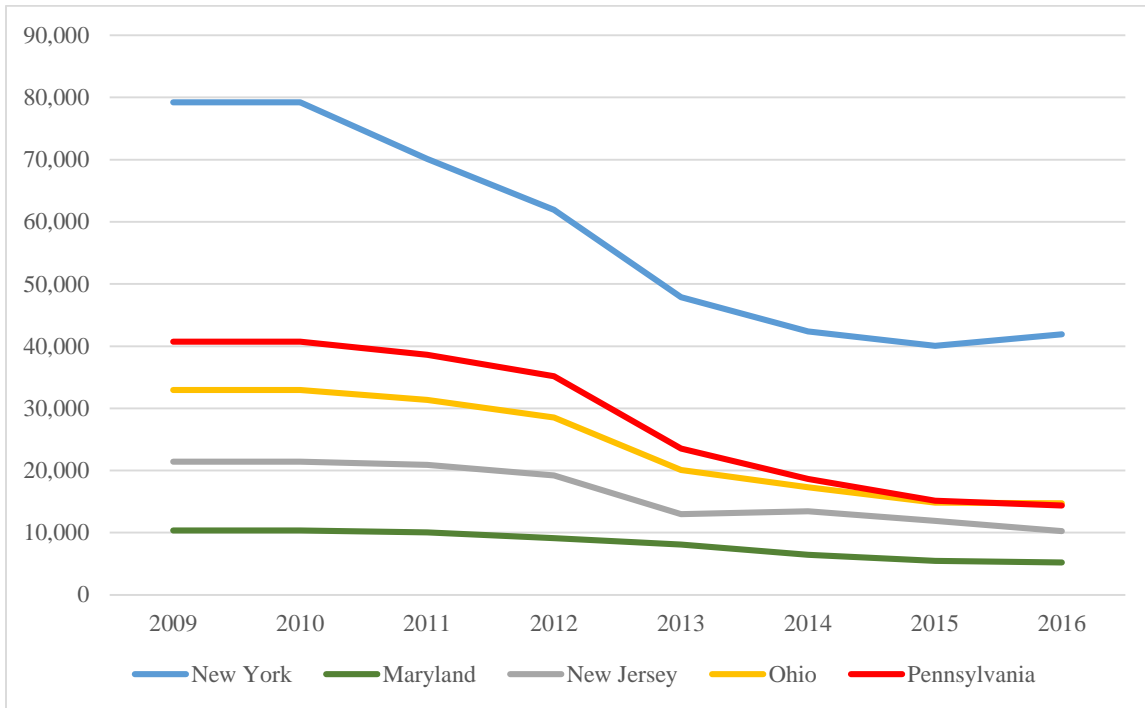
With respect to urban districts, only the Philadelphia Metro and South East regions had enough newly hired “other” ELL teachers to assess changes over time. Both regions experienced increases in the number of such teachers.

With respect to rural districts, only the South Central region had enough data to identify a trend. In this region, there was a 45 percent decline in the number of newly hired “other” ELL teachers.

### **Additional Information on the Potential Supply of Newly Licensed Teachers**

There are two additional sources of information that can inform policymakers about the potential future supply of newly licensed teachers. The first set of data comes from the Title II reports that states must annually submit to the U.S. Department of Education (USDoE). Title II data were used instead of IPEDS data because using IPEDS data yields inaccurate estimates of the number of students enrolled in and completing TPPs (Cowan, et al., 2016). One of the Title II data elements is the number of individuals enrolled in TPPs. The data cover the years 2009 through 2016. As shown in Figure 19, the number of students enrolled in teacher preparation programs has declined dramatically for every mid-Atlantic state. Moreover, while the number of individuals enrolled in such programs appears to have stabilized, there does not appear to be any significant rebound in student enrollment in TPPs. While the data are complete only through the fall of 2016, most of those enrolled in TPPs as of fall 2016 have just recently graduated or are graduating this year. If there was going to be a rebound in the number of newly licensed teachers after 2016, there would have been some increase in the number of students enrolled in teacher preparation programs by the fall of 2016.

Figure 19: Decline in the Number of Students Enrolled in Teacher Preparation Programs for Mid-Atlantic States (2009 to 2016)

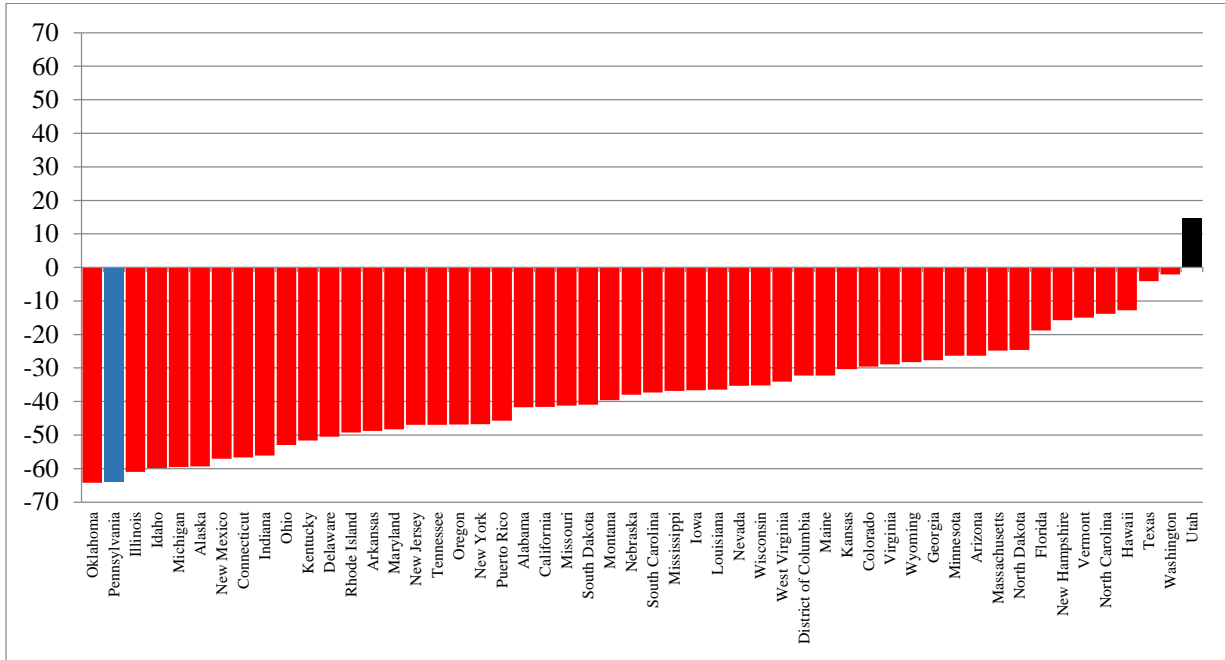


Data Source: Title II Teacher Preparation Program Data Tools (<https://title2.ed.gov/Public/DataTools/Tables.aspx>)

When taking a national perspective examining the number of TPP enrollees using Title II data, only Utah had an increase in TPP enrollees as shown in Figure 20. At -63.9 percent, Pennsylvania had the second greatest decline of any state. Only Oklahoma had a greater decrease than Pennsylvania.

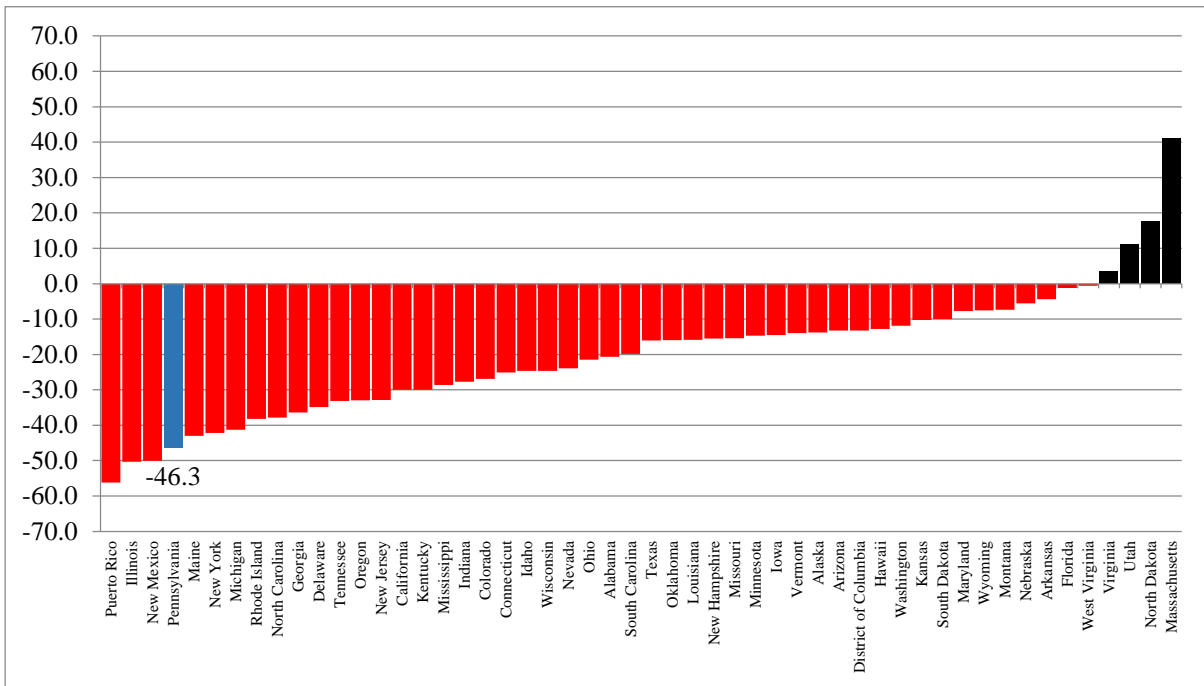
Figure 21 documents the change in TPP completers by state. Similar to the prior analysis, this analysis compares the average number of completers in 2008-09, 2009-10, and 2010-11 to the average number of completers in 2014-15, 2015-16, and 2016-17. Across this 6-year time span, Pennsylvania had the fourth greatest decline at -46.3 percent.

Figure 20: Percentage Change in TPP Enrollees by State  
 (Average of 2008-09, 2009-10, and 2010-11 to average of 2014-15, 2015-16, and 2016-17)



Data Source: Title II Teacher Preparation Program Data Tools (<https://title2.ed.gov/Public/DataTools/Tables.aspx>)

Figure 21: Percentage Change in the Number of TPP Completers by State  
 (Average of 2008-09, 2009-10, and 2010-11 to average of 2014-15, 2015-16, and 2016-17)



Data Source: Title II Teacher Preparation Program Data Tools (<https://title2.ed.gov/Public/DataTools/Tables.aspx>)

An additional source of data that can inform policymakers’ perspectives on the future supply of newly licensed teachers is the number and percentage of students taking the SAT who declared education as their intended college major. When students take the SAT, they are also invited to complete a survey about their personal information and goals about college. The data for Pennsylvania are displayed in Table 33 below. The data from the College Board suggest there will be no increase in the number of students graduating with education majors in the coming years. Indeed, Table 33 below shows that the percentage of students taking the SAT and indicating education would be their likely college major declined from 10 percent in 2011 to 6 percent in 2014, and it has remained constant at 6 percent from 2014 through 2018. Moreover, the number of students taking the SAT declined from nearly 106,000 to just over 95,794 in 2019. Given that students taking the SAT represent the larger pool from which individuals choose to be teachers, these trends suggest that there will be no substantial increase in the number of individuals obtaining an initial teaching license in Pennsylvania for at least the next 5 years.

Table 33: Number and Percentage of Pennsylvania College-Bound Seniors Indicating Education as a Major (2011 to 2018)

Category	Year									Change	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	#	%
Education (#)	8,900	7,649	5,976	5,259	5,020	4,415	4,469	4,763	4,744	-4,156	-46.7
Education (%)	10	9	7	6	6	6	6	6	6	-4	-40.0
Respondents	89,000	84,989	85,371	87,650	83,667	73,583	74,483	79,383	83,137	-5,863	-6.6
Test-Takers	105,907	104,220	101,368	99,460	96,826	92,569	89,218	96,740	95,794	-10,113	-9.5

Data Source: The College Board’s “College-Bound Seniors” reports for 2011 through 2018

### Summary of Supply

As shown above, the supply of teachers available to be hired by Pennsylvania school districts has plummeted over the last decade. In fact, according to Title II data, Pennsylvania has experienced declines in TPP enrollment and completion that are greater than all but a handful of states. Moreover, the out-of-state supply of teachers has declined substantially as well and will

likely continue to remain low as TPP enrollment remains at historically low levels in surrounding states.

While the lack of data makes it impossible to accurately capture the reserve pool of teachers, districts rely substantially on the ability to recruit individuals from private schools in Pennsylvania, private schools in other states, and former teachers from Pennsylvania to meet the annual demand for teachers. While the decline in newly licensed teachers over the past 6 years has likely resulted in a decline in the supply of these “other” teachers, PDE did not provide sufficient data to determine the veracity of this conjecture. Finally, as documented in the “Shortage” section of this report, districts are increasingly using emergency permits to meet the demand for teachers. In fact, teachers on an emergency permit are the only source of teachers that has increased over the last 6 years.

The downward trend in the supply of teachers is troubling and should be of great concern to state policymakers. Research suggests that a reduced supply of labor generally decreases the quality of the labor in that pool unless more stringent barriers to entry into the pool was the reason for the constricted supply (Boe & Cook, 2006). Yet, there is no available evidence that increased barriers to entry – such as changes in licensure requirements or changes in test passing rates that make licensure more difficult or less attractive to obtain – have restricted supply in Pennsylvania. Alternative explanations of the decline in enrollment and completion of TPPs would include stagnant salaries, reduced benefits, and deteriorating working conditions (Allegretto, & Mishel, 2018; Sutchter, et al., 2019). When the pool of available candidates declines from factors not associated with increased barriers to entry, the quality of those entering the profession is likely to decline as well (Boe & Cook, 2006). Moreover, a reduced supply of teachers also decreases the ability of districts to ensure a good fit between the district and the

teacher (Liu, & Johnson, 2006; Sutchter, et al., 2019). Research strongly suggests a decrease in the fit is associated with greater odds of leaving the school and the profession (Liu, & Johnson, 2006). Thus, research would suggest the reduced supply of quality teachers could begin to drive greater attrition rates of teachers, all other factors held equal (Liu, & Johnson, 2006; Sutchter, et al., 2019).

Unfortunately, researchers do not fully understand the reasons why the supply of teachers has decreased so dramatically over such a short period of time in Pennsylvania. Such decreases are easier to understand in states like New Mexico, Oklahoma, Arizona, and North Carolina where state legislatures have failed to increase teacher salaries to the point where there is little fiscal incentive to enter teaching relative to other occupations (Allegretto & Mishel, 2018). In Pennsylvania, teacher salaries remain relatively high compared to alternative occupations (Allegretto & Mishel, 2018)—especially in rural areas of the state. However, the gap between teacher pay and pay for alternative occupations in competition with teaching for college-educated workers has declined over time and is now almost 14 percent (Allegretto & Mishel, 2018). In other words, by choosing to enter teaching rather than another profession that requires a college-degree, an individual in Pennsylvania would expect to make nearly 14 percent less in salary than would otherwise be the case. Dr. Bruce Baker, a school finance researcher from Rutgers University, has reached similar conclusions using a slightly different methodology (Baker, 2020). In addition, until recently, the health and retirement benefits offered to teachers helped make the profession relatively attractive (Keefe, 2018).

Increasing tuition at institutions of higher education likely resulted in reduced TPP enrollment as well since higher tuition rates reduce enrollment in higher education (Hemelt & Marcotte, 2011). However, during the previous recession, some researchers have found that



enrollment in higher education increased, but that the increase was due to greater enrollment for part-time students and lower enrollment of full-time students (Long, 2014). Students also took on a greater debt burden to enroll in higher education (Long, 2014). The increasing need to enter into debt to complete higher education is problematic for lower-income families, who are less likely to feel comfortable taking on debt to finance higher education (Callender & Mason, 2017).

In combination, high college tuition costs (Shackner, 2019), increasing student debt loads that are the highest in the country (Deto, 2019), and the reality that many graduates of Pennsylvania TPPs have historically had to move out of the state to find a teaching position (Keefe, 2018; Satullo, 2013) likely made choosing an education major a less attractive decision. Indeed, given that young adults often want to stay near their families (Boyd, et al., 2005; Strauss, 1999), choosing to major in education has historically meant choosing to move away from your family for prospective teachers in Pennsylvania.

Given increasing costs to enter and complete higher education, students may have also chosen to forego a major in education to major in an area with greater job opportunities and fiscal rewards. Indeed, across the country, a decline in education majors and TPP graduates has occurred while enrollment in other fields has increased rather substantially (Snyder, de Brey, & Dillow, 2019). In fact, in terms of post-secondary degrees, education had the third largest decline (-17.4 percent) in the number of students graduating from 2006-07 to 2015-16 (Snyder, et al., 2019). In contrast, the female dominated health professions experienced an almost 125 percent increase in graduates (Snyder, et al., 2019).

In terms of fiscal rewards, teacher pay has fallen behind that of competing occupations in the U.S. and in Pennsylvania (Allegretto & Mishler, 2018; Keefe, 2018). For example, in an analysis of U.S. of salary data from the American Community Survey, shown in Appendix A,

Baker (2020) found that the salaries for nurses in Pennsylvania have increased over the last 15 years relative to competing professions – professions that require a college degree for entrance into the field – while the salaries for teachers in Pennsylvania have declined. This was true even after adjusting for differences in age, degree level, hours worked, and weeks worked. In fact, since 2005, the difference in pay between nurses and teachers has roughly doubled—thus providing a strong fiscal incentive for individuals to forego teaching as a career and choose nursing instead.

Recent legislative efforts regarding pensions may have also influenced prospective educators’ decisions to enter the field. In fact, in discussing the factors driving the shortage of teachers in Pennsylvania, Keefe (2018, p. 1) states, “Pension legislation passed in 2010 (Act 120) decreased pension benefits for teachers hired in 2011 and later, while a 2017 law (Act 5) will further cut pension benefits for teachers hired in 2019 (and beyond).” Indeed, given the low salaries offered to teachers relative to other professions for college graduates (Baker, 2020; Keefe, 2018), one of the benefits of entering the teaching profession was the comparatively greater pension and benefits. Reduction in pension benefits without increasing salaries makes the profession less attractive to potential entrants (Keefe, 2018).

Another potential factor in the declining supply of teachers is the structure of TPPs in Pennsylvania. Faculty members in TPPs routinely complain that the bureaucratic regulations imposed by the Commonwealth make programs longer and more cumbersome than necessary. According to anecdotal evidence from TPP faculty, these factors negatively impact TPP enrollment. This should certainly be closely examined by policymakers.

Regardless of the reason, teacher supply has declined dramatically in Pennsylvania and there is little evidence to suggest that the supply of teachers will increase substantially in the

coming years. Better understanding the reasons behind the decrease is imperative so the state can adopt strategies to increase teacher supply.

### **Elements of the Demand for Teachers in Pennsylvania**

There are multiple factors that influence the demand for teachers. These include the number of students enrolled in public schools, class sizes, teacher attrition, and policy changes. Overall demand for teachers is driven, in large part, by the number of students enrolled in a district and student-teacher ratios. This analysis uses both of these measures to calculate the demand for the number of teachers for the coming years.

The factor that most impacts the annual demand for newly hired teachers in a state or a district is the attrition of teachers from a state or a district (Borman & Dowling, 2008; Nguyen, et al., 2019). Thus, this study examines the historical and projected annual teacher attrition for each district. This approach captures both individuals retiring from teaching as well as those leaving a district to transfer to another school district within or beyond Pennsylvania.

### **Student Enrollment**

The number of students enrolled in public schools is the primary long-term driver of the demand for teachers. Obviously, the greater the number of students, the greater the demand for teachers to instruct those students assuming class sizes remain relatively stable.

