Student Mobility and Dropout in Philadelphia High Schools, 2013-14 through 2016-17

MATTHEW P. STEINBERG

MOLLY PILEGGI

RUTH NEILD

PERC Philadelphia Education Research Consortium

About this study

This study was conducted to inform the work of Project U-Turn, a citywide collaborative effort to raise Philadelphia's graduation, engagement, and re-engagement rates through a collective impact strategy. The Philadelphia Youth Network, on behalf of Project U-Turn, commissioned the study with funding from the William Penn Foundation. However, the content of this report does not necessarily reflect the views of Project U-Turn, the Philadelphia Youth Network, or the William Penn Foundation, nor did they exercise editorial control over this report.

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About PERC

The mission of the Philadelphia Education Research Consortium is to provide timely, actionable, rigorous, and non-partisan research on the most pressing issues facing Philadelphia public education. To do this, PERC seeks to engage the region's colleges and universities, nonprofits, and the Philadelphia public education sector in respectful, mutually beneficial research-practice partnerships. By providing Philadelphia's leaders and citizenry with high-quality information about progress, challenges, and effective strategies in education, PERC aims to increase education opportunities and achievement for all Philadelphia students. PERC is based at Research for Action, a nonprofit education research organization in Philadelphia.

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Student Mobility and Dropout in Philadelphia High Schools, 2013-14 through 2016-17

Matthew P. Steinberg, Molly Pileggi, and Ruth Neild • September 2019

Philadelphia offers an extensive array of public high school options for students, including charter schools, traditional schools, schools with selective admissions, and schools at which admission is based on residence (that is, neighborhood catchment zones). A large number of education options might benefit students by enabling them to find schools that are the right fit for them. But a choice-rich education system might also increase student mobility from one school to another during high school. For example, schools might counsel students experiencing academic or behavioral problems to enroll elsewhere, while the extent of school choices might lead some students to continue shopping for schools throughout their high school years. While some student mobility is expected and perhaps even beneficial for some students, prior research shows that, on average, students who move schools have lower academic achievement and higher dropout rates than their non-mobile peers. Studies have also shown that there are negative consequences for non-mobile students if many of their peers are mobile.

While many studies have shown a connection between student mobility and negative student outcomes, few have focused on the high school grades, and there is no prior evidence on student mobility that specifically focuses on Philadelphia. The purpose of this report is to fill that gap with new information about the extent of mobility in Philadelphia's public high schools and to examine the association between mobility and the likelihood of dropping out of high school.

This study uses four years of student-level data for all students enrolled in Philadelphia public high schools from the 2013-14 through 2016-17 school years. We examine the characteristics of mobile students and the types of schools they most commonly exit and enter as well as the characteristics of schools with higher rates of student mobility. The study concludes with an examination of the association between student mobility and high school dropout.

Key Findings

- **One-third of Philadelphia high school students were mobile during the study period.** The mobility includes students who: (1) changed schools across academic years; (2) changed school districts within an academic year; (3) exited public education in Pennsylvania, or (4) dropped out of high school.

- **Philadelphia high school students who were Black, lower-achieving, or in ninth grade were more likely to be mobile.** 57 percent of students in the study sample were Black; yet, Black students accounted for 70 percent of students who attended more than one Philadelphia public high school in consecutive academic years and 69 percent of students who attended more than one Philadelphia high school in the same academic year. Mobile students were less likely than non-mobile students to have been academically proficient prior to entering high school (i.e., on their eighth grade PSSA exams). Among students in the cohort who began ninth grade in the 2013-14 school year, all types of mobility (except dropout) were concentrated in ninth grade.

- **Schools that served more high-poverty, lower-achieving, or minority students tended to have higher rates of student mobility.** In schools with the highest percentages of low-

income students, 27 percent of students were mobile in a typical school year; in comparison, the annual student mobility rate was 15 percent in schools serving the fewest students in receipt of free/reduced-price lunch. In schools serving the fewest academically proficient students, 32 percent of students were mobile in a typical school year; this compares to an annual student mobility rate of 10 percent in schools serving the most academically proficient students. In schools serving the most racial/ethnic minority students, 28 percent of students were mobile in a typical school year; in comparison, the annual student mobility rate was 14 percent in schools serving the fewest racial/ethnic minority students.

- **When students moved schools, those who exited Philadelphia moved to schools with fewer racial/ethnic minority students, fewer students from families with incomes below the poverty line, and higher-achieving peers.** In contrast, mobile students who remained in Philadelphia public schools moved to schools with similar peers.

- **Mobile Philadelphia high school students attended an average of two schools during their high school careers.** Among students in the cohort that started ninth grade in 2013-14, half remained in the same Philadelphia high school for their entire high school career while approximately one-quarter attended at least two Pennsylvania high schools.

- **Philadelphia high school students who change schools are twice as likely to drop out of school as their non-mobile peers.** Even after controlling for student demographics, poverty, and academic achievement, student mobility is highly correlated with dropout among Philadelphia high school students.

Implications for policy and practice

- **Policy efforts should be informed by the disproportionately high rate of mobility among the most academically and economically disadvantaged ninth-grade students and the concentration of mobility in the city's high schools serving high numbers of these students.** City and state policymakers should identify ways to provide additional supports to the city's most vulnerable students, and the schools who serve them, and implement strategies to limit early grade mobility that risks having serious consequences for high school persistence and completion.

- **Philadelphia's education community – both charter and traditional school leaders – should work together to address the persistent problems associated with high rates of student mobility.** The student mobility that we observe in this study is not disproportionately concentrated in the charter or traditional public school sectors in Philadelphia. Instead, mobility is concentrated in schools serving the lowest-achieving, highest-poverty students, independent of a school's sector. This suggests that city leaders should work together by taking a citywide approach to reducing student mobility.

- **Students who move to another Philadelphia school do not enroll in higher-quality schools – a fact that can inform efforts to limit student mobility and improve the high school match process early in a student's high school career.** This finding should inform education leaders on the detrimental effect of school switching within Philadelphia, while also providing impetus for city leaders to help students and their families identify the best school match for students prior to entering high school.

- **The fact that the dropout rate among mobile high school students is twice as high as their non-mobile peers should inform efforts by education leaders to identify and support these at-risk students.** City and state education leaders should work to identify students who have experienced a mobility event and dedicate additional supports and resources toward these mobile students who have a significantly greater risk of school detachment and dropout.

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Why this study

Philadelphia offers an extensive array of public high school options for students, including charter schools, traditional schools, schools with selective admissions, and schools at which admission is based on residence (that is, neighborhood catchment zones). In 2015-16, almost three-quarters of ninth graders in Philadelphia's public schools attended a school that required them to apply for admission—a school that by definition was not the neighborhood school they would otherwise have attended.[1] A large number of education options might benefit students by enabling them to find schools that are the right fit for them. But a choice-rich education system might also increase student mobility from one school to another during the high school career. Indeed, evidence from other urban school districts indicates that a substantial percentage of students do not remain at the school where they began ninth grade.[2] These students change schools because of residential mobility, dissatisfaction with their current school, failure to meet academic requirements, being "counseled out," or other factors. Some students switch schools multiple times during grades 9-12.

Why student mobility matters. Some student mobility is to be expected in every school and district. When families relocate to new neighborhoods, students' former schools may be too far away or outside their attendance zone. And some student mobility should be welcomed. For example, when a student discovers that a school's curriculum does not match their educational needs, the opportunity to transfer to a new school whose curriculum offerings match students' preferences can improve their educational experiences and overall engagement with school.

While recognizing that some school mobility is inevitable and potentially beneficial, public education systems should pay close attention to the extent of student mobility from one high school to another. This is because the weight of research evidence indicates that changing schools for reasons other than being promoted to the next grade is associated with lower academic achievement, even taking into consideration prior attendance and achievement.[3] Further, students attending schools with greater student mobility have, on average, lower academic achievement, and even non-mobile students experience negative impacts of being in schools with a revolving door of students.[4]

Several studies have shown that students who change high schools are more likely to drop out of school.[5] A large, nationally representative study found that students who changed schools even

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[1] Schmitt, M. (2017). *Getting Into High School in Philadelphia.* Philadelphia: The Pew Charitable Trusts.