Unfortunately, the only available *projections* of student enrollment include regular public schools. This excludes charter schools, Career and Technology Centers (CTCs), Intermediate Units, and special state schools. As noted previously, there are deficiencies in the projections made by PDE. In fact, on its website, the Pennsylvania Department of Education (n.d.) lists the potential issues that could make its projections inaccurate. In the opinion of this study's researchers, the most serious of these potential issues are the external factors, including, "the

opening or closing of a nonpublic school,” “a significant increase or decrease in new home building,” or, “a shift in migration patterns.” So, for example, if a charter school opens up in a district or an existing charter expands its capacity, the enrollment projections for the district in which that charter school operates will be inaccurate. The degree of inaccuracy depends on many factors, such as the student enrollment of the district, and the student enrollment of the charter school. Other new schooling options could also affect the accuracy of the projections, including private schools and home schooling. The lack of data for charter schools could lead to substantial underestimates for the Philadelphia Metro, South East, South Central, and Pittsburgh Metro regions. The inability to include CTCs and IUs could lead to slight underestimates for rural student enrollment.

As shown in Table 34, there has been—and will continue to be—a decline in the number of students enrolled in Pennsylvania school districts in both urban and rural areas of the state. Specifically, from 2011-12 to 2017-18, there was a 3.3 percent decline in the number of students enrolled in urban districts and a 7.3 percent decline in rural districts. Based on data from the PDE website, student enrollment will likely decrease an additional 1.8 percent in urban districts and 5.6 percent in rural districts from 2017-18 to 2025-26. Across the entire time span—2011-12 to 2025-26—there will likely be a total decline in student enrollment of 5.1 percent for urban districts and 12.6 percent decline for rural districts.

Table 34: Change in the Number of Students Enrolled in Pennsylvania School Districts from Academic Year 2011-12 to Academic Year 2025-26 by Locale (in 1,000s of students)

Locale	Academic Year			Change					
	2011-12	2017-18	2025-26	11-12 to 17-18		17-18 to 25-26		11-12 to 25-26	
				N	%	N	%	N	%
Urban	1,207	1,167	1,146	-40	-3.3	-21	-1.8	-61	-5.1
Rural	422	391	369	-31	-7.3	-22	-5.6	-53	-12.6
Total	1,629	1,559	1,516	-70	-4.3	-43	-2.8	-113	-6.9

Data Source: PDE student enrollment data and student enrollment projections by district

Table 35 presents the changes in the number of students in traditional public school districts from 2011-12 to 2025-26 by region and locale. Overall, student enrollment is projected to decline from 2011-12 to 2025-26 by slightly more than 113,000 students. Of these students, about 60,000 will be from urban districts while about 53,000 will be from rural districts.

Declines will likely occur throughout all regions of the state, although the declines will be greater in some regions than in others. The regions with the greatest overall declines will likely include the North East (-11.6 percent), Central (-12.1 percent), and North West (-12.3 percent) regions, while the regions with the smallest declines will include the South Central (-0.2 percent), Philadelphia Metro (-5.8 percent), and South West (-6.0 percent) regions. With respect to rural schools, the regions with the greatest projected decline in students in rural districts will likely be the Central (-14.3 percent), South East (-16.1 percent), and North East (-18.1 percent) regions, while the regions with the smallest declines in student enrollment will be the South West (-4.4 percent), North Central (-5.5 percent), and South West (-4.4 percent) regions. Thus, the demand for teachers will decline across the Commonwealth, particularly in rural areas, although the declines will not be distributed equally across regions.

Table 35: Projected Number of Students Enrolled  
in Pennsylvania School Districts by Region and Locale (2011-12 to 2025-26)

Region	Locale	Academic Year		CHG: 11-12 to 25-26	
		2011-12	2025-26	N	%
Philadelphia Metro	Urban	471,582	444,529	-27,053	-5.7
	Rural	4,390	3,986	-404	-9.2
	Total	475,972	448,515	-27,457	-5.8
South East	Urban	143,915	131,502	-12,413	-8.6
	Rural	17,771	14,912	-2,859	-16.1
	Total	161,686	146,414	-15,272	-9.4
North East	Urban	75,635	72,965	-2,670	-3.5
	Rural	95,342	78,107	-17,235	-18.1
	Total	170,977	151,072	-19,905	-11.6
South Central	Urban	192,387	197,782	5,395	2.8
	Rural	63,837	57,968	-5,869	-9.2
	Total	256,224	255,750	-474	-0.2
Central	Urban	26,307	24,495	-1,812	-6.9
	Rural	62,799	53,825	-8,974	-14.3
	Total	89,106	78,320	-10,786	-12.1
North Central	Urban	6,905	6,105	-800	-11.6
	Rural	25,783	24,375	-1,408	-5.5
	Total	32,688	30,480	-2,208	-6.8
South West	Urban	11,173	9,655	-1,518	-13.6
	Rural	51,266	49,018	-2,248	-4.4
	Total	62,439	58,673	-3,766	-6
Pittsburgh Metro	Urban	244,524	228,143	-16,381	-6.7
	Rural	37,435	32,593	-4,842	-12.9
	Total	281,959	260,736	-21,223	-7.5
North West	Urban	34,851	31,620	-3,231	-9.3
	Rural	63,748	54,853	-8,895	-14
	Total	98,599	86,473	-12,126	-12.3
Total	Urban	1,207,279	1,146,796	-60,483	-5
	Rural	422,371	369,637	-52,734	-12.5
	Total	1,629,650	1,516,433	-113,217	-6.9

Data Source: PDE Student enrollment data projections

<https://www.education.pa.gov/Data-and-Statistics/Pages/Enrollment%20Reports%20and%20Projections.aspx>

### Student-Teacher Ratios

The ratio of the number of students to the number of teachers also influences the demand for teachers, albeit not as strongly as the number of students or teacher attrition. Indeed, all other

factors held constant, such as student enrollment, placing fewer students in classrooms requires more classrooms of students and, thus, more teachers. In short, when districts reduce class sizes, there is an increased demand for teachers. Alternatively, when districts increase class sizes, there is a reduced demand for teachers.

As shown in Table 36, student-teacher ratios declined very slightly (-0.1) for both urban and rural districts across the Commonwealth from 2012-13 through 2017-18. Urban districts had slightly greater student-teacher ratios than rural districts for all academic years. The differences between urban and rural districts ranged from a high of 1.1 in the 2014-15 academic year to a low of 0.7 in the 2012-13 academic year.

There were decreases in student-teacher ratios for urban districts in five of the nine regions, while there were decreases for rural districts in six of the nine regions. Regions with declines for both urban and rural districts included the South East, North East, Central, and North West. Alternatively, there were increases in student-teacher ratios for both urban and rural districts in two regions, North Central and South West. In the Philadelphia Metro and South Central regions, there were decreases in student-teacher ratios for rural districts but increases for urban districts. Finally, in the Pittsburgh Metro region, there was a decrease in the student-teacher ratio for urban districts but an increase in the student-teacher ratio for rural districts.

Table 36: Student-Teacher Ratios by Locale and Region (2012-13 through 2017-18)

Region	Locale	Academic Year						Chg: 2012-13 to 2017-18
		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	16.5	16.8	16.8	17.2	17.3	17.0	0.1
	Rural	14.5	14.7	14.6	14.1	13.9	13.6	-1.1
	Total	16.5	16.8	16.7	17.2	17.2	16.9	0.1
South East	Urban	17.3	17.3	17.7	17.7	17.1	16.9	-0.4
	Rural	13.7	14.3	13.8	13.7	13.6	13.5	-0.8
	Total	16.6	16.8	17.0	17.0	16.5	16.4	-0.3
North East	Urban	16.2	16.3	17.3	16.5	16.0	15.7	-0.6
	Rural	14.3	14.5	14.4	14.3	14.3	14.3	-0.2
	Total	15.0	15.2	15.5	15.1	14.9	14.8	-0.3
South Central	Urban	15.8	15.8	16.2	15.9	16.4	16.1	0.3
	Rural	15.3	14.8	14.9	15.0	15.0	14.7	-0.2
	Total	15.6	15.5	15.8	15.6	15.9	15.6	0.1
Central	Urban	13.7	13.3	13.3	13.2	13.0	13.0	-0.3
	Rural	16.0	16.0	16.0	16.2	15.7	15.6	-0.4
	Total	15.4	15.3	15.3	15.4	15.0	15.0	-0.4
North Central	Urban	15.2	15.2	15.1	15.0	15.0	15.5	0.3
	Rural	15.5	15.6	15.5	15.6	15.7	16.4	0.8
	Total	15.4	15.6	15.5	15.5	15.7	16.3	0.8
South West	Urban	14.6	14.4	15.5	14.1	17.1	15.2	0.8
	Rural	15.9	15.8	15.8	16.0	15.7	15.8	0.0
	Total	15.8	15.7	15.8	15.8	15.8	15.7	0.0
Pittsburgh Metro	Urban	15.7	15.8	16.0	15.4	15.4	15.3	-0.5
	Rural	16.9	17.0	16.7	17.0	17.3	17.6	0.6
	Total	15.9	16.0	16.2	15.6	15.8	15.7	-0.3
North West	Urban	15.5	16.2	16.8	15.7	15.8	16.0	-0.1
	Rural	15.4	15.7	15.9	15.5	15.6	15.4	-0.3
	Total	15.5	15.9	16.1	15.6	15.6	15.6	-0.2
Commonwealth	Urban	16.1	16.3	16.5	16.4	16.4	16.2	-0.1
	Rural	15.4	15.5	15.4	15.5	15.4	15.4	-0.1
	Total	15.9	16.0	16.1	16.0	16.0	15.9	-0.1

Data Source: PDE Student enrollment data and teacher employment data

However, when the analysis is limited to only public school districts by excluding charter schools and Career and Technical Centers, the results are different as shown in Table 37.

Specifically, there were declines in student-teacher ratios for both urban and rural districts in all but the South Central region. Moreover, the declines for both urban and rural districts across the Commonwealth were greater when excluding charter schools and CTCs. Indeed, instead of



declines of 0.1 for both urban and rural districts, the exclusion of charter schools and CTCs results in a decline of 0.3 for urban districts and a decline of 0.4 for rural districts.

Table 37: District Student-Teacher Ratios by Locale and Region for School Districts Only (2012-13 through 2017-18)

Region	Locale	Academic Year						Chg: 2012-13 to 2017-18
		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	14.9	14.9	14.8	14.7	14.7	14.7	-0.2
	Rural	14.5	14.7	14.6	14.1	13.9	13.6	-1.1
	Total	14.9	14.9	14.8	14.7	14.7	14.7	-0.2
South East	Urban	15.6	15.6	15.9	15.5	15.4	15.4	-0.2
	Rural	13.7	13.6	13.6	13.7	13.6	13.5	-0.1
	Total	15.2	15.1	15.4	15.1	15.0	14.9	-0.2
North East	Urban	15.8	15.8	16.5	15.5	15.5	15.5	-0.3
	Rural	13.9	13.8	13.9	13.6	13.6	13.6	-0.2
	Total	14.4	14.4	14.7	14.2	14.2	14.2	-0.2
South Central	Urban	15.5	15.5	15.5	15.5	15.4	15.4	-0.2
	Rural	14.6	14.2	14.2	14.2	14.2	14.1	-0.1
	Total	15.2	15.0	15.0	15.0	15.0	14.9	-0.1
Central	Urban	15.1	14.8	14.9	14.7	14.5	14.6	-0.2
	Rural	14.2	14.2	13.9	13.8	13.7	13.6	-0.6
	Total	14.4	14.3	14.2	14.0	13.9	13.9	-0.5
North Central	Urban	15.2	15.2	15.1	15.0	15.0	15.5	0.3
	Rural	13.9	13.9	13.9	14.0	13.9	14.1	0.2
	Total	14.1	14.0	14.0	14.1	14.0	14.2	0.2
South West	Urban	16.1	16.0	15.8	15.1	15.0	14.8	-1.2
	Rural	14.2	14.2	14.1	13.8	13.6	13.5	-0.7
	Total	14.3	14.3	14.2	13.9	13.7	13.6	-0.7
Pittsburgh Metro	Urban	14.8	14.7	15.2	14.5	14.4	14.3	-0.4
	Rural	14.5	14.7	14.4	14.5	14.5	14.4	-0.4
	Total	14.8	14.7	15.1	14.5	14.4	14.3	-0.4
North West	Urban	15.0	15.5	15.4	15.2	15.0	15.2	-0.3
	Rural	14.2	14.1	14.3	13.8	13.7	13.6	-0.5
	Total	14.4	14.4	14.6	14.2	14.0	14.0	-0.5
Total	Urban	15.1	15.1	15.4	15.0	14.9	14.9	-0.3
	Rural	14.2	14.1	14.1	13.9	13.8	13.7	-0.4
	Total	14.7	14.7	14.8	14.5	14.4	14.3	-0.3

Data Source: PDE Student enrollment data and teacher employment data

## **Teacher Attrition**

Research has consistently identified teacher attrition as the primary factor influencing the annual demand for teachers and the shortage of teachers (Borman & Dowling, 2008; Nguyen, et al., 2019). Historically, the average annual U.S. teacher attrition rate is about 8 percent (Sutcher, et al., 2019). The attrition rate is even greater for beginning teachers and teachers employed in schools serving high proportions of students living in poverty. In a recent survey of teachers from across the U.S., about 7.3 percent of U.S. teachers indicated that they planned to leave the profession. In contrast, only 4.8 percent of Pennsylvania teachers indicated plans to leave the profession. Thus, teacher attrition in Pennsylvania is substantially lower than the attrition rate for teachers across the U.S.

Table 38 documents the annual attrition rate of teachers by region and locale. The data in each academic year column represent the percentage of teachers who left teaching in Pennsylvania from one year to the next. So, for example, the 7.3 percentage in the 2013-14 column in the Total row for the Commonwealth shows that 7.3 percent of the teachers employed in a Pennsylvania school district in the 2012-13 school year did not return to the teaching profession in a Pennsylvania public school district in the 2013-14 school year. If a person retired from teaching, left teaching prior to retirement, transferred to a district in another state, or transferred to a private school in Pennsylvania, that person would be considered a “leaver” and be counted in the attrition percentage.

Across the Commonwealth, teacher attrition declined from 7.3 percent to 6.1 percent across the five transitions (2012-13 to 2013-14, 2013-14 to 2014-15, 2014-15 to 2015-16, 2015-16-17, and 2016-17 to 2017-18). There was a decline of 1.1 percentage points for teachers in urban districts and a decline of 1.7 percentage points for teachers in rural districts.

By far, the annual attrition rate was greatest in the Philadelphia Metro region for most of the turnover opportunities. The annual teacher attrition rate was greatest in the Philadelphia Metro region. In fact, across the five transition opportunities, the average annual teacher turnover rate for the Philadelphia Metro region was 8.8 percent. No other region exceeded 7.0 percent. Annual teacher attrition tended to be the lowest in three regions—North East, North Central, and South West. The last two regions are predominantly rural in nature.

For the 2017-18 transition, three regions had extremely low annual attrition rates of less than 5 percent: North East (4.5 percent), South West (4.8 percent), and Pittsburgh Metro (4.8 percent). At 8.0 percent, the Philadelphia Metro region was the only region with a 2017-18 annual attrition rate greater than 6.4 percent.

For all but two regions (North East and South West), the average annual teacher attrition rates were lower in urban districts than in rural districts. In the North East region, the average annual teacher attrition rate was slightly greater in rural districts than in urban districts—5.3 percent to 4.9 percent, respectively. In the South West region, the average annual teacher attrition rate was substantially greater for rural districts than for urban districts—5.9 percent to 5.0 percent, respectively.

Table 38: Annual Teacher Attrition by Region and Locale  
(2012-13 to 2013-14 through 2016-17 to 2017-18)

Region	Locale	Academic Year					Average Attrition	CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18		
Philadelphia Metro	Urban	9.3	8.0	10.9	7.9	8.0	8.8	-1.3
	Rural	4.0	4.0	3.7	6.2	5.8	4.8	1.8
	Total	9.2	7.9	10.9	7.9	8.0	8.8	-1.3
South East	Urban	6.0	8.1	5.9	5.7	5.7	6.3	-0.4
	Rural	5.9	6.3	5.2	4.4	4.9	5.3	-1.0
	Total	6.0	7.9	5.8	5.5	5.6	6.2	-0.4
North East	Urban	4.9	6.9	4.6	4.3	3.7	4.9	-1.1
	Rural	7.0	4.4	5.1	4.7	5.1	5.3	-1.9
	Total	6.1	5.5	4.9	4.6	4.5	5.1	-1.6
South Central	Urban	6.7	7.3	6.2	6.1	6.2	6.5	-0.5
	Rural	6.7	6.9	5.7	5.6	4.9	6.0	-1.8
	Total	6.7	7.2	6.1	6.0	5.9	6.4	-0.8
Central	Urban	7.8	7.0	5.7	6.9	5.5	6.6	-2.3
	Rural	7.8	6.2	5.7	6.2	4.8	6.2	-3.0
	Total	7.8	6.4	5.7	6.4	5.0	6.3	-2.8
North Central	Urban	8.6	8.4	8.2	5.6	5.4	7.3	-3.2
	Rural	5.7	5.5	5.2	4.9	5.6	5.4	-0.1
	Total	6.3	6.1	5.9	5.1	5.6	5.8	-0.8
South West	Urban	6.0	5.9	3.5	5.0	4.4	5.0	-1.6
	Rural	6.0	7.1	6.3	5.2	4.9	5.9	-1.1
	Total	6.0	6.9	5.9	5.1	4.8	5.7	-1.2
Pittsburgh Metro	Urban	6.3	8.8	5.8	4.9	4.8	6.1	-1.5
	Rural	6.4	4.4	5.2	4.4	4.4	4.9	-2.0
	Total	6.3	8.2	5.8	4.8	4.8	6.0	-1.5
North West	Urban	6.4	8.2	5.9	6.9	7.1	6.9	0.7
	Rural	6.4	9.1	5.6	5.0	5.0	6.2	-1.4
	Total	6.4	8.8	5.7	5.6	5.7	6.4	-0.7
Total	Urban	7.5	8.0	7.9	6.4	6.5	7.3	-1.1
	Rural	6.6	6.3	5.5	5.2	4.9	5.7	-1.7
	Total	7.3	7.5	7.3	6.1	6.1	6.9	-1.2

Data Source: PDE Teacher Employment files; Calculations by researchers.

Importantly, teacher attrition varies dramatically by organization type as shown in Table 39. District type is introduced in this analysis because it is important for policymakers to grasp the drivers of attrition, and the factors that most profoundly influence the shortage of teachers. In both urban and rural areas, teacher attrition is substantially greater in charter schools than in other organization types. IUs and CTCs also tend to have greater teacher attrition than public

school districts. Thus, of the four organizational types, public school districts have the lowest annual teacher attrition rates.

Table 39: Annual Teacher Attrition by Organization Type  
(2012-13 to 2016-17)

District Type and Locale	Academic Years					CHG 13 to 17
	2012-13	2013-14	2014-15	2015-16	2016-17	
Urban	6.7	7.1	7.0	5.3	5.5	-1.2
Urban-CTC	7.8	8.3	7.8	7.5	7.0	-0.8
Urban-IU	8.9	9.0	8.5	9.7	8.3	-0.6
Urban-Charter	17.7	17.8	18.5	17.5	17.3	-0.3
Rural	6.4	6.3	5.2	4.9	4.7	-1.7
Rural-CTC	9.9	5.1	7.2	7.0	8.9	-1.1
Rural-IU	9.4	8.8	9.3	9.7	6.8	-2.6
Rural-Charter	21.1	11.0	14.6	14.6	15.4	-5.7
Charter-Cyber	10.3	11.7	9.5	15.3	5.4	-4.9
Total	7.3	7.6	7.3	6.1	6.1	-1.2

The academic year represents the initial year of two consecutive academic years. So, for example, 2012-13 represents the percentage of teachers who were employed in the 2012-13 year who returned to teach in the 2013-14 year.