[2] For example, the typical public high school in Chicago retained 54 percent of the ninth graders in the Class of 2003 through twelfth grade (de la Torre, M., & Gwynne, J. (2009). *Changing Schools A Look at Student Mobility Trends in Chicago Public Schools Since 1995.* Chicago: The Consortium on Chicago School Research).

[3] Institute of Medicine. (2010). *Student Mobility: Exploring the Impacts of Frequent Moves on Achievement: Summary of a Workshop.* Washington, DC: The National Academies Press; Mehana M., & Reynolds A.J. (2004). School mobility and achievement: A meta-analysis. *Children and Youth Services Review, 26*:93–119; Rumberger R. (2003). The causes and consequences of student mobility. *Journal of Negro Education, 72*:6–21.

[4] South S., Haynie D., & Bose S. (2007). Student mobility and school dropout. *Social Science Research, 36*:68–94; Hanushek, E., Kain, J., & Rivkin, S. (2004). Disruption versus tiebout improvements: The costs and benefits of switching schools. *Journal of Public Economics, 88,* 1721-1746.

[5] Gasper, J., DeLuca, S., & Estacion, A. (2012). Switching schools: Revisiting the relationship between school mobility and high school dropout. *American Educational Research Journal*, 49(3), 487–519; Ou, S.-R., & Reynolds, A. J. (2008). Predictors of educational attainment in the Chicago Longitudinal Study. *School Psychology Quarterly, 23*(2), 199-229; South S., Haynie D., & Bose S. (2007). Student mobility and school dropout. *Social Science Research, 36*:68–94; Rumberger, R., & Larson, K.

once between eighth and twelfth grade (not including the typical move to a new school for ninth grade) were twice as likely to leave school without a diploma.[6]

Student mobility may drive inequality. Student mobility between schools may be one of the drivers of inequality in education outcomes by race, ethnicity, and income. Nationally representative studies and studies of Chicago and New York City public schools show that Black and Hispanic students are more likely to switch schools than White students, and that low-income students are more likely to transfer schools than students from families with higher incomes.[7]

How student mobility may affect student outcomes. Student mobility may be both a symptom and a cause of disengagement from school and poor education outcomes, with each reinforcing the other in a negative feedback loop. Mobility is a symptom when students who have become disengaged from the academic and social life of high school drift from one school to another, sometimes interspersed with periods of dropping out of school entirely. At the same time, changing schools causes the disruption of relationships with teachers and peers that promote engagement with schooling.[8] Changing schools also creates academic challenges when students are required to adapt to a new curriculum, and mid-year transfers can contribute to gaps in knowledge and skills when the pacing and rigor of the curriculum in the student's prior school are misaligned with the student's new school. For schools, high levels of student mobility make it difficult to establish a positive culture with shared routines and expectations. Mobility can divert teacher attention away from instruction toward mobile students who require additional supports to catch up with their new classroom peers.[9]

No prior evidence on student mobility in Philadelphia. While many studies have shown a connection between student mobility and negative student outcomes, that evidence is not focused on the high school grades, and there is no prior evidence that specifically focuses on Philadelphia. The motivation for this report is to provide new information about the extent of mobility in Philadelphia's public high schools and to examine the association between mobility and the likelihood of dropping out of high school. This information can inform stakeholders interested in addressing the causes and consequences of high rates of student mobility, including policymakers and school leaders locally in Philadelphia as well as in other urban school settings.

(1998). Student mobility and the increased risk of high school dropout. *American Journal of Education, 107*(1), 1-35; Haveman R., Wolfe B., & Spaulding J. (1991). Childhood events and circumstances influencing high school completion. *Demography. 28*(1):133–157.

[6] Rumberger, R., & Larson, K. (1998). Student mobility and the increased risk of high school dropout. *American Journal of Education, 107*(1), 1-35.

[7] Institute of Medicine. (2010). *Student Mobility: Exploring the Impacts of Frequent Moves on Achievement: Summary of a Workshop*. Washington, DC: The National Academies Press; de la Torre, M., & Gwynne, J. (2009). *Changing Schools A Look at Student Mobility Trends in Chicago Public Schools Since 1995.* Chicago: The Consortium on Chicago School Research.

[8] Pribesh, S. and Downey, D.B. (1999) Why are residential and school moves associated with poor school performance? *Demography, 36,* 521-534.