Data Source: Educator Employment Files; Calculations by researchers

The problem with relying on simple descriptive statistics to compare attrition rates is that differences in teacher and school characteristics between urban and rural districts might be the underlying factors driving different attrition rates between the two types of districts. For example, if fewer rural than urban teachers have between 3 and 30 years of experience, then rural teachers would be less likely to leave the profession than urban teachers. If policymakers are interested in examining whether there are factors that are unique to rural schools associated with teacher attrition other than observable teacher and school characteristics, then some statistical strategy must be used to rule out the possibility that differences in observable teacher and school characteristics are driving overall differences in attrition between the two types of teachers. As noted in the methods section, the researchers used logistic regression to isolate the relationship between teaching in a rural district and the odds of leaving the teaching profession. All relevant details are included in the methods section.

The results from the logistic regression analysis is presented in Table 40. The results of the analysis reveal that older teachers were more likely to leave while Other teachers of Color (Asian, American Indian, Alaskan Native, Hispanic, and Mixed Race) were slightly more likely to leave than white teachers. As expected, both very inexperienced and very experienced teachers were more likely to leave as well. District enrollment was positively related with leaving—meaning teachers enrolled in larger districts were more likely to leave teaching than teachers with lower student enrollments. Consistent with prior research, a district’s percentage of students living in poverty was strongly and positively associated with increased odds of leaving the profession.

Also consistent with prior research, the analysis showed higher salaries, after adjusting for wages in alternative occupations in the same labor market, were associated with decreased odds of leaving the profession. Finally, teachers employed in charter schools were more than three times as likely as teachers employed in public school districts to leave the profession. Regardless of the combination of other variables used in the analyses, the results found rural teachers did not have different odds of leaving the profession relative to their peers in urban districts. In other words, after controlling for the effects of teacher and district characteristics, there was no difference in the odds of a leaving the teaching profession between teachers employed in rural schools and teachers employed in urban schools.

Table 40: Logistic Regression Results  
for One-Year Teacher Attrition

Variable	Stat. Sig.	Odds Ratio
Age	0.000	1.052
Female	0.132	1.041
Race: Black	0.094	1.087
Race: Other Teachers of Color	0.046	1.161
Years of Education Experience	0.000	0.848
Years of Education Experience (squared)	0.000	1.005
Salary (Adjusted by CWI)	0.000	0.594
District Enrollment	0.000	1.000
% Students living in poverty	0.000	1.832
Region: Philadelphia Metro	0.725	0.988
Region: Pittsburgh Metro	0.822	0.992
Rural District	0.127	1.049
Charter School	0.000	3.289
Constant	0.001	3.724

Data Source: PDE Educator Employment Files; PDE Student Enrollment Files;  
Calculations by researchers

### Summary of Demand

As shown above, the demand for teachers in Pennsylvania is relatively low compared to other states, primarily because of the relatively low teacher attrition rates in the state. While the attrition rate is likely to increase slightly—around 1 percent—in about 5 years due to an increase in retirements (Pennsylvania Department of Education, 2018), declining student enrollments will likely more than offset any marginal increase in teacher attrition due to an increase in retirements.

As noted above, teacher attrition is associated with a number of factors, including salary, change in benefits, working conditions, and perceptions of school leadership among other factors (Borman & Dowling, 2008; Keefe, 2018; Munnell & Fraenkel, 2013; Nguyen, et al., 2019). In particular, given the stagnant salaries in Pennsylvania, changes in pension benefits, and the growing difference in salaries between teaching and professions like nursing (Allegeretto & Mishel, 2018; Baker, 2020; Keefe, 2018), one would expect teacher attrition to increase a

percentage point or two over the coming decade. The effect of the pension changes should be closely watched over the coming years. According to Keefe (2018, p. 1), “Pension legislation passed in 2010 (Act 120) decreased pension benefits for teachers hired in 2011 and later, while a 2017 law (Act 5) will further cut pension benefits for teachers hired in 2019 (and beyond).”

The element of demand most difficult to predict is the ratio of students to teachers. As with almost all other states, the student-teacher ratio in Pennsylvania has been slowly declining over the past 8 years. Part of this decline is due to an increase in the number of special education students. Such students, even when mainstreamed in regular education classes, typically require a greater number of teachers than would otherwise be the case. A second factor, particularly in states with a large number of rural districts such as Pennsylvania, is declining enrollments in rural districts across the nation. As the population of students declines, student-teacher ratios also typically decline.

When student enrollment declines, districts can, at some point, reduce the number of teachers. However, districts must wait for fairly large declines in enrollment before choosing to not replace vacancies. For example, suppose a rural district in Pennsylvania has 36 students enrolled in the 3<sup>rd</sup> grade and employs two teachers to instruct the students. Over time, student enrollment declines to 30 students. The student-teacher ratio in 3<sup>rd</sup> grade has declined from 18:1 to 15:1. Theoretically, if one of the teachers decides to leave the district, district leaders could decide to employ only one 3<sup>rd</sup> grade teacher, which would result in student-teacher ratio of 30:1. While doing so would save money and increase the student-teacher ratio, researchers generally agree that smaller classes are associated with positive student outcomes in elementary schools (Finn & Achilles, 1999; Isenberg, 2010; Krueger, 1999; Mosteller, 1995; Shin & Raudenbush,



2011). Moreover, research suggests that teachers with smaller class sizes are significantly less likely to leave a school or quit the profession (Isenberg, 2010).

District leaders could also attempt to create multi-age classrooms as a strategy to maintain or increase student-teacher ratios and reduce the demand for teachers. Such a strategy, however, requires additional professional development and creates a much more complex teaching environment. This, in turn, may result in greater difficulties in recruiting and retaining teachers.

The available evidence suggests the student-teacher ratio in Pennsylvania will slowly decline over time. This slow decline will likely have only a marginal impact on the demand for teachers. If the student-teacher ratio declines because of greater enrollments in special education, then the declining student-teacher ratio will more quickly create a greater demand for teachers—especially for special education teachers. In fact, the number and percentage of special education students across the nation has increased over the past decade (McFarland, et al., 2018). Evidence suggests an increase in special education students is certainly quite possible, especially in rural communities, given the opioid epidemic has hit rural communities particularly hard (Samuels, 2018), including in Pennsylvania (Drug Enforcement Agency, 2018).

If, on the other hand, the decline in the student-teacher ratio is a result of slow reductions in enrollment, there would be little effect on the demand for teachers in the next 5 years and only a minimal effect after 5 years. At some point, these lower student enrollments will begin to exert downward pressure on the demand for teachers such that there will be lower demand. This, however, will be a slow process over time. Without access to class size information that is available in other states, determining the effect and time horizon is very difficult.

## **Estimates of the Shortage of Teachers in Pennsylvania**

Unfortunately, there is no easy way to accurately assess a shortage of teachers without the extensive collection of data. Pennsylvania currently does not collect enough data to conduct a comprehensive and accurate assessment of the shortage of teachers. However, this section includes analyses of the available data to provide the best possible estimate of any shortage of teachers in the Commonwealth over the coming decade.

This section discusses the potential shortage of teachers using four strategies. Strategy one compares the supply of teachers to the demand for teachers. The second strategy examines the extent to which districts rely on the use of emergency permits to fill vacant teaching positions. The third strategy includes an analysis of the shortage areas identified by PDE and sent to the U.S. Department of Education. The final strategy reviews the results of three surveys of school- and district- administrators about their perceptions of the shortage of teachers as well as a focus group of superintendents in IU10, located just north of State College. IU10 covers a large area of Central Pennsylvania, including most of Clearfield, Clinton, and Centre counties. This IU was chosen because of existing research relationships between IU10 staff and Penn State College of Education, and the relationship the study's researchers had already developed with most of the superintendents in IU10 districts.

### **Comparison of Supply and Demand**

The first strategy was to compare the supply of newly licensed teachers by subject to the number of beginning teachers hired across the Commonwealth. This approach is appropriate because districts rely on newly licensed teachers to fill a substantial proportion of open positions. In fact, as shown previously, approximately 50 percent of all newly hired teachers in Pennsylvania are beginning teachers (teachers with no prior teaching experience), most of whom

appear to be from Pennsylvania TPPs. As shown in Table 41, another 25 percent of newly hired teachers had between 2 and 3 years of experience. Most of the newly hired teachers with between 2 and 3 years of experience also obtained their initial teaching license from a Pennsylvania TPP. Thus, the majority of newly hired teachers in Pennsylvania school districts are individuals who recently completed a Pennsylvania TPP.

Table 41: Number and Percentage of Newly Hired Teachers by Years of Education Experience (2014-2017)

Years of Experience	2014		2015		2016		2017	
	N	%	N	%	N	%	N	%
1	3,651.8	53.7	3,587.8	53.1	3,569.9	43.8	3,528.5	50.0
2-3	1,670.8	24.6	1,667.4	24.7	1,918.6	23.5	1,858.0	26.3
4-5	604.2	8.9	592.5	8.8	584.6	7.2	559.8	7.9
6-10	572.5	8.4	581.0	8.6	912.3	11.2	623.8	8.8
11-20	249.2	3.7	273.8	4.1	855.5	10.5	407.1	5.8
> 20	49.1	0.7	49.4	0.7	307.2	3.8	76.1	1.1
All	6,797.7	100.0	6,751.8	100.0	8,148.1	100.0	7,053.3	100.0

Data Source: PDE Educator Employment Files; Calculations by researchers

When there is a decline in the number of newly licensed teachers to hire, districts must choose from one of five options: (1) hire from the reserve pool of teachers; (2) attempt to recruit teachers from out-of-state; (3) hire under-qualified individuals to fill vacancies, (4) choose to increase class sizes rather than hire a new teacher, (5) or simply choose to not fill vacancies. Recruiting teachers from the reserve pool can be more difficult because individuals are more likely to have roots in a particular community, and, thus, less likely to move for an available position. This likely disproportionately disadvantages rural districts given that fewer individuals live in rural districts. Recruiting teachers from other states is often expensive and difficult.

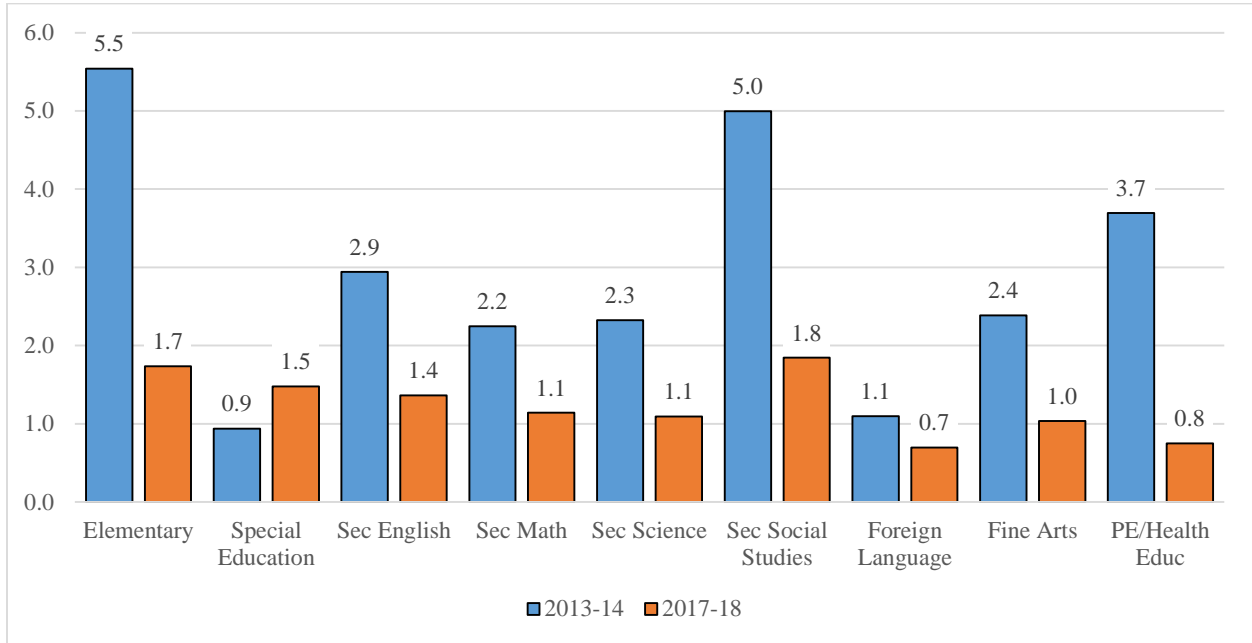
The primary estimate of supply versus demand is a comparison of the number of newly licensed teachers by subject area to the number of beginning teachers hired by subject area. This is designated as the supply-demand ratio. A more accurate estimate would be to compare the

number of individuals who obtained their initial teaching license in the prior 3 years who were not employed in a Pennsylvania public school but residing in the Commonwealth. Unfortunately, PDE cannot provide such a data file because of restrictions on what information can be collected and provided, and an inability to track where an individual resides. As noted previously, this is a critical flaw in the state data system and should be remedied so researchers can more accurately measure educator supply, demand, and shortages.

As shown in Figure 22, the overall supply-demand ratio of the number of new Instructional I licenses to the number of beginning teachers hired has substantially declined from 2013-14 to 2017-18 for all major subject areas with the exception of special education. By 2017-18, all of the supply-demand ratios were lower than two Instructional I licenses per one beginning teacher. The greatest supply-demand ratio decline was for elementary teachers, from a ratio of 5.5 to 1.0 in 2013-14 to a ratio of 1.7 to 1.0 in 2017-18.

The supply-demand ratio declined to 1.1 licenses per one beginning teacher or lower for five of the nine major subject areas: secondary mathematics, secondary science, foreign language, fine arts, and physical/health education. This strongly suggests the available pool of individuals for districts to hire has dwindled in a rather dramatic fashion.

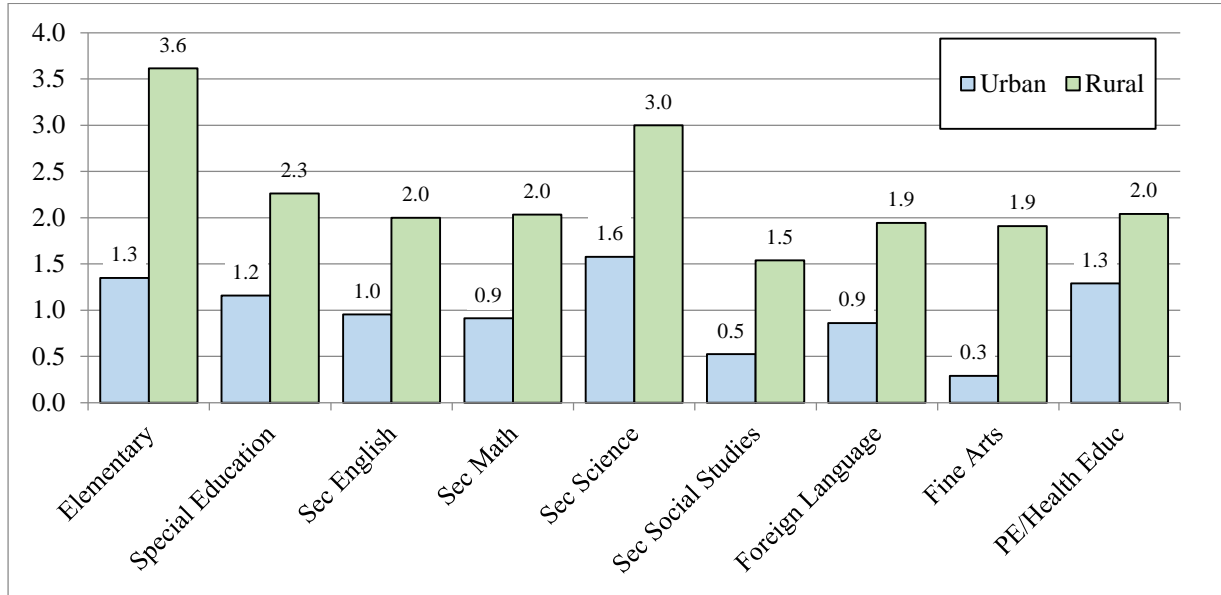
Figure 22: Ratio of Number of In-State New Instructional I Certificates To the Number of Beginning Teachers Hired by Major Subject Area (2013-14 and 2017-18)



Data Source: PDE Aggregate Licensure files and Educator Employment Files; Calculations by researchers

While there were overall declines across the Commonwealth, the supply-demand ratios for 2017-18 differed for urban and rural districts. Specifically, as shown in Figure 23, the supply-demand ratios by subject area were substantially lower for urban districts than for rural districts. Indeed, across all subject areas, the supply-demand ratios for rural districts were about twice as large as the supply-demand ratios for urban districts. These results were due to declining enrollments—and thus less demand for beginning teachers—in rural areas as well as greater teacher attrition rates in schools in the Philadelphia Metro region.

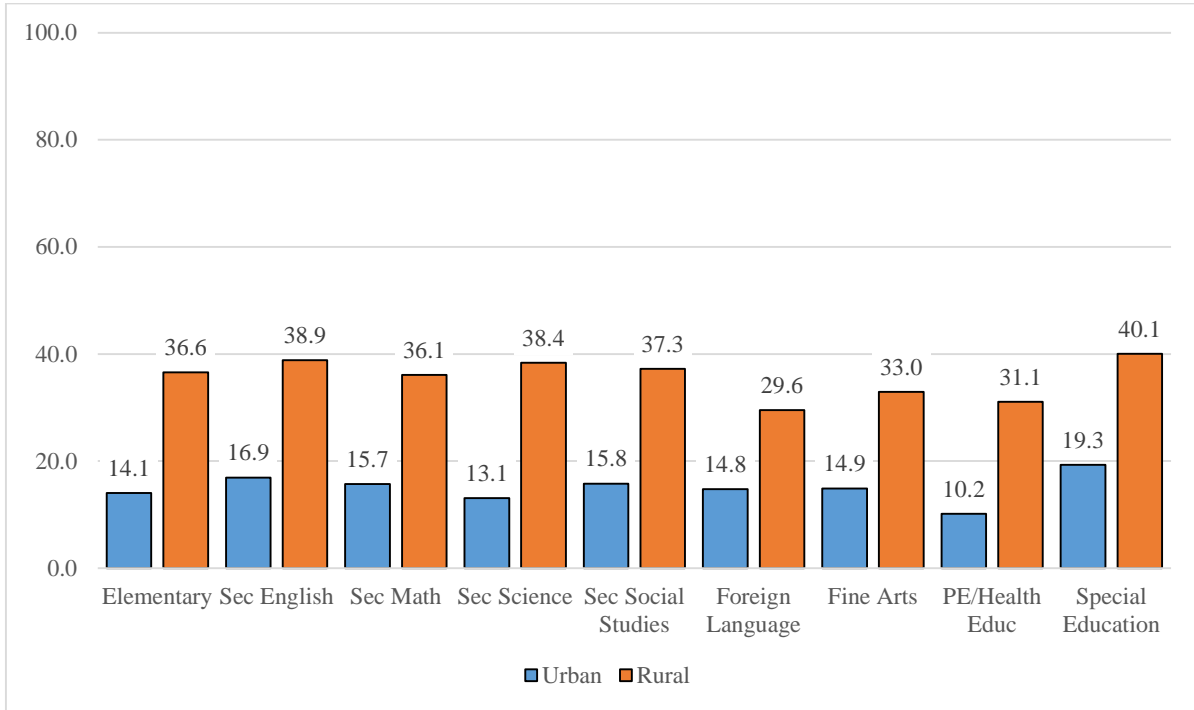
Figure 23: Ratio of Number of In-State New Instructional I Certificates To the Number of Beginning Teachers Hired by Major Subject Area and Locale (2017-18)



Data Source: PDE Aggregate Licensure files and Educator Employment Files; Calculations by researchers

However, the comparison of the supply-demand ratios by locale can be misleading if one assumes that all individuals completing their licensure programs in rural counties take positions in rural schools. Such an assumption, in fact, would be untrue. Indeed, Figure 24, shows the percentage of beginning teachers in rural districts who obtained their Instructional I license from Pennsylvania TPPs that were located in urban and rural counties. Across all subject areas, 40 percent or fewer of beginning teachers from TPPs located in rural counties take teaching positions in rural districts. The subject area in which the greatest percentage of beginning teachers in rural districts came from rural TPPs was special education at 40.1 percent. In contrast, the subject area with the lowest percentage of beginning teachers in rural districts from rural TPPs was foreign language at 29.6 percent.

Figure 24: Percentage of Beginning Teachers in Rural Districts from Urban and Rural Pennsylvania Teacher Preparations Programs (2013-2014 through 2017-18)



Data Source: PDE Aggregate Licensure files and Educator Employment Files; Calculations by researchers

Because so many prospective teachers from rural TPPs do not take positions in rural districts, the rural districts in the Commonwealth must recruit teachers who complete an urban TPP, enter from out-of-state, transfer from private school, or return from taking a break from teaching. This is problematic for two reasons. First, this makes teacher recruitment more difficult and expensive for rural districts. Second, there is some evidence that preparing teachers for specific teaching contexts yields positive benefits for both students and teachers (Azano & Stewart, 2015).

**Subject areas by region and locale.** The following sections describe the change in supply-demand ratios by subject area, region, and locale. The supply-demand ratios in 2017-18, can be divided into three groups: small supply-demand ratios are those for which there were fewer than one license granted to one beginning teacher hired; moderate supply-demand ratios

are those for which there were between a one-to-one and a two-to-one ratio of new Instructional I licenses and beginning teachers; and large supply-demand ratios are those for which there were two-to-one or greater ratios of new Instructional I licenses to beginning teachers.

*Elementary education.* The supply-demand ratio decreased for eight of the nine regions and the Commonwealth as shown in Table 42. In 2017-18, four regions had large supply-demand ratios, four regions had moderate supply-demand ratios, and the South Central region had a small supply-demand ratio. For urban districts, five regions had moderate supply-demand ratios and the North West region had a large supply-demand ratio. The other regions did not have sufficient data to calculate a supply-demand ratio. For rural districts, the South Central region had a small supply-demand ratio, the South West region had a moderate supply-demand ratio, while four regions had large supply-demand ratios.



Table 42: Ratio of New Instructional I Licenses to Number of Beginning Elementary Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	5.8	1.6	1.7	1.4	1.3	-4.5
	Rural	na	na	na	na	na	na
	Total	5.8	1.6	1.7	1.4	1.3	-4.4
South East	Urban	9.3	3.4	2.0	3.0	1.4	-7.9
	Rural	na	na	na	na	na	na
	Total	8.2	3.3	1.9	2.9	1.3	-6.8
North East	Urban	7.4	5.6	6.5	5.7	1.8	-5.6
	Rural	7.7	6.9	7.0	5.2	3.8	-3.9
	Total	7.6	6.3	6.8	5.4	2.7	-4.9
South Central	Urban	3.5	2.0	2.3	2.3	1.1	-2.5
	Rural	0.8	0.2	0.2	0.5	0.3	-0.5
	Total	2.8	1.6	1.7	1.9	0.9	-1.9
Central	Urban	na	na	na	na	na	na
	Rural	14.3	9.3	15.2	8.9	8.4	-5.9
	Total	9.5	7.0	8.2	5.5	5.3	-4.2
North Central	Urban	na	na	na	na	na	na
	Rural	5.6	2.8	2.8	2.9	1.3	na
	Total	4.7	1.8	2.3	2.1	1.1	-3.6
South West	Urban	na	na	na	na	na	na
	Rural	0.9	1.0	0.6	0.7	1.4	0.5
	Total	0.8	0.9	0.5	0.4	1.0	0.2
Pittsburgh Metro	Urban	2.9	1.6	1.9	2.7	1.9	-1.0
	Rural	25.5	13.3	22.8	38.5	11.3	-14.3
	Total	5.8	3.0	3.9	5.1	2.6	-3.2
North West	Urban	19.4	5.6	3.9	2.8	2.8	-16.6
	Rural	4.7	2.8	2.6	4.8	4.6	-0.1
	Total	7.4	3.8	3.2	3.6	3.7	-3.8
Total	Urban	5.0	2.0	1.9	1.9	1.3	-3.7
	Rural	7.0	4.3	4.9	5.2	3.6	-3.4
	Total	5.5	2.5	2.5	2.4	1.7	-3.8

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*Secondary English Language Arts teachers.* Table 43 shows the supply-demand ratios decreased for all of the eight regions with sufficient data and for the Commonwealth. In 2017-18, the Central region had a large supply-demand ratio, five regions had moderate supply-demand ratios, and two regions had small supply-demand ratios. For urban districts, five regions had moderate supply-demand ratios while the South Central region had a small supply-demand ratio.

For rural districts in regions with sufficient data, two regions had small supply-demand ratios, two had moderate supply-demand ratios, and two had large supply-demand ratios.

Table 43: Ratio of New Instructional I Licenses to Number of Beginning Secondary English Language Arts Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia	Urban	3.2	1.7	2.1	1.3	1.4	-1.8
	Rural	na	na	na	na	na	na
	Total	3.2	1.7	2.0	1.3	1.4	-1.8
South East	Urban	3.8	3.7	3.0	2.6	1.2	-2.6
	Rural	na	na	na	na	na	na
	Total	3.3	3.3	2.7	2.6	1.1	-2.2
North East	Urban	2.6	2.8	3.4	5.3	1.0	-1.6
	Rural	1.7	2.6	2.9	2.7	1.8	0.1
	Total	2.1	2.7	3.1	3.5	1.4	-0.6
South Central	Urban	2.6	3.3	2.8	1.7	0.9	-1.7
	Rural	0.6	0.2	0.5	0.8	0.7	0.0
	Total	2.2	2.5	2.1	1.5	0.8	-1.3
Central	Urban	na	na	na	na	na	na
	Rural	8.0	10.2	10.1	7.1	5.3	-2.7
	Total	5.7	9.0	6.1	5.0	4.1	-1.6
North Central	Urban	na	na	na	na	na	na
	Rural	0.7	4.0	1.6	na	na	na
	Total	0.6	4.0	1.3	2.0	na	na
South West	Urban	na	na	na	na	na	na
	Rural	0.8	0.9	0.4	0.6	0.2	-0.6
	Total	0.6	0.7	0.3	0.4	0.1	-0.5
Pittsburgh Metro	Urban	2.7	2.9	2.4	3.2	1.1	-1.6
	Rural	8.6	14.3	10.7	39.0	16.0	7.4
	Total	3.3	4.1	3.0	4.5	1.4	-1.9
North West	Urban	2.5	1.2	2.6	1.9	1.7	-0.9
	Rural	2.2	5.2	2.1	1.1	1.1	-1.1
	Total	2.4	2.2	2.3	1.5	1.2	-1.1
Total	Urban	2.8	2.1	2.3	1.7	1.2	-1.7
	Rural	3.3	4.3	2.9	3.2	2.3	-1.0
	Total	2.9	2.6	2.4	1.9	1.4	-1.6

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*Secondary mathematics teachers.* The supply-demand ratios decreased for all eight regions with sufficient data and for the Commonwealth as shown in Table 44. In 2017-18, the Central region had a large supply-demand ratio, five had moderate supply-demand ratios, and the South Central and South West regions had small supply-demand ratios. For urban districts with

sufficient data, five regions had moderate supply-demand ratios while the South Central region had a small supply-demand ratio. For rural districts in regions with sufficient data, two regions had small supply-demand ratios, two had moderate supply-demand ratios, and two had large supply-demand ratios.

Table 44: Ratio of New Instructional I Licenses to Number of Beginning Secondary Mathematics Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	2.2	1.7	1.5	1.0	0.9	-1.3
	Rural	na	na	na	na	na	na
	Total	2.2	1.7	1.5	1.0	0.9	-1.3
South East	Urban	5.8	4.6	3.3	1.7	0.9	-4.9
	Rural	na	na	na	na	na	na
	Total	5.2	4.2	3.3	1.6	0.8	-4.4
North East	Urban	2.4	1.8	0.9	3.0	1.0	-1.4
	Rural	3.9	6.0	3.1	3.6	3.0	-0.9
	Total	3.1	3.5	1.7	3.4	2.3	-0.9
South Central	Urban	2.3	3.6	2.6	2.8	1.1	-1.1
	Rural	0.8	0.3	0.1	2.7	0.3	-0.5
	Total	1.9	2.5	2.1	2.8	0.9	-0.9
Central	Urban	na	na	na	na	na	na
	Rural	4.5	6.4	9.3	7.9	3.1	-1.4
	Total	3.1	5.5	5.1	6.9	2.5	-0.6
North Central	Urban	na	na	na	na	na	na
	Rural	1.7	8.0	1.7	0.7	3.0	na
	Total	1.3	4.0	1.7	0.7	3.0	1.8
South West	Urban	na	na	na	na	na	na
	Rural	1.0	0.7	0.3	1.3	6.0	5.0
	Total	0.9	0.7	0.3	1.3	6.0	5.1
Pittsburgh Metro	Urban	1.4	1.9	1.2	1.7	1.1	-0.3
	Rural	9.7	6.0	8.7	25.0	5.0	-4.7
	Total	1.8	2.5	1.8	2.9	1.4	-0.4
North West	Urban	2.1	3.2	3.2	2.7	1.7	-0.5
	Rural	1.7	4.7	2.1	3.4	1.3	-0.4
	Total	1.8	4.0	2.4	3.1	1.4	-0.4
Total	Urban	2.1	2.2	1.7	1.4	1.0	-1.1
	Rural	2.8	3.2	2.8	4.0	2.0	-0.8
	Total	2.2	2.4	1.9	1.8	1.1	-1.1

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*Secondary science teachers.* Table 45 shows the supply-demand ratios decreased for six of the nine regions as well as for the Commonwealth, while two of the other regions remained

relatively stagnant, and the Central region had an increase in the supply-demand ratio. In 2017-18, three regions had small supply-demand ratios, three had moderate supply-demand ratios, and three had large supply-demand ratios. For urban districts with sufficient data, four regions had small supply-demand ratios, Philadelphia Metro had a moderate supply-demand ratio and the North West region had a large supply-demand ratio. For rural districts in regions with sufficient data, the South Central region had a small supply-demand ratio, three regions had moderate supply-demand ratios, and two had large supply-demand ratios.

Table 45: Ratio of New Instructional I Licenses to Number of Beginning Secondary Science Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	2.2	1.6	1.7	1.2	1.2	-1.0
	Rural	na	na	na	na	na	na
	Total	2.2	1.6	1.7	1.2	1.2	-1.0
South East	Urban	2.3	2.6	1.5	2.1	0.8	-1.5
	Rural	na	na	na	na	na	na
	Total	2.0	2.4	na	1.9	0.7	-1.3
North East	Urban	1.9	4.0	2.3	3.7	0.8	-1.1
	Rural	3.3	2.4	2.0	1.4	1.0	-2.3
	Total	2.5	3.1	2.1	1.9	0.9	-1.6
South Central	Urban	1.9	2.0	2.7	1.5	0.5	-1.4
	Rural	1.3	0.3	0.5	1.5	0.0	-1.3
	Total	1.8	1.6	1.9	1.5	0.4	-1.4
Central	Urban	na	na	na	na	na	na
	Rural	5.8	7.1	12.0	3.1	12.5	6.7
	Total	4.0	4.5	4.8	2.5	5.0	1.0
North Central	Urban	na	na	na	na	na	na
	Rural	5.5	1.7	1.0	3.0	2.0	na
	Total	5.5	1.3	0.5	0.8	2.0	-3.5
South West	Urban	na	na	na	na	na	na
	Rural	1.3	0.4	1.2	1.3	1.3	-0.1
	Total	1.2	0.4	1.2	1.1	1.1	-0.1
Pittsburgh Metro	Urban	1.4	1.1	1.2	1.1	1.0	-0.5
	Rural	5.6	9.3	5.0	16.5	na	na
	Total	2.0	1.7	1.7	2.6	1.3	-0.6
North West	Urban	3.8	2.5	1.2	1.2	4.5	0.7
	Rural	5.3	11.5	4.5	9.0	1.5	-3.8
	Total	4.6	4.3	2.2	3.1	2.1	-2.5
Total	Urban	2.0	1.7	1.6	1.3	0.9	-1.1
	Rural	3.7	3.0	3.1	3.1	2.0	-1.6
	Total	2.3	1.9	1.9	1.6	1.1	-1.2

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*Secondary Social Studies teachers.* As shown in Table 46, the supply-demand ratios decreased for seven of the nine regions. Two regions had modest supply-demand ratio increases while the Commonwealth had a decrease in the supply-demand ratio. In 2017-18, the South Central region had a small supply-demand ratio, three regions had moderate supply-demand ratios, and five had large supply-demand ratios. For urban districts with sufficient data, there were three regions with moderate supply-demand ratios and two regions with large supply-demand ratios. For rural districts in regions with sufficient data, the South Central region had a small supply-demand ratio, two regions had moderate supply-demand ratios, and three regions had large supply-demand ratios.

Table 46: Ratio of New Instructional I Licenses to Number of Beginning Secondary Social Studies Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	3.6	3.6	2.9	1.6	1.6	-2.0
	Rural	na	na	na	na	na	na
	Total	3.6	3.6	2.9	1.5	1.6	-2.0
South East	Urban	6.6	6.1	11.8	3.2	1.6	-5.1
	Rural	na	na	na	na	na	na
	Total	6.1	5.2	9.8	3.2	1.5	-4.6
North East	Urban	17.3	8.0	5.8	28.0	2.7	-14.7
	Rural	6.0	5.0	5.7	4.8	1.6	-4.4
	Total	8.8	6.1	5.7	9.4	1.8	-7.0
South Central	Urban	4.9	4.2	4.0	4.3	1.0	-3.9
	Rural	0.8	2.6	1.4	2.3	0.3	-0.5
	Total	3.9	4.0	3.3	3.9	0.8	-3.1
Central	Urban	na	na	na	na	na	na
	Rural	11.8	13.7	9.6	11.3	17.0	5.3
	Total	7.8	9.6	8.6	7.6	8.5	0.7
North Central	Urban	na	na	na	na	na	na
	Rural	11.0	na	3.0	7.0	5.0	na
	Total	11.0	na	2.0	7.0	5.0	-6.0
South West	Urban	na	na	na	na	na	na
	Rural	1.3	3.3	8.0	2.3	2.0	0.7
	Total	1.2	2.0	8.0	1.8	2.0	0.8
Pittsburgh Metro	Urban	6.2	2.8	5.4	4.6	2.1	-4.1
	Rural	13.5	35.5	28.0	21.0	11.0	-2.5
	Total	7.5	5.0	9.2	6.8	3.1	-4.4
North West	Urban	6.6	7.2	5.5	1.8	na	na
	Rural	6.1	9.8	8.3	3.7	1.3	-4.8
	Total	6.3	8.3	7.2	2.6	4.3	-2.0
Total	Urban	4.7	3.9	3.8	2.3	1.6	-3.1
	Rural	5.8	9.0	7.0	6.3	3.0	-2.8
	Total	5.0	4.7	4.4	2.9	1.8	-3.2

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*PK-12 Foreign language teachers.* As shown in Table 47, the supply-demand ratios decreased for two regions and the other five regions had only small increases or decreases in the supply-demand ratio. The Commonwealth had a small supply-demand ratio decrease. In 2017-18, five regions had small supply-demand ratios, the North East region had a moderate supply-demand ratio, and the Central region had a large supply-demand ratio. For urban districts with sufficient data, there were six regions with small supply-demand ratios. For rural districts in

regions with sufficient data, two regions had small supply-demand ratios, two had moderate supply-demand ratios, and the North East region had a large supply-demand ratio.

Table 47: Ratio of New Instructional I Licenses to Number of Beginning Foreign Language Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	1.0	0.8	0.6	0.4	0.9	-0.1
	Rural	na	na	na	na	na	na
	Total	1.0	0.8	0.6	0.4	0.9	0.0
South East	Urban	1.1	0.9	1.1	1.2	0.1	-1.0
	Rural	na	na	na	na	na	na
	Total	0.9	0.9	1.1	1.0	0.1	-0.8
North East	Urban	2.0	2.7	1.3	0.5	0.0	-2.0
	Rural	1.3	0.8	1.7	1.0	4.0	2.7
	Total	1.5	1.4	1.5	0.9	1.0	-0.5
South Central	Urban	2.6	1.8	1.0	2.3	0.7	-1.9
	Rural	0.4	0.1	0.8	2.0	0.3	-0.1
	Total	1.6	1.3	0.9	2.2	0.5	-1.1
Central	Urban	na	na	na	na	na	na
	Rural	5.3	5.3	5.0	12.0	na	na
	Total	2.1	2.6	3.3	3.0	4.0	1.9
North Central	Urban	na	na	na	na	na	na
	Rural	0.0	0.0	na	3.0	na	na
	Total	0.0	0.0	na	3.0	na	na
South West	Urban	na	na	na	na	na	na
	Rural	0.7	0.0	0.0	na	0.0	-0.7
	Total	0.5	0.0	0.0	0.0	0.0	-0.5
Pittsburgh Metro	Urban	0.4	0.6	0.8	0.8	0.2	-0.1
	Rural	4.0	2.0	4.0	6.0	1.0	-3.0
	Total	0.6	0.7	0.9	1.1	0.4	-0.2
North West	Urban	2.0	3.0	3.0	1.0	0.0	-2.0
	Rural	2.3	2.0	0.8	0.8	1.5	-0.8
	Total	2.2	2.3	1.1	0.9	0.8	-1.5
Total	Urban	1.0	0.9	0.8	0.7	0.5	-0.4
	Rural	1.6	1.5	1.9	1.7	1.5	0.0
	Total	1.1	1.0	0.9	0.8	0.7	-0.4

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*PK-12 Fine arts teachers.* The supply-demand ratios decreased for five regions and the other four regions had only small supply-demand ratio increases or decreases as shown in Table 48. The Commonwealth had a supply-demand ratio decrease. In 2017-18, six regions had small supply-demand ratios, the North West region had a moderate supply-demand ratio, and two regions had large supply-demand ratios. For urban districts with sufficient data, five regions had

small supply-demand ratios and the North West region had a moderate supply-demand ratio. For rural districts in regions with sufficient data, four regions had small supply-demand ratios and two had large supply-demand ratios.

Table 48: Ratio of New Instructional I Licenses to Number of Beginning Fine Arts Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	1.8	0.9	0.7	0.7	0.9	-0.9
	Rural	na	na	na	na	na	na
	Total	1.8	0.8	0.7	0.7	0.9	-0.9
South East	Urban	3.8	3.0	2.7	1.7	0.9	-2.8
	Rural	na	na	na	na	na	na
	Total	3.2	2.7	2.3	1.6	0.9	-2.3
North East	Urban	1.3	2.4	1.0	3.0	0.7	-0.6
	Rural	0.1	0.4	0.3	0.1	0.1	0.0
	Total	0.5	1.5	0.6	0.9	0.4	-0.1
South Central	Urban	5.0	2.9	1.9	2.5	0.9	-4.1
	Rural	0.5	0.6	0.5	0.3	0.0	-0.5
	Total	3.2	2.4	1.6	1.9	0.7	-2.6
Central	Urban	na	na	na	na	na	na
	Rural	9.5	23.4	10.3	8.5	13.3	3.8
	Total	6.3	9.0	7.2	3.8	6.7	0.3
North Central	Urban	na	na	na	na	na	na
	Rural	38.0	8.7	16.0	6.0	11.0	na
	Total	19.0	6.5	6.4	6.0	3.7	-15.3
South West	Urban	na	na	na	na	na	na
	Rural	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.0	0.0	0.0	0.0	0.0	0.0
Pittsburgh Metro	Urban	1.9	2.3	1.1	1.5	0.7	-1.2
	Rural	7.3	12.3	28.0	3.0	na	na
	Total	2.6	3.4	1.9	1.7	0.9	-1.6
North West	Urban	6.0	6.0	4.7	4.0	1.9	-4.1
	Rural	1.0	1.8	1.2	3.4	0.9	-0.1
	Total	2.4	3.4	2.5	3.7	1.3	-1.0
Total	Urban	2.3	1.5	1.1	1.1	0.9	-1.4
	Rural	2.6	4.4	2.9	2.1	1.9	-0.7
	Total	2.4	1.9	1.4	1.2	1.0	-1.3

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*PK-12 Health and physical education teachers.* As shown in Table 49, the supply-demand ratios decreased for five regions and the other region had a small supply-demand ratio decrease. The Commonwealth had a supply-demand ratio decrease. In 2017-18, three regions had small supply-demand ratios, the Central region had a moderate supply-demand ratio, and two regions had large supply-demand ratios. For urban districts with sufficient data, two regions



had small supply-demand ratios and two had moderate supply-demand ratios. For rural districts in regions with sufficient data, two had large supply-demand ratios, North East and Central.

Table 49: Ratio of New Instructional I Licenses to Number of Beginning Physical/Health Education Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	2.8	1.0	0.5	0.3	0.4	-2.4
	Rural	na	na	na	na	na	na
	Total	2.8	1.0	0.5	0.3	0.4	-2.4
South East	Urban	na	na	na	na	na	na
	Rural	na	na	na	na	na	na
	Total	na	na	na	na	na	na
North East	Urban	1.7	2.3	1.0	0.5	1.0	-0.7
	Rural	33.0	10.6	4.3	na	2.4	-30.6
	Total	11.1	7.8	3.2	2.9	2.2	-8.9
South Central	Urban	1.0	1.2	0.6	0.3	0.3	-0.8
	Rural	na	na	na	na	na	na
	Total	0.6	0.9	0.4	0.2	0.2	-0.5
Central	Urban	na	na	na	na	na	na
	Rural	44.0	11.9	15.5	26.5	9.0	-35.0
	Total	22.0	11.9	6.9	13.3	6.8	-15.3
North Central	Urban	na	na	na	na	na	na
	Rural	na	na	1.5	0.7	na	na
	Total	3.0	na	1.0	0.7	na	na
South West	Urban	na	na	na	na	na	na
	Rural	na	na	na	na	na	na
	Total	an	na	na	na	na	na
Pittsburgh Metro	Urban	na	na	na	na	na	na
	Rural	na	na	17.0	26.0	7.0	na
	Total	4.4	6.8	3.1	1.5	1.4	-3.0
North West	Urban	2.3	4.4	13.0	1.0	1.0	-1.3
	Rural	na	na	na	na	na	na
	Total	1.3	1.8	1.4	0.6	0.3	-1.0
Total	Urban	1.6	1.0	0.5	0.3	0.3	-1.3
	Rural	14.0	7.7	3.5	3.4	1.9	-12.1
	Total	3.7	2.2	1.0	0.7	0.8	-2.9

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

*PK-12 Special education teachers.* As shown in Table 50, the supply-demand ratios increased for four regions and the other four regions had small supply-demand ratio increases. The Commonwealth had a small supply-demand ratio increase. In 2017-18, three regions had small supply-demand ratios, two regions had a moderate supply-demand ratio, and four regions had large supply-demand ratios. For urban districts with sufficient data, two regions had small supply-demand ratios, three had moderate supply-demand ratios, and one had a large supply-

demand ratio. For rural districts in regions with sufficient data, one had a small supply-demand ratio and four had large supply-demand ratios.

Table 50: Ratio of New Instructional I Licenses to Number of Beginning Special Education Teachers Hired (2013-14 to 2017-18)

Region	Locale	Academic Year					CHG: 13-14 to 17-18
		2013-14	2014-15	2015-16	2016-17	2017-18	
Philadelphia Metro	Urban	0.5	1.8	2.3	2.4	1.7	1.2
	Rural	na	na	na	na	na	na
	Total	0.5	1.8	2.2	2.4	1.7	1.2
South East	Urban	0.6	1.8	1.4	1.5	0.7	0.1
	Rural	na	na	na	na	na	na
	Total	0.6	1.7	1.3	1.4	0.6	0.1
North East	Urban	1.8	3.9	4.0	4.0	1.8	0.1
	Rural	3.1	7.2	3.1	4.4	2.9	-0.2
	Total	2.3	5.5	3.4	4.2	2.3	0.1
South Central	Urban	0.6	1.4	1.8	1.7	0.9	0.4
	Rural	na	na	na	na	na	na
	Total	0.4	1.0	1.3	1.2	0.7	0.3
Central	Urban	na	na	na	na	na	na
	Rural	2.6	5.3	5.4	3.9	3.6	1.0
	Total	1.8	4.3	4.3	3.1	3.0	1.2
North Central	Urban	na	na	na	na	na	na
	Rural	0.2	2.9	2.0	2.3	1.5	na
	Total	0.1	0.9	1.5	1.4	1.3	1.2
South West	Urban	na	na	na	na	na	na
	Rural	0.6	1.1	1.1	1.7	0.7	0.1
	Total	0.4	1.0	0.9	1.3	0.5	0.1
Pittsburgh Metro	Urban	0.9	1.6	1.9	1.7	1.4	0.5
	Rural	2.7	8.4	11.2	17.2	8.3	5.6
	Total	1.2	2.9	3.7	3.6	2.4	1.1
North West	Urban	3.5	4.5	1.6	4.8	3.1	-0.4
	Rural	1.7	4.5	2.5	4.5	2.1	0.4
	Total	2.4	4.5	2.0	4.6	2.4	0.0
Total	Urban	0.7	1.8	2.0	2.1	1.3	0.6
	Rural	1.5	3.9	3.4	3.8	2.0	0.5
	Total	0.9	2.4	2.3	2.5	1.5	0.5

Data Source: PDE Licensure File; PDE Educator Employment Files; Calculations by researchers

## Emergency Permits

Emergency permits are used when districts cannot find an appropriately licensed teacher to fill a particular teaching position. This sometimes happens when a teacher gets sick or moves during the middle of the year. In such cases, districts might hire a long-term substitute. In other cases, districts simply cannot find a person willing to teach a particular subject who possesses the appropriate Pennsylvania license. Thus, the number and percentage of teachers on an emergency

permit is a good indication of the difficulty districts are having in hiring appropriately qualified teachers.

As shown in Table 51, there was a 111 percent increase in the number of teachers on emergency permits across all subject areas and all districts. For all urban districts, the increase was almost 150 percent while the increase for all rural districts was 70 percent. These increases occurred while the number of Pennsylvania teachers actually decreased across the same time period. Thus, to reiterate, as the number of teachers has decreased across the state from 2011-12 to 2017-18, the number of teachers on emergency permits has increased dramatically. This is a very strong indication that districts are increasingly having difficulty in hiring appropriately qualified individuals to fill vacant teaching positions.

Table 51: Number of Teachers and Emergency Permits  
by Academic Year and Subject Area (2011-12 to 2017-18)

School Type and Geographic Locale	Teachers				Emergency Permits			
	Academic Year		12-13 to 17-18		Academic Year		12-13 to 17-18	
	2012-13	2017-18	N	%	2012-13	2017-18	N	%
Charter-Cyber	774	958	184	23.8	10	15	5	50.0
Mixed-IU	2,090	1,251	-839	-40.1	1,077	1,509	432	40.1
<b>All Rural</b>	<b>35,348</b>	<b>29,632</b>	<b>-5,716</b>	<b>-16.2</b>	<b>2,725</b>	<b>4,635</b>	<b>1,910</b>	<b>70.1</b>
Rural-Districts	33,256	28,099	-5,157	-15.5	1,682	2,857	1,175	69.9
Rural-Charter	179	146	-33	-18.3	11	23	12	109.1
Rural-CTC	882	810	-72	-8.2	148	197	49	33.1
Rural-IU	1,031	578	-453	-44.0	884	1,558	674	76.2
<b>All Urban</b>	<b>99,124</b>	<b>87,427</b>	<b>-11,697</b>	<b>-11.8</b>	<b>5,231</b>	<b>13,061</b>	<b>7,830</b>	<b>149.7</b>
Urban-Districts	88,772	77,117	-11,655	-13.1	2,663	8,193	5,530	207.7
Urban-Charter	6,474	7,126	652	10.1	157	811	654	416.6
Urban-CTC	1,303	1,199	-104	-8.0	195	293	98	50.3
Urban-IU	2,575	1,985	-590	-22.9	2,216	3,764	1,548	69.9
<b>All Districts</b>	<b>137,336</b>	<b>119,268</b>	<b>-18,068</b>	<b>-13.2</b>	<b>9,269</b>	<b>19,596</b>	<b>10,327</b>	<b>111.4</b>

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

The change in the number of teachers on emergency permits is even more dramatic when examining only teachers in the major subject areas. Indeed, for teachers in the 11 subject areas

listed in Table 52, the overall increase in the number of teachers employed on an emergency permit from 2011-12 to 2017-18 was 2,385—more than 400 percent greater than in 2011-12.

Three subject areas—English Language Arts, Social Studies, and Fine Arts—experienced increases greater than 500 percent while there was a 1,376 percent increase in the number of elementary teachers on emergency permits. These results are incredibly strong indicators that districts are having difficulty in finding enough appropriately qualified people to fill vacant positions. Further, the dramatic increases since just 2014-15 suggest the problem has escalated rather quickly. Finally, note that these increases coincide with decreases in the supply of new Instructional I licenses over the same time period and in the same subject areas.

Table 52: Number of Teachers on Emergency Permits  
by Academic Year and Subject Area (2011-12 to 2017-18)

Subject Area	Academic Year							CHG: 11-12 to 17-18	
	11-12	12-13	13-14	14-15	15-16	16-17	17-18	N	%
Elementary	70	69	105	186	337	742	1033	963	1375.7
English	30	40	48	43	106	141	187	157	523.3
Math	39	53	44	73	87	133	165	126	323.1
Science	55	84	57	80	111	131	187	132	240.0
Soc Studies	13	26	17	24	40	37	84	71	546.2
Health	11	15	8	12	15	45	64	53	481.8
Fine Arts	12	23	29	33	37	66	89	77	641.7
Foreign Language	45	61	75	77	108	128	134	89	197.8
Computer Science	1	2	8	2	1	4	6	na	na
Special Education	268	321	319	329	479	697	864	596	222.4
ELL	27	23	33	43	59	110	143	116	429.6
All Areas	571	717	743	902	1380	2234	2956	2385	417.7

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

### Shortage Designations from Pennsylvania Department of Education

The U.S. Department of Education requires all state education agencies to identify educator shortage areas and submit this information to the US Department of Education each year. Table 53 includes the designations provided by PDE for the most recent 8 academic years.

As shown in the table, the number of designations has increased over time. This evidence suggests the shortage of teachers has become more acute over the past 8 years.

Table 53: Statewide Teacher Shortages Areas (2013-14 to 2020-2021)

Area	Subject	Grades	Academic Year							
			13-14	14-15	15-16*	16-17	17-18	18-19	19-20	20-21
Core Subjects	Elem Educ	P-8				X	X	X	X	X
Core Subjects	Elem Educ	4-8				X	X	X	X	X
Language Arts	English	7-12				X	X	X	X	X
Language Arts	Reading & Literacy	P-12						X	X	X
Language Arts	Communications	7-12								X
Mathematics	-	7-12				X	X	X	X	X
Science	General	7-12					X	X	X	
Science	Life Sciences	7-12				X				X
Science	Physical Science	7-12				X				
Science	Chemistry	7-12		X						
World Languages		P-12					X	X	X	X
Art & Music Education		P-12					X	X	X	X
English as a Second Language		P-12				X	X	X	X	X
Special Education	General	P-12	X	X		X	X	X	X	X
Special Education	Hearing Impaired	P-12	X	X		X	X	X	X	X
Special Education	Visually Impaired	P-12	X	X		X	X	X	X	X
Special Education	Language & Speech	P-12	X	X		X	X	X	X	X
Career & Technical Education		7-12	X	X		X	X	X	X	X

Data Source: <https://tsa.ed.gov/#/reports>

\*No data were submitted to USDoe in 2015-16

## Perceptions of the Shortage of Teachers

This section reviews the combined results of two online surveys administered to superintendents and principals, a survey of members of the Pennsylvania School Study Council, and a focus group of 11 superintendents from IU10.

**Survey of Administrators.** Using administrative data to assess the shortage of teachers is difficult given that the Commonwealth does not collect any information about the number of applicants for each position or the perceptions of district leaders about the quality of applicants or the quality of those hired for vacant positions. Thus, the researchers administered two surveys

of principals and superintendents to garner their perceptions of the supply, demand, and shortage of teachers at each of the three school levels and for various subject areas and subjects.

Ultimately, because of the low response rate, the reader must be cautious in interpreting the results. While this study includes the findings of these surveys, a much higher response rate to a statewide survey would be necessary to have full confidence in any findings. PDE should formalize such a survey and require all districts complete a short survey each year. While PDE currently asks districts to identify shortage areas, the survey lacks the specificity needed to fully understand teacher shortage issues in the Commonwealth.

**Findings from survey of administrators.** The respondents identified several areas in which finding a well-qualified teacher to fill a vacant position was “very difficult.” As shown in Table 54, the areas for which at least 25 percent of respondents perceived finding a well-qualified candidate was “very difficult” include the areas historically identified as shortage areas: special education, English Language Learner, mathematics, and science. In addition, respondents identified difficulty in hiring foreign language teachers and, at the high school level, Career and Technical Education teachers.

With respect to the locale of the district (rural or urban) in which a respondent worked, a greater percentage of respondents in rural districts identified that the hiring of a well-qualified teacher was very difficult.

At the elementary school level, there were four areas for which at least 25 percent of respondents characterized the hiring of teachers in the area as very difficult. These areas included English Language Learner teachers and three different types of special education teachers. For all four areas, a substantially greater percentage of respondents from rural districts than

respondents from urban districts characterized the hiring of such teachers as very difficult. The 41 percentage point difference for English Language Learner teachers was especially large.

Table 54: Percentage of Principals and Superintendents Identifying Hiring a Teacher to be Very Difficult at the Elementary School Level by Locale

School Level and Subject Area/Subject	Respondent Group			Diff: R - U
	All	Urban	Rural	
<b>Elementary</b>				
Elem: English Language Learner	45.8	28.6	70.0	41.4
Elem: Special Educ (Hearing Impaired)	40.5	32.3	52.2	19.9
Elem: Special Educ (Visually Impaired)	39.3	29.9	53.3	23.5
Elem: Special Educ (Autism)	28.5	22.3	37.5	15.2
Elem: Science	22.5	22.5	22.4	0.0
Elem: Mathematics	22.3	19.6	27.5	7.9
Elem: Special Education	13.3	9.3	19.8	10.5
Elem: Reading	12.5	10.6	15.6	5.0
Elem: Music	7.1	7.2	6.9	-0.3
Elem: Early Childhood	6.0	2.5	11.1	8.6
Elem: Art	5.6	6.3	4.4	-1.9
Elem: All	2.5	0.8	5.3	4.6
Elem: Kindergarten	2.4	0.8	5.1	4.4
Elem: Physical Education	2.2	3.7	0.0	-3.7

Data Source: Author created surveys of principals and district administrators

At the middle school level (Table 55), there were five areas for which at least 25 percent of respondents characterized the hiring of teachers in the area as very difficult. These areas included English Language Learner teachers, foreign language teachers, and three different types of special education teachers. For four of the five areas, a substantially greater percentage of respondents from rural districts than respondents from urban districts characterized the hiring of such teachers as very difficult. At least 25 percent of respondents from rural districts also identified the hiring of elementary mathematics teachers to be very difficult.

Table 55: Percentage of Principals and Superintendents Identifying Hiring a Teacher to be Very Difficult at the Middle School Level by Locale

School Level and Subject Area/Subject	Respondent Group			Diff: R – U
	All	Urban	Rural	
<b>Middle School</b>				
MS: Foreign Language	37.9	30.1	49.1	19.0
MS: Special Educ (Visually Impaired)	37.6	27.1	48.9	21.8
MS: Special Educ (Hearing Impaired)	36.2	28.6	44.4	15.9
MS: Special Educ (Autism)	31.7	30.0	33.9	3.9
MS: English Language Learner	25.2	17.8	35.2	17.4
MS: Technology Education	22.7	17.4	29.4	12.0
MS: Computer Science	19.6	14.6	25.8	11.1
MS: CTE	18.9	13.3	26.1	12.8
MS: Special Education	14.8	15.7	13.5	-2.2
MS: Science	12.7	11.3	14.5	3.1
MS: Mathematics	10.2	7.8	13.5	5.7
MS: Art	5.3	3.6	7.6	4.0
MS: Music	4.9	4.3	5.8	1.5
MS: Foreign Language (Other)	4.6	1.6	8.9	7.3
MS: English	3.2	1.8	5.2	3.4
MS: Social Studies	1.1	0.0	2.8	2.8
MS: Health Education	0.7	1.3	0.0	-1.3
MS: Physical Education	0.0	0.0	0.0	0.0

Data Source: Author created surveys of principals and district administrators

At the high school level (Table 56), there were 13 areas for which at least 25 percent of respondents characterized the hiring of teachers in the area as very difficult. These areas included: science, physics, chemistry, calculus, advanced mathematics, foreign language, computer science, technology education, CTE, English Language Learner, and three types of special education teachers. For 11 of these 13 areas, the percentage of respondents from rural districts who perceived hiring to be very difficult was at least 10 percentage points greater than for respondents from urban districts. The only two areas for which this was not true was physics and computer science.

Rural respondents also identified three additional areas for which at least 25 percent characterized the hiring of teachers in the area as very difficult. These three areas included economics, mathematics, and biology.



Table 56: Percentage of Principals and Superintendents Identifying Hiring a Teacher to be Very Difficult at the High School Level by Locale

School Level and Subject Area/Subject	Respondent Group			Diff: R - U
	All	Urban	Rural	
<b>High School</b>				
HS: Physics	54.0	52.6	56.1	3.5
HS: Science	47.8	43.8	53.8	10.1
HS: Chemistry	40.4	36.3	46.4	10.1
HS: Foreign Language	39.9	31.3	52.2	20.9
HS: Calculus	39.8	32.6	50.0	17.4
HS: Special Educ (Hearing Impaired)	39.2	30.9	48.9	18.0
HS: Special Educ (Visually Impaired)	37.9	28.6	48.9	20.4
HS: Special Educ (Autism)	32.9	23.8	45.8	22.0
HS: Mathematics-Advanced	31.2	24.7	40.6	15.9
HS: Computer Science	30.5	32.3	27.7	-4.6
HS: Technology Education	29.6	24.2	37.1	12.9
HS: CTE	27.9	23.5	34.9	11.4
HS: English Language Learner	27.8	20.0	39.2	19.2
HS: Economics	22.2	0.0	50.0	50.0
HS: Mathematics	21.4	16.2	29.4	13.2
HS: Biology	21.2	16.8	27.5	10.7
HS: Special Education	18.3	16.2	21.4	5.3
HS: Science	16.2	16.0	16.4	0.4
HS: Social Studies	13.2	11.5	15.9	4.4
HS: Physical Science	13.0	12.5	13.8	1.3
HS: English-Advanced	12.4	7.3	20.0	12.7
HS: Social Studies	11.8	0.0	25.0	25.0
HS: Foreign Language (Other)	8.4	4.2	14.6	10.4
HS: Music	8.4	5.6	12.1	6.5
HS: Art	7.8	3.4	14.1	10.7
HS: English	4.0	3.9	4.3	0.4
HS: Health Education	1.9	1.1	3.2	2.1
HS: Physical Education	1.2	1.1	1.5	0.4

Data Source: Author created surveys of principals and district administrators

However, logistic regression analysis was also used to determine if the difference in perceptions between rural and urban respondents remained after controlling for the percentage of students living in poverty in the district. Once the percentage of students living in poverty in the district was included in the analysis, the relationship between being a rural district and perceptions of hiring difficulty was often not statistically significant. However, there were statistically significant differences in the perceptions regarding the difficulty of hiring teachers

between rural and urban respondents for the following areas: elementary English Language Learner, elementary special education-visually impaired, elementary special education—autism support, middle school foreign language, middle school English Language Learner, high school foreign language, and high school English Language Learner.

In addition, perceptions of respondents in counties with teacher preparation programs and those in counties with no teacher preparation program were also compared. Almost all of the counties with TPPs were rural counties. The subject areas and subjects in which at least 25 percent of individuals from districts in counties with no teacher preparation program indicated that hiring a teacher was very difficult are shown in Table 57 (Elementary schools), Table 58 (Middle schools), and Table 59 (high schools). The results included the following areas: special education at all three school levels, English Language Learner at all three school levels, secondary technology education, secondary foreign language, secondary CTE, high school science, high school calculus, high school physics, high school chemistry, high school advanced mathematics, high school advanced English Language Arts, and high school economics. While respondents in counties with teacher preparation programs also identified that hiring teachers in these areas is very difficult, there were some differences in perceptions. Indeed, respondents from counties with no teacher preparation program identified the following areas that were not identified by respondents in counties with teacher preparation programs: elementary mathematics, elementary reading, elementary special education (general), middle school English Language Learner, middle school technology education, middle school CTE, high school economics, high school special education (general), and high school advanced English Language Arts. Moreover, there were significant differences in the percentage of respondents identifying hiring as being very difficult between the two groups—especially at the elementary school level.

Table 57: Percentage of Principals and Superintendents Identifying Hiring Elementary Teachers to be Very Difficult by Access to Teacher Preparation Program

School Level and Subject Area/Subject	Respondent Group			Diff: noTPP - TPP
	All	TPP	No TPP	
<b>Elementary</b>				
Elem: Special Educ (Visually Impaired)	39.3	31.9	71.4	39.6
Elem: Special Educ (Hearing Impaired)	40.5	33.3	71.4	38.1
Elem: English Language Learner	45.8	35.3	71.4	36.1
Elem: Special Educ (Autism)	28.5	24.2	50.0	25.8
Elem: Mathematics	22.3	21.3	28.6	7.3
Elem: Reading	12.5	10.0	26.7	16.7
Elem: Special Education	13.3	10.8	26.5	15.7
Elem: Science	22.5	22.9	20.0	-2.9
Elem: Early Childhood	6.0	3.8	14.3	10.5
Elem: Music	7.1	7.1	7.4	0.4
Elem: Kindergarten	2.4	1.7	6.5	4.8
Elem: Art	5.6	5.8	4.0	-1.8
Elem: All	2.5	2.3	3.4	1.1
Elem: Physical Education	2.2	2.6	0.0	-2.6

Data Source: Author created surveys of principals and district administrators

Table 58: Percentage of Principals and Superintendents Identifying Hiring Middle School Teachers to be Very Difficult by Access to Teacher Preparation Program

School Level and Subject Area/Subject	Respondent Group			Diff: NoTPP-TPP
	All	TPP	No TPP	
<b>Middle School</b>				
MS: Special Education	37.6	28.8	70.0	41.2
MS: Special Educ (Hearing Impaired)	36.2	28.4	65.0	36.6
MS: Foreign Language	37.9	34.5	57.1	22.7
MS: Special Educ (Autism)	31.7	29.2	45.5	16.3
MS: English Language Learner	25.2	21.2	43.5	22.3
MS: Technology Education	22.7	21.5	29.2	7.6
MS: CTE	18.9	16.5	28.6	12.1
MS: Computer Science	19.6	18.7	24.0	5.3
MS: Science	12.7	11.2	20.0	8.8
MS: Social Studies	13.2	12.5	17.4	4.9
MS: Mathematics	10.2	9.4	14.8	5.4
MS: English	3.2	2.5	6.7	4.1
MS: Art	5.3	5.5	4.5	-0.9
MS: Music	4.9	5.0	4.3	-0.7
MS: Foreign Language (Other)	4.6	5.3	0.0	-5.3
MS: Health Education	0.7	0.8	0.0	-0.8
MS: Physical Education	0.0	0.0	0.0	0.0
MS: Social Studies	1.1	1.3	0.0	-1.3

Data Source: Author created surveys of principals and district administrators

Table 59: Percentage of Principals and Superintendents Identifying Hiring High School Teachers to be Very Difficult by Access to Teacher Preparation Program

School Level and Subject Area/Subject	Respondent Group			Diff: noTPP-TPP
	All	TPP	No TPP	
<b>High School</b>				
Elem: Special Educ (Hearing Impaired)	39.2	33.8	59.1	25.3
HS: Special Educ (Visually Impaired)	37.9	32.1	59.1	27.0
HS: Special Educ (Autism)	32.9	29.2	52.2	23.0
HS: Science	47.8	47.1	52.2	5.1
HS: Calculus	39.8	38.0	50.0	12.0
HS: Physics	54.0	55.4	45.8	-9.6
HS: Mathematics-Advanced	31.2	29.6	40.9	11.3
HS: Chemistry	40.4	40.4	40.0	-0.4
HS: Foreign Language	39.9	40.6	36.0	-4.6
HS: CTE	27.9	26.9	33.3	6.5
HS: Economics	22.2	16.7	33.3	16.7
HS: English Language Learner	27.8	26.9	31.8	4.9
HS: Technology Education	29.6	29.4	30.8	1.4
HS: Special Education	18.3	17.0	25.0	8.0
HS: Computer Science	30.5	31.4	25.0	-6.4
HS: English-Advanced	12.4	10.2	25.0	14.8
HS: Mathematics	21.4	21.2	22.2	1.0
HS: Special Education	14.8	14.0	19.2	5.2
HS: Biology	21.2	22.1	16.0	-6.1
HS: Physical Science	13.0	12.5	16.0	3.5
HS: Foreign Language (Other)	8.4	7.7	13.3	5.6
HS: Science	16.2	16.9	12.0	-4.9
HS: Art	7.8	7.7	8.7	1.0
HS: Music	8.4	8.4	8.3	-0.1
HS: English	4.0	4.1	3.7	-0.4
HS: Social Studies	11.8	14.3	0.0	-14.3
HS: Health Education	1.9	2.3	0.0	-2.3
HS: Physical Education	1.2	1.5	0.0	-1.5

Data Source: Author created surveys of principals and district administrators

These results suggest that rural districts—especially those located in counties with no TPPs—have trouble in hiring teachers in shortage areas more acutely than other districts. This is generally consistent with the limited research on teacher shortages by district locale.

**Focus group of superintendents.** During fall 2019, one of the study’s researchers attended a meeting of superintendents at IU10. To protect confidentiality, the names of the superintendents and their school districts were not collected. All the districts are identified as

rural districts using the Center for Rural Pennsylvania definition. At the meeting, the participants engaged in a discussion about teacher shortages. Three open-ended questions were posed to participants:

- Are you experiencing a shortage of teachers?
- What are the causes of the shortage of teachers in your district?
- What strategies have you adopted or are thinking of adopting in response to the shortage?

Below, the responses to the first two questions are summarized. The responses to question three are included in the Policy Implications section.

**Findings from the focus group.** All 11 superintendents indicated they were experiencing some degree of teacher shortages. Moreover, all 11 participants indicated the shortage was growing more, rather than less, acute. Respondents also mentioned that they have always encountered some degree of difficulty in hiring secondary math, physics, chemistry, special education, and AP/IB teachers, but that they are now facing difficulty in hiring teachers across a much broader array of courses and subject areas. Moreover, even superintendents of districts that have historically not faced difficulty in hiring teachers reported that they are now encountering much greater difficulty than in recent history.

Most of the participants indicated four factors that had the greatest influence on the shortage of teachers. First, participants noted that far fewer K-12 students were indicating any interest in entering the teaching profession. This observation is consistent with the declining number of TPP enrollees over the past 8 years.

Further, participants perceived that recent changes to teacher pension benefits have had a negative effect on interest in entering teaching and that the most recent reductions related to teacher pensions would have an even more negative effect in coming years.

The third and fourth factors were interrelated in the eyes of participants. Participants noted they had difficulty in offering salaries at a level sufficient to recruit new teachers to their district. They also argued higher salaries were necessary, in part, to offset the lack of amenities in their community desired by recent college graduates. So, for example, participants mentioned recent graduates wanted to be able to go shopping, eat at different restaurants, and see movies but that not all communities had such amenities readily available. Thus, to compensate for the lack of amenities, higher salaries were needed to attract recent college graduates.

### **Projections of the Demand and Shortage of Teachers in Pennsylvania**

While the above analyses relied on past data, this section uses past and current data to make predictions about the future supply, demand, and shortage of teachers in Pennsylvania. The underlying files that include all of the information used to make these projections are available upon request from the primary author of this study. As noted previously, several factors influence the demand for teachers. In making these projections, the following factors were considered:

- Projected student enrollment of Pennsylvania school districts, including the use of projected birth rates to predict elementary school enrollment;
- The projected number of teachers needed to cover future student enrollment;
- The projected number of teachers that will need to be replaced each year to cover student enrollment;
- The projected rate of teacher turnover and loss; and,

- The difference between the total number of teachers a district is expected to have and the total number of teachers a district will need to cover student enrollment.

The final category is the most direct measure of where teacher shortages and surpluses will result due to the demand of student populations. These projections should be treated more as trends than actual teacher counts for several reasons listed below, even though the estimates used by the researchers in this study had low error rates as shown elsewhere in this study.

Below, each category comprising teacher demand is outlined in more detail, with specific examples shown to illustrate trends. Given the large number of districts, school levels, and content areas, discussing every trend would be difficult. To illustrate specifics that may be lost in the presentation of aggregate data, one rural (Penns Valley), one suburban (Lower Merion), and one urban (Harrisburg City) exemplar district was chosen and examined in more depth.

Exemplar districts are those with data that represent the “average” district within a category as well as perceived to be well known throughout the state. These districts offer a window into differences across Pennsylvania. These districts were chosen because they represent the average district within each of these three categories. The third category of suburban is introduced because there are stark differences between suburban and urban districts within the over-arching “urban” category used throughout the rest of this report and by the Center for Rural Pennsylvania. Suburban districts were identified using the geographic locales used by the National Center for Education Statistics (n.d.).

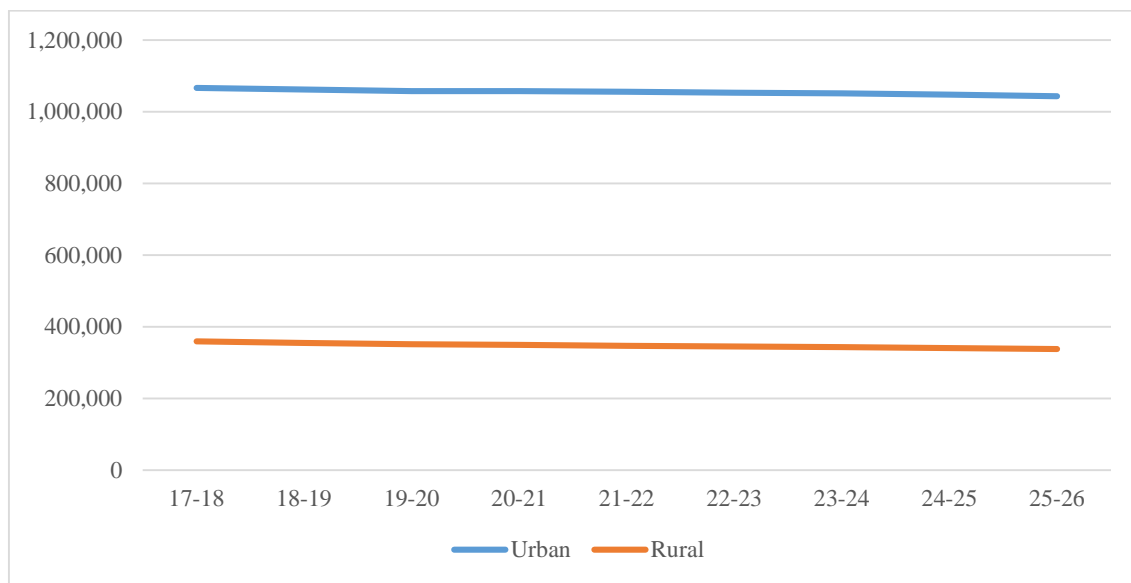
### **Projected Enrollment**

Using state-determined school enrollment rates from 2017-18 through 2025-26, Figure 25 shows a slight decline in student enrollment throughout the Commonwealth for both urban and

rural districts. Overall, most schools in the Commonwealth will see a slight but consistent decline in student enrollment, with an average yearly loss of 82 students per district.

Using greater detail in locale, both rural areas and urban cores will experience declines in student enrollment, while suburban and Metropolitan districts will experience an increase in student enrollment. Except for the Philadelphia and Pittsburgh Metro regions, rural districts are projected to lose a greater proportion of students than other districts, with an average yearly loss of 91 students per district. Alternatively, suburban and small urban districts will experience an average loss of 75 students per district.

Figure 25: Total Student Enrollment for Urban and Rural Districts from 2017-18 through 2025-26



Data Source: PDE student enrollment data and student enrollment projections by district

Table 60 shows the percentage change in student enrollment from 2017-18 through 2025-26 by the decile of percentage change for urban and rural districts. Deciles were created by placing an equal number of districts into 10 different groups based on their percentage change in student enrollment from 2017-18 to 2025-26.



For the deciles of districts with the greatest decline in enrollment (Decile 10), the percentage change in student enrollment was a 13.7 percent decline for urban districts and a 18.2 percent decline for rural districts. There were declines in student enrollment for urban districts through the 50<sup>th</sup> percentile while there were declines in student enrollment for rural districts through the 70<sup>th</sup> percentile. Thus, 50 percent of urban districts and 70 percent of rural districts are predicted to have declines in student enrollment in the coming decade. Thus, a far greater percentage of rural districts will experience a student decline than urban districts. Only the top decile of rural districts will experience more than a marginal increase in student enrollment through 2025-26.

Table 60: Percentage Change in Student Enrollment by District Decile of Percentage Change (2017-18 through 2025-26)

District Decile	Locale	
	Urban	Rural
10	-13.7	-18.2
20	-11.0	-14.1
30	-8.0	-10.5
40	-5.1	-8.3
50	-2.4	-6.3
60	0.2	-3.3
70	3.6	-0.7
80	6.8	1.3
90	10.7	6.3

Data Source: PDE student enrollment data and student enrollment projections by district

Table 61 shows the school districts with the greatest increases and decreases in enrollment. Examining the counties in which these districts are located suggests Montgomery, Fayette, Dauphin, and Lebanon counties will experience the largest increases in student enrollments, while the counties of Bucks, Pike, and Monroe will experience the greatest declines. With some exceptions, there appears to be a general trend of movement of students into more suburban areas of the state from both urban and rural areas of the state.

Table 61: Pennsylvania School Districts with the Greatest Increases and Decreases in Student Enrollment from 2017-18 through 2025-26

Increasing Enrollment		Decreasing Enrollment	
District	Increase	District	Decrease
Colonial SD	6,049	Philadelphia City SD	-8,319
Jenkintown SD	3,516	Pittsburgh SD	-2,660
Connellsville Area SD	2,782	Central Bucks SD	-2,521
Cheltenham SD	2,747	Bethlehem Area SD	-2,029
Central Dauphin SD	2,167	Reading SD	-1,416

Data Source: PDE Projected Student Enrollment Data

Finally, Table 62 presents the rural districts with at least a 10 percent increase in student enrollment from 2017-18 through 2025-26, and the rural districts with at least a 20 percent decline in student enrollment over the same time period.

Table 62: Rural Districts with the Greatest Increases and Decreases in Student Enrollment (2017-18 through 2025-26)

District Name	% Change	District Name	% Change
Connellsville Area SD	61.9	Shade-Central City SD	-38.2
Smethport Area SD	37.6	Northwest Area SD	-25.7
Curwensville Area SD	25.1	Avella Area SD	-24.4
Berlin Brothersvalley SD	18.6	United SD	-24.3
Southern Huntingdon County SD	15.9	Northern Cambria SD	-23.8
Juniata Valley SD	14.8	South Side Area SD	-23.4
Mohawk Area SD	13.1	West Middlesex Area SD	-22.9
Clarion-Limestone Area SD	13.0	Freeport Area SD	-22.7
Shanksville-Stonycreek SD	11.7	Halifax Area SD	-22.6
Montoursville Area SD	11.1	Turkeyfoot Valley Area SD	-22.6
Riverside Beaver County SD	10.5	Ligonier Valley SD	-22.6
Athens Area SD	10.5	Kane Area SD	-22.6
		Northwestern Lehigh SD	-22.2
		Union City Area SD	-22.2
		Galeton Area SD	-21.4
		Chestnut Ridge SD	-21.1
		Central Cambria SD	-21.0

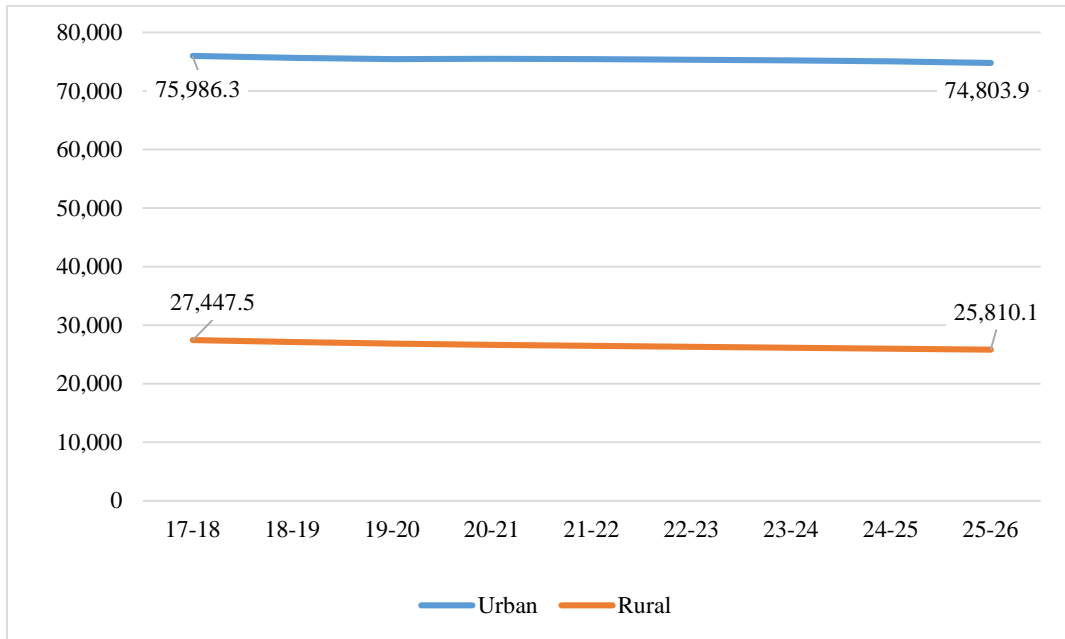
Data Source: PDE Projected Student Enrollment Data

## **Projected Teacher FTEs and Additional FTEs Needed**

Given these changes in enrollment, the research estimated the number of FTE positions needed to maintain the average student-teacher ratio for the appropriate content area by district. The student-teacher ratio was calculated as the number of students in a given grade range divided by the number of FTE positions in the district for that particular grade range. This number was then averaged across the five sample years for each district, and divided again by the estimated number of students enrolled for each projected year. These teacher FTE projections follow the general trend of enrollment in a district, while accounting for population increases or decreases in cohorts as they move through grade levels. For example, a sharp increase in the kindergarten cohort in 2018 will be felt in the elementary intermediate category around 2022, and impact middle school positions by 2025.

Figure 26 shows the decline in the number of teacher FTEs needed from 2017-18 through 2025-26 for urban and rural districts. Both groups of districts will require fewer teacher FTEs through 2025-26 with a greater decline for rural districts than for urban districts. In other words, the demand for teachers will decline at a greater rate for rural districts than for urban districts.

Figure 26: Total Number of Teacher FTEs for Urban and Rural Districts from 2017-18 through 2025-26



Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

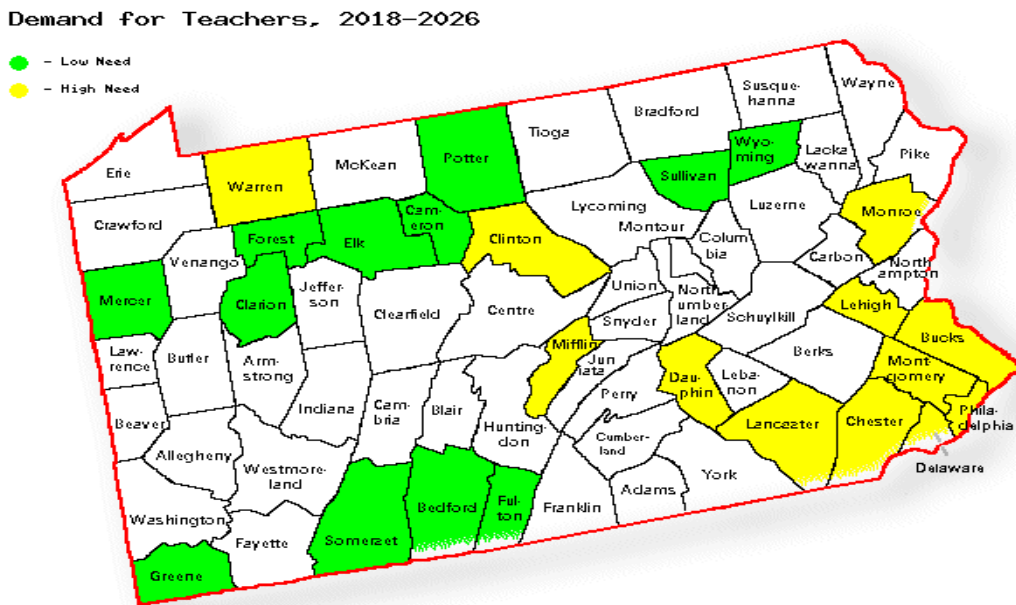
Remember, however, that these estimates only account for the influence of declines in student birth rates and the in- and out-migration of families. These PDE estimates do not include movement of students into other educational settings such as home schools, private schools, and charter schools.

The calculations made by the researchers on this study also predict a general decline in the number of teachers needed across each subject area. In total, Pennsylvania will need approximately 2,820 fewer teachers over the next 8 years, with rural districts needing 1,637 fewer teachers and urban districts needing 1,182 fewer teachers. Most districts (67 percent) will experience a slight decline in the number of FTEs needed, with the average district reduction being five FTE positions. The districts with the largest projected student enrollment increases will need to add the most FTE positions. For example, Colonial School District in Montgomery

County—with the largest increase in students across the Commonwealth—will need to add 487 teaching positions over the next 8 years to maintain its current student-to-teacher ratio.

Figure 27 displays the teacher demand geographically. The map shows a cluster of high-demand counties surrounding the Philadelphia Metro region, with a few other high-demand counties distributed around the state. Low-demand counties in the southern and north west portions of the state are generally located in rural areas. While Pittsburgh is also a high-demand district, it is offset by the other Allegheny County suburban and rural districts with lower teacher demand.

Figure 27: Demand for Teachers by County



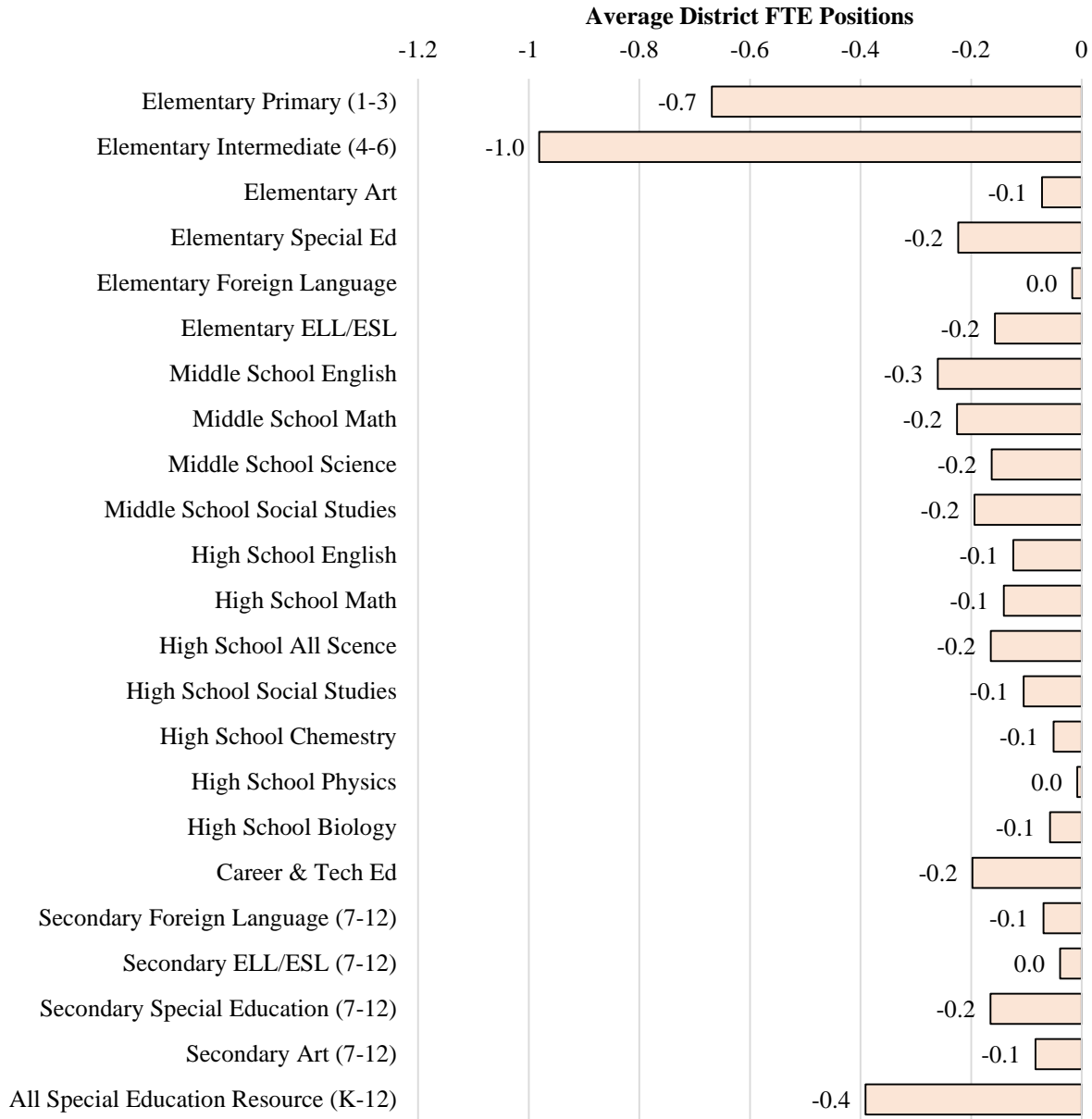
Source: dlymaps.net (c)

Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

Figure 28 displays the average district change in the demand for teachers by subject area. Elementary teachers will see the greatest decline in the number of FTE positions needed to maintain the current student-teacher ratio through 2025-26, with an overall reduction of 1,294 positions needed and an average reduction of 2.6 positions per district. In most subject areas,

including math and science, there will be a slight reduction in the number of positions needed, usually between 0.5 and 1.0 FTEs per district.

Figure 28: Statewide Average District Change in Demand for Teachers by Subject Area (Negative numbers indicate greater demand)



Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

## **Projected Teacher Attrition and Turnover**

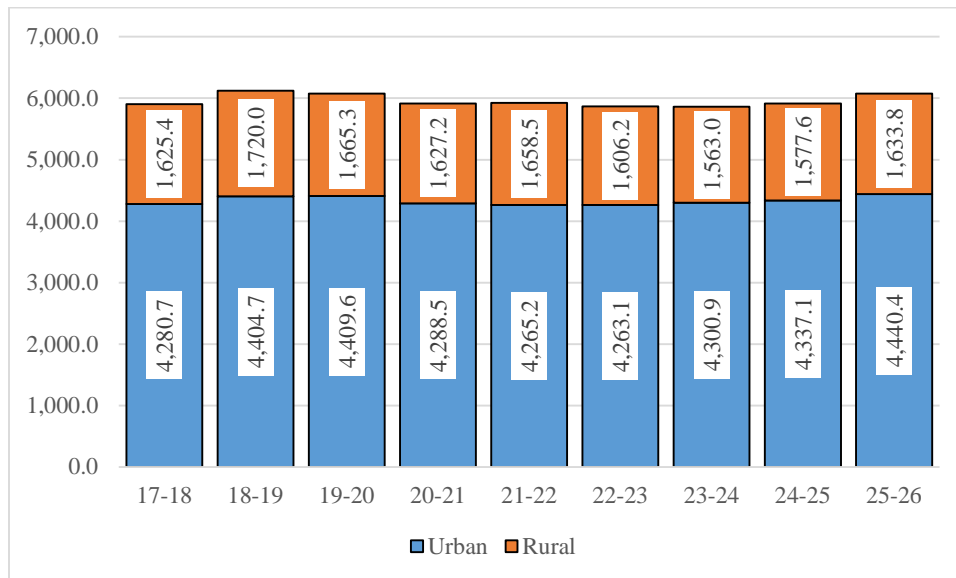
In addition to estimating the number of teacher positions needed by student population, calculating demand also requires an understanding of how many teachers will leave a given district each year. Using the data file available to the public, the researchers calculated *the estimated number of positions each district will lose each year by subject area*. This was calculated as the average level of FTE loss due to teacher transfer or exits, in addition to the number of teachers eligible to retire. These estimations assume teachers will retire in the first year of eligibility based on age and experience. This is likely an overestimate of retirement behavior, but also serves as the most conservative means to model behavior. Teachers that left during or after their first year of retirement eligibility were considered retirements, so as to not double count turnover after retirement eligibility.

Given that teacher turnover in terms of FTE does not occur at a consistent “rate,” but follows individuals as they leave, results should be interpreted as more of a trend than an absolute prediction of teacher loss. For example, if District A had five teachers leave in 2018 and zero teachers leave in 2019 through 2022, the annual loss rate would be one teacher per year. This would, obviously, misrepresent turnover in District A. Furthermore, it should be noted that these figures do not include hires, so these are projections of total teacher loss without the addition of any new hires.

Figure 29 documents the total number of teacher FTEs lost by urban and rural districts due to teacher turnover. Since approximately 72 percent of teachers in Pennsylvania are employed in urban districts, it is not surprising that the majority of teachers leaving—about 72 percent—are from urban districts. Clearly, the greatest number of teachers leaving a district will

be teachers in urban districts. Specifically, between 4,200 and 4,400 teachers will leave urban districts each year while around 1,600 teachers will leave rural districts each year.

Figure 29: Statewide Annual Number of Teachers Leaving Their District by Locale (2017-18 through 2025-26)



Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

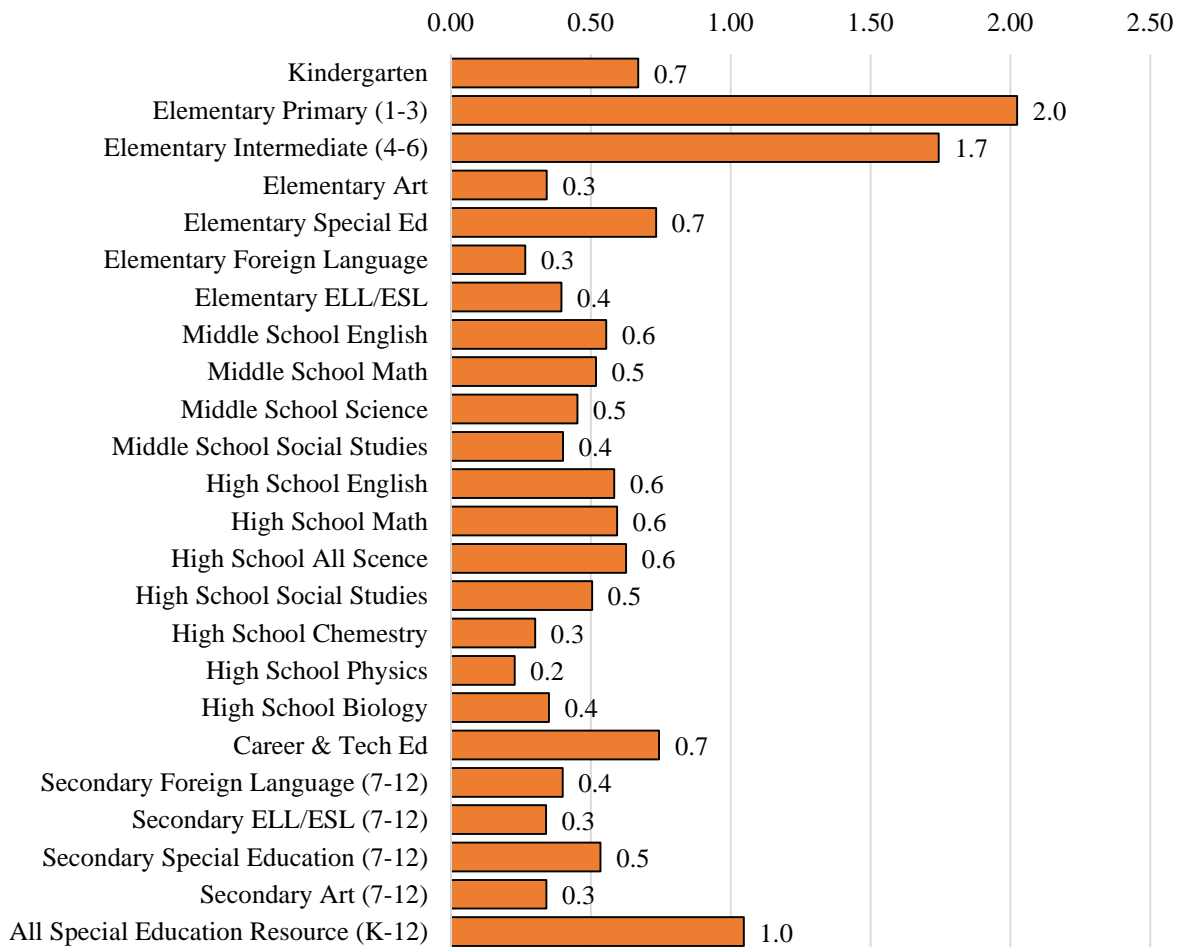
Overall, urban districts are set to experience considerably more teacher turnover and loss. The majority of this is driven by the Philadelphia and Pittsburgh Metro regions, which will lose more than 7,500 and 1,300 teachers, respectively, through 2025-26. These projections are driven by the larger total teacher populations, as well as the high rate of teacher attrition in urban areas. However, both rural and urban districts are roughly equal in terms of the percentages of teacher loss, with both experiencing an average loss of 17 percent of their teaching force through 2025-26.

With respect to subject area, Figure 30 documents the average teacher loss due to turnover by subject area. These results are driven primarily by the number of teachers employed in each subject area. With respect to the percentage of teachers lost, the research calculations (not shown) suggest a greater average rate of loss across all secondary science teachers—



approximately 12 percent across over the next 8 years, as compared to a 5 percent loss of secondary English Language Arts teachers.

Figure 30: Statewide Average District Teacher Turnover by Subject Area



Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

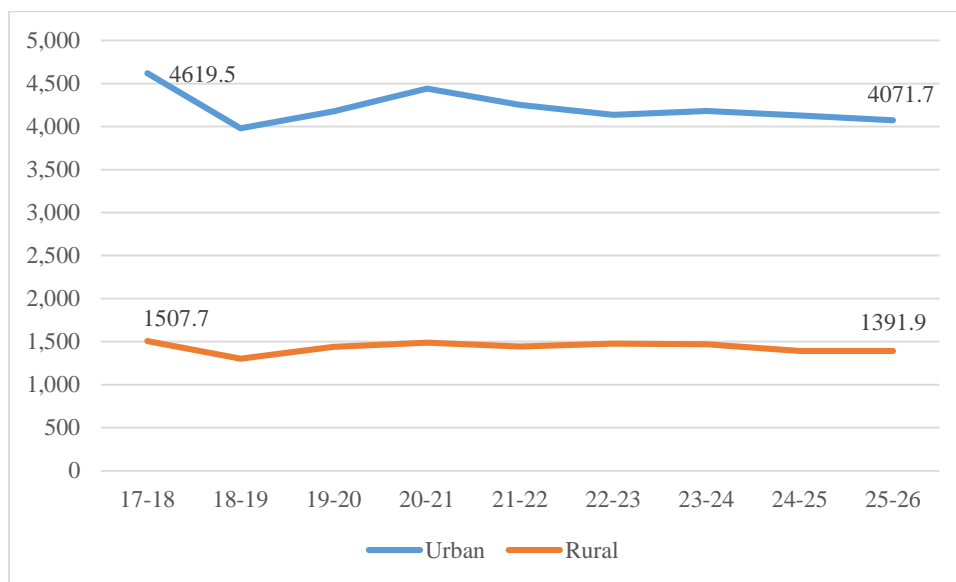
### Projected Replacement of Teachers

Because trends in student enrollment also influence the need to hire teachers, the rate of teacher loss does not fully determine the rate of teacher replacement needed to maintain the student-teacher ratio. These analyses include *the number of positions that would need to be replaced each year* given the loss of teachers in the prior year and the need for teachers in the current year. In other words, this study’s assessment considers the influence of *both* teacher loss

and student enrollment. In districts with declining enrollment, this would mean that not every FTE loss would need to be replaced to maintain student-teacher-ratios.

As shown in Figure 31, the number of replacement teachers needed will remain relatively stable for both urban and rural districts, although there will be some slight fluctuations for urban districts in the first 3 years. These fluctuations are driven primarily by the Philadelphia School District, which has experienced relatively substantial fluctuations in the number of teachers employed over the last 5 years due to dramatic shifts in funding from one year to the next. For rural districts, the projections are essentially a flat line over time. Thus, as stated previously, this study projects that the demand for teachers will remain constant or slightly decline over the next decade.

Figure 31: Annual Number of Teachers Leaving Their District by Locale (2017-18 through 2025-26)



Data Source: PDE Projected Student Enrollment Data and PDE teacher employment data; Calculations by researchers

Overall, districts will see a reduction in the number of teachers that need to be replaced. Pennsylvania districts, on average, will transition from needing to replace about 12 teachers each year in 2017-18 to needing to replace just under 11 teachers each year in 2025- 2026. Between

2017-18 and 2025-26, the Commonwealth will transition from needing to replace 6,127 teachers annually to needing to replace 5,464 teachers annually, a reduction of 664 teachers that need to be replaced between 2017-18 and 2025-26. However, there are slight differences by subject area and locale. For example, while both urban and rural districts will need to replace fewer high school English teachers each year, rural districts will need to slightly increase the number of replacement high school science teachers while urban districts will need fewer replacement high school science teachers.

### **Predicted Balance of Teacher Supply and Demand**

This section presents the balance of FTE positions in each district. Specifically, the numbers represent *how many FTE positions a district is projected to have if the district's historical rates of hiring and turnover continue on the same trend line*. This number was calculated by taking the last observable year of teacher FTE data from 2016-17, cumulatively adding in the average rate of district hiring, and then cumulatively subtracting the average rate of teacher loss for the district. In some cases, this will result in irrational outcomes, such as negative numbers of teachers because the district loss was substantial during the sample period. As stated earlier, *these estimates should be considered trends rather than actual outcomes* and are simply an extension of the observable data.

Overall, if the current rates of hiring and turnover continue, this study projects Pennsylvania will lose more than 3,000 FTE teaching positions between 2017-18 and 2025-26, with rural districts losing slightly more positions than urban districts (1,644 rural teaching positions and 1,340 urban teaching positions). This represents an average rate of a loss of nearly six FTE positions per district per year. This rate is roughly the same, on average, for math and

science positions, which will both lose between 0.2 and 0.3 FTE positions per year, similar to high school English.

Thus, as stated previously, the demand for teachers in Pennsylvania will decline slightly through 2025-26 and the decline will be slightly greater for rural districts than for urban districts.

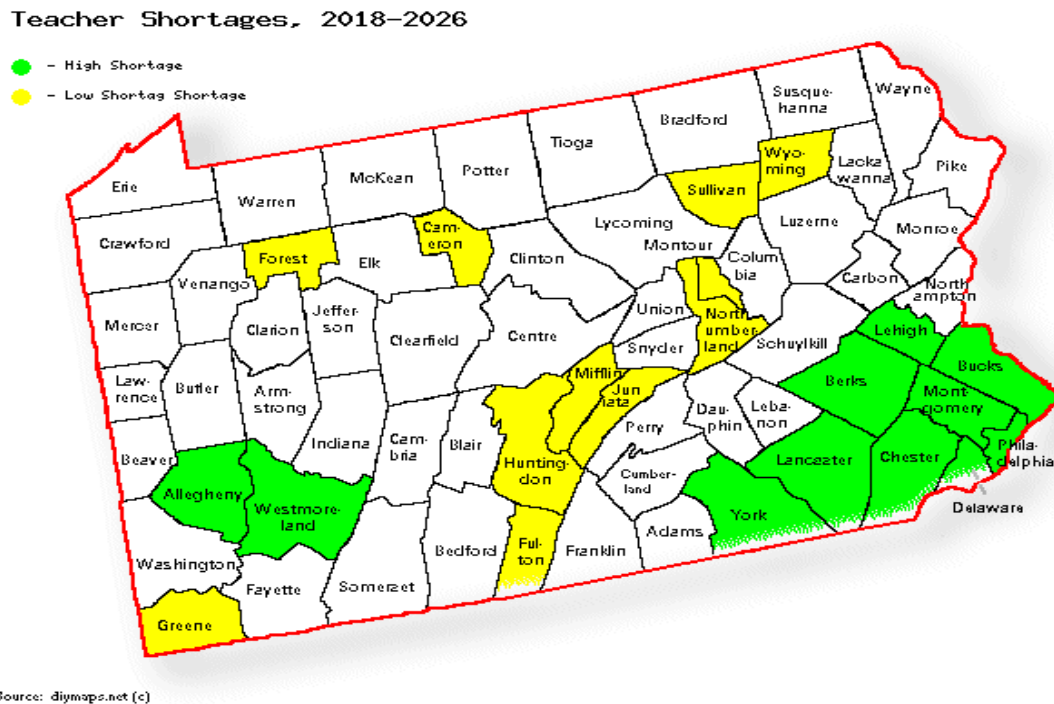
### **Predicted Shortage or Surplus**

Finally, this section presents the overall projected teacher shortage or surplus which *represents the difference between the number of positions a district will need to maintain historical student-teacher ratios for the district and the number of teacher positions in the district estimated using historical rates of attrition and hiring.* So, for example, if a district has historically lost 10 teaching positions each year but only filled nine teaching positions that year, then there would be a one FTE position shortage for that district.

This study projects most Pennsylvania districts will experience a slight increase in the demand for new hires given that *retirements and exit rates are marginally outpacing hiring rates*, with an average district needing to hire an additional six FTE positions above and beyond current rates between 2018 and 2026.

As shown in Figure 32, the greatest shortages will be in the urban areas surrounding the cities of Pittsburgh and Philadelphia, with lower levels of shortages through the middle state corridor.

Figure 32: Identification of Areas of Future Teacher Shortages in the Commonwealth by County



Data Source: Estimates of teacher shortages by researchers based on historical averages of student enrollment, teacher FTEs, student teacher ratios, and estimates of future student enrollment from PDE

### Discussion of Error in Projections

All projections were made from two sources of data. Observable teacher enrollments from 2013-2017, and projected student enrollment from 2017-2026. As a means to check the accuracy of projection models, algorithms were run over years where observable data were present to see how well the projections “fit” the real observations. The difference between projected and actual student enrollment were observable for the year 2017, and so the difference between the two allowed the researchers to observe how well the projections matched the real student enrollment. While most of the errors were small (<1 percent), there were some districts in which projections did considerably differ from actual enrollment, such as in the larger Metropolitan areas (e.g. Pittsburgh SD), or areas experiencing large population shifts (e.g.

Connellsville SD). Unfortunately, there is no means to improve these population projections, but the level of error does allow researchers and policymakers to observe which district projections will contain sources of error due to biased student projections.

Similarly, model fit for FTE projections was assessed by estimating FTE positions for years when there were observable data. Again, the difference between the actual FTE and projected FTE demonstrated small error rates (<1 percent) for the vast majority of districts, with a few exceptions. Districts with high error rates generally had major fluctuations in trends during the sample period, such as a large drop in FTEs in one year followed by a large increase in hiring in a subsequent year. Such fluctuations may have been due to a host of factors, such as consolidation, the opening or closing of schools within the district, or changes in reporting. These sharp fluctuations are masked when averages are used to project trends, and as such create distance between the models and the data. However, this does not mean the overall trends are incorrect, it simply means that the overall trends do not match with the data for a small number of districts.

This section presents the basic overall district trends in student enrollment and teacher demand between 2017-18 and 2025-26. Overall, districts will experience a 2.8 percent decrease in student enrollment, losing on average 82 students over the next 8 years. Districts will likely experience an equivalent 5 percent reduction in staff, which translates into, on average, a reduction of 5.7 FTE positions. With an average district turnover of 6 percent, districts will lose approximately 125 FTE positions over the next 8 years, and will need to replace roughly 120 of the FTEs lost to turnover. Given that the teacher turnover rate is slightly greater (6 percent) than the decline in student enrollment (five percent), *most districts will likely experience a very slight*

*level of understaffing. This will translate into a “shortage” of, on average, five FTE positions, which is about 3 percent of the average number of teacher FTEs in the average district.*

## **Conclusions**

This section presents the final conclusions related to teacher supply, the demand for teachers, and the shortage of teachers, both for the present and for the coming decade. Because of a lack of data and inaccuracies in existing data, the following conclusions are based on the study’s analyses of imperfect information.

### **Teacher Supply**

Without a doubt, the supply of teachers in Pennsylvania has declined substantially over the past 8 years. These substantial declines have occurred in all regions of the state and for both urban and rural areas of the state. Moreover, except for special education, these declines occurred for all school levels and all subject areas.

While most states have also experienced declines in the supply of teachers, the declines in Pennsylvania have been greater than in most other states and certainly than in states adjacent to Pennsylvania. Indeed, as shown in this research, Pennsylvania has experienced one of the greatest declines of any state in the number of enrollees and graduates of teacher preparation programs.

This substantial decline should be of great concern to policymakers. Basic economic theory posits that a greater supply of teachers tends to increase the quality of new hires made by firms (in this case, school districts), and also allows firms to pay relatively lower wages to maintain a quality workforce. When the supply of teachers declines due to factors other than policies designed to increase the quality of applicants, the quality of hires tends to decline (Boe

& Cook, 2006). This is critical given that teacher quality is the most influential in-school factor on student outcomes (Chetty, et al., 2011; Kraft, 2019; Opper, 2012). Further, efforts to improve the supply of teachers will likely require some fiscal investment by the state (Allegretto & Mishel, 2018). This is particularly true given the stagnant salaries, declining competitiveness of salaries, and reduction in pension benefits experienced by Pennsylvania teachers (Allegretto & Mishel, 2018; Keefe, 2018). This fiscal investment could come in various forms, such as reduced tuition for individuals enrolled in TPPs, loan forgiveness plans for those choosing to teach for a specified number of years, and/or increased salaries for teachers (Keefe, 2018).

However, researchers still do not fully understand the root causes of the decline in teacher supply in Pennsylvania or elsewhere. The Commonwealth would be wise to engage higher education institutions to conduct research in this area to provide the legislature more clarity on the appropriate policy solutions.

### **Demand for Teachers**

Based on analyses of available data, student enrollment in Pennsylvania public school districts (excludes charter schools, Career and Technology Education centers, and special state schools) has declined and will continue to decline for the foreseeable future. This decline has been experienced by all regions of the state and for both urban and rural districts. The declines in enrollment will be most acute for the Philadelphia and Pittsburgh school districts (largely through student transfers to charter schools) and school districts located in rural areas—especially sparsely populated rural areas.

An aging teacher workforce, however, will lead to a small increase in teacher attrition as educators become eligible to retire. This increase in attrition associated with retirement will impact rural school districts to a greater degree than urban districts. As attrition increases—



especially in rural areas—there will be a concomitant slight increase in the demand for newly hired teachers to replace those retiring.

Without considering the impact of factors, such as trends in teacher supply, the demand for teachers will increase ever so slightly in the Commonwealth given slightly smaller student-teacher ratios and slightly greater teacher attrition rates. This change will be very small, however, and will have only a marginal impact on the balance between the supply and demand for teachers.

### **Shortage of Teachers**

The dramatic decline in the supply of teachers, coupled with the very slight increase in the demand for teachers, has created a shortage of teachers and, assuming the continuation of current trends, this shortage will continue throughout the next 5 to 10 years without serious changes in the system. Even if one assumes a slight decline of around 1 percent in the demand for teachers, there is currently a shortage of teachers, and the shortage will continue for the next 5 to 10 years.

The analysis of available data – including the results from the survey of principals and superintendents – suggests the teacher shortage is, and will continue to be, more acute for certain types of districts, and many districts will experience a shortage of certain types of teachers.

With respect to district types, the analyses in this study suggest that rural districts – especially those located in sparsely populated areas that are relatively far away from TPPs – will have greater difficulty in recruiting and hiring teachers, particularly teachers in high demand, such as STEM teachers, advanced course teachers, special education teachers, foreign language teachers, and teachers of English Language Learners. In addition, fast-growth districts will face rapidly increasing demands for newly hired teachers. Such districts may face difficulties in

recruiting and hiring a sufficient number of teachers to meet their growing demands. Such districts in Pennsylvania, however, do tend to be more affluent and are often located near teacher preparation programs, thus providing them an advantage in recruitment that other districts often do not possess.

With respect to specific types of teachers, the results from the analyses in this study suggest that many districts are encountering difficulty in hiring many of the types of teachers for which there has historically been a shortage. These teachers include secondary mathematics teachers, secondary science teachers, special education teachers, and teachers of English Language Learners. There has been a shortage of such teachers and there will continue to be a shortage of such teachers. In fact, the shortage of such teachers is more widespread and more acute than in years past. In addition, the analyses in this study suggest a looming shortage of foreign language teachers and computer science/technology education teachers.

The most disconcerting conclusion, however, is that the dramatic decline in the number of newly licensed teachers is unlikely to rebound significantly within the next 5 years. As cohort after cohort of newly licensed teachers remains near historic lows, the reserve pool of teachers will begin to dwindle. This, in turn, will expand the shortage of teachers to a wider array of subject areas, and more acutely impact districts that are already experiencing difficulties in recruiting and hiring teachers. In particular, as revealed from this study's analysis of the surveys of principals and superintendents, rural districts will likely be the first to encounter the potential expansion of the shortage of teachers. This is particularly true for rural districts in regions of the state where there are few newly licensed teachers.

## **Policy Implications**

The most pressing policy implication is for the General Assembly to commission a group of experts to review and make recommendations for improving the data collection surrounding educator workforce in Pennsylvania. Numerous issues with the data, particularly the licensure data, greatly limited the ability to accurately estimate supply and demand for this study. For example, PDE could not provide a list of all individuals and their licenses for individuals who do not become employed in a Pennsylvania public school. In addition, the lack of data connecting individual teachers to courses greatly limits the ability of researchers to accurately track supply, demand, and mobility by specific courses. Such data are available for tested subjects but were not made available by PDE. Another data limitation that severely restricts researchers' abilities to make accurate predictions is lack of information on class sizes. The number of students in each class and the average class size has a substantial impact on the demand for teachers. The researchers for this study could only calculate a crude student-teacher ratio using the number of students enrolled in a school and the number of teachers employed in a school. The imprecision in using the student-teacher ratio rather than class size added much greater error to the estimates. Finally, the state's prediction of future enrollment is flawed in that charter schools are not included in the analysis. Instead, the state estimates assume a certain percentage of students living within a district boundary will attend the district schools. With greater charter seats available as well as more families choosing home schooling and other non-public school options, the future student enrollment estimates include a great deal of error.

The second policy consideration is to create an expert working group to research the causes of the decline in enrollment and completion of TPPs as well as review and propose incentives for individuals to enter the teacher workforce through TPPs. The working group could

consider incentives such as an increasing teacher salaries, adopting a cost-of-education index that distributes money in a manner that levels the playing field regarding teacher recruitment, instituting student loan forgiveness programs, and reducing tuition for enrollees in teacher preparation programs.

The third policy consideration is for PDE to develop and administer a yearly survey of principals and superintendents regarding teacher supply, demand, and shortages. Such a survey would provide valuable information necessary to develop a much more robust understanding of teacher supply, demand, and shortages in Pennsylvania. While PDE currently asks districts to identify shortage areas, the survey should include much greater detail.

The fourth policy consideration is for the General Assembly to commission a study of teacher attrition in the Philadelphia Metro area. The loss of teachers by the Philadelphia School District and the numerous other districts and charter schools in the Philadelphia Metro area have a significant impact on the overall supply and demand of teachers for the entire Commonwealth. Addressing teacher attrition in this region could help address the shortage of teachers across the Commonwealth.

A fifth policy consideration is for PDE to develop data-sharing agreements with surrounding states so that PDE and Pennsylvania TPPs can identify the number and percentage of newly licensed teachers who take positions in other states. This would provide valuable additional information that could help to more accurately measure teacher supply, demand, and shortages.

A sixth policy consideration would be to carefully review teacher licensure rules—especially those creating licenses for grade spans that do not map onto school grade configurations. Specifically, the state should consider returning to licensure grade spans of EC-6,

6-9, and 8-12 to facilitate the hiring of teachers by school districts. At the EC-6 level, potential candidates could focus their studies on specific grade spans such as grades EC-2, 2-4, and 4-6.

A seventh policy consideration is to conduct a thorough review of TPP rules. Anecdotal accounts from TPP faculty members suggest that state regulations around the courses taken, tests to be passed, and other requirements serve as unnecessary barriers to enter the teaching profession. While requirements should be reviewed, careful attention must be focused on those requirements that improve beginning teacher effectiveness and retention. With a careful eye, TPPs may be able to increase enrollment and graduation with greater freedom to create programs that best meet the needs of their students and constituents within their labor market while not negatively impacting effectiveness or retention.

The final consideration is for policymakers to highlight the benefits of entering the teaching profession. With encouraging words, policymakers can positively impact the number of individuals considering the education profession as a career. Teachers are critical to the future well-being of the Commonwealth and that belief could be expressed with words and actions across state government.

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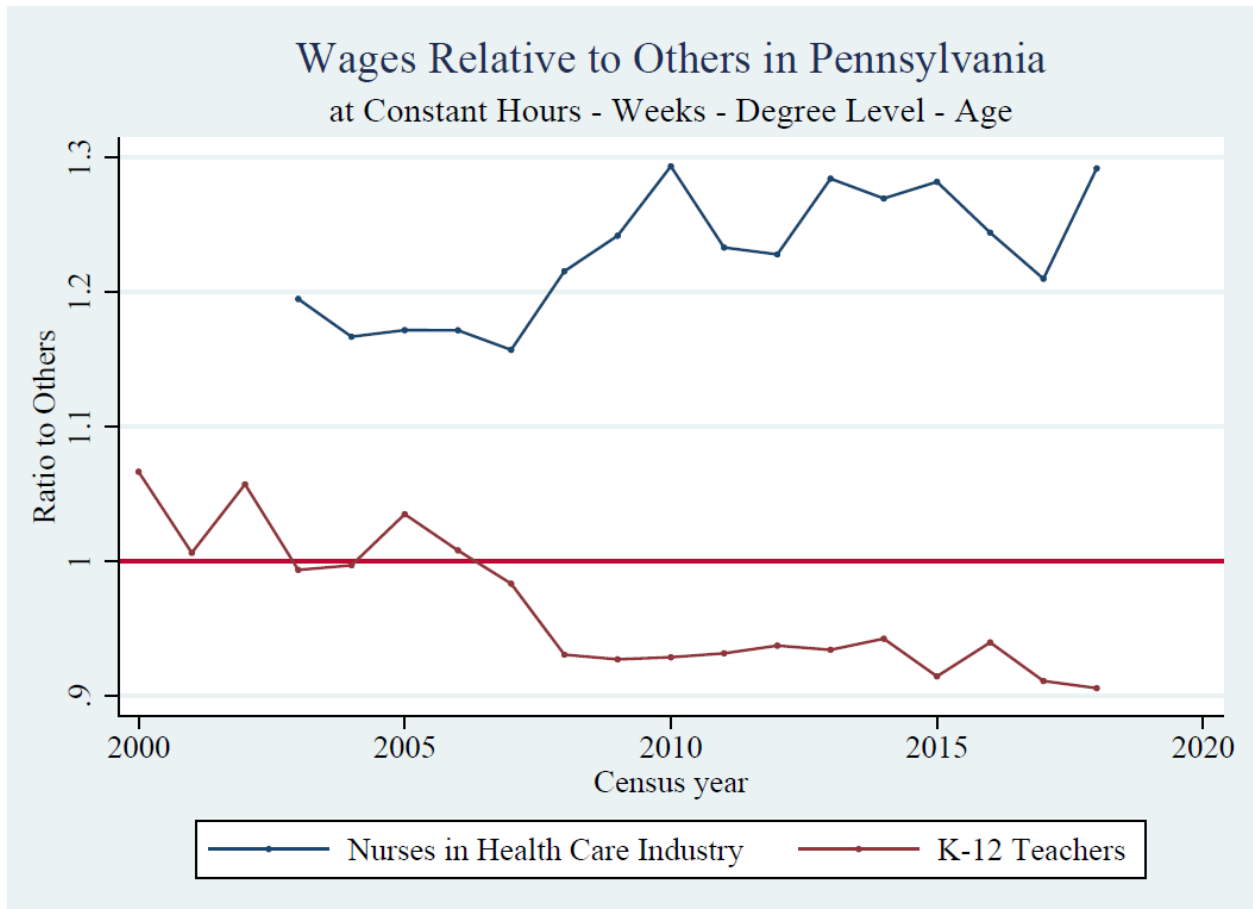
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## Appendix A: Comparison of Wages of Nurses and Teachers in Pennsylvania



Data Source: Analysis of American Community Service Data; Analysis by Dr. Bruce Baker



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