[9] Lash A., & Kirkpatrick S. (1990). A classroom perspective on student mobility. *Elementary School Journal, 91*:177–191.

What the study examined

The purpose of this study is to understand the extent of school mobility among Philadelphia public school students—in both charter schools and traditional district schools—during grades 9-12. The study also examines the characteristics of mobile students and the types of schools they most commonly exit and enter, as well as the characteristics of schools with higher rates of student mobility. The study concludes with an examination of the association between student mobility and high school dropout.

The research questions guiding this study are:

- What is the prevalence of student mobility among Philadelphia public high school students?
- Does student mobility vary by student and school characteristics?
- Among students who are mobile, how do the schools they exit compare to the schools that they enter?
- What is the association between student mobility and dropout?

Box 1 describes these questions in more detail.

To answer these questions, the study team used four years of student enrollment records from the Pennsylvania Department of Education (PDE) and publicly available school-level information retrieved from the PDE and from the U.S. Department of Education's Common Core of Data (CCD). The data include students' school enrollments for the 2013-14 through 2016-17 academic years (see Box 2 for a description of the data and student- and school-level variables). In all, the study included 107,871 unique students across 102 schools who were ever enrolled in Philadelphia public schools during the study period.

Limitations

The study is unable to examine one specific type of school transfer that might occur within a school year—namely, within-year mobility for students who attend more than one Philadelphia traditional public school (TPS) in the same year. This is because student enrollment in Philadelphia public schools is reported to PDE once a year in the Spring, capturing a snapshot of the last school the student was enrolled in in each district at that time. As a result, we observe a student in just one Philadelphia TPS in any given academic year even if a student attended multiple Philadelphia TPS schools in the same year. Further, we are unable to observe the direction of mobility in a given school year—e.g., from a charter high school to a TPS high school—because we cannot identify a student's first school of record in a given school year. Finally, this study is unable to examine the reasons why students exit their schools, which would require additional survey or qualitative data.

Box 1

Research Questions, in Detail

1. What is the prevalence of student mobility among Philadelphia high school students?
   a. What percentage of Philadelphia high school students attended a different high school in the next school year?
   b. What percentage of Philadelphia high school students switched sectors or school districts during a school year?
   c. What percentage of Philadelphia high school students exited Pennsylvania public education?
   d. What percentage of Philadelphia high school students dropped out?
2. Does student mobility vary by student characteristics?
3. Does student mobility vary by school characteristics?
4. Among students who are mobile across school years, how do the schools they exit compare to the schools that they enter?
5. For the cohort who entered a Philadelphia public high school in grade 9 in 2013-14 (the 2013/14 cohort), what percentage of students by 2016-17:
   a. Remained in the same school where they began?
   b. Switched sectors in Philadelphia?
   c. Switched Philadelphia schools at least once?
   d. Exited Philadelphia public education?
   e. Exited Pennsylvania public education?
   f. Dropped out?
6. For students in the 2013/14 cohort who were mobile across years:
   a. How many different schools did they attend?
   b. How is mobility distributed across high school grades and years in high school (i.e., first to fourth years)?
7. For students in the 2013/14 cohort who were mobile across sectors:
   a. How many different schools did they attend)?
   b. How is mobility distributed across high school grades and years in high school (i.e., first to fourth years)?
8. What is the association between student mobility and dropout?

Box 2

Data and Variables

The study uses four years of student-level data for students in grades 9-12 who attended a Philadelphia public high school – either a traditional district or charter high school – in any school year from 2013-14 through 2016-17.[10] The study includes 226,106 student*year observations (107,871 unique students) observed across 102 Philadelphia high schools (57 traditional public high schools and 45 charter public high schools located in Philadelphia).

The Pennsylvania Department of Education (PDE) provided the student-level data. The study team also used publicly available school-level data for all Pennsylvania public high schools from PDE and from the U.S. Department of Education Common Core of Data (CCD). From these school-level files, the study team constructed the following school-level aggregates: (1) enrollment; (2) % proficient in math and reading; (3) % free/reduced-price lunch (FRPL); (4) % poverty; and (5) % racial/ethnic minority. The team calculated terciles of these school-level measures for 2013-14 through 2016-17. Unless otherwise specified, data were reported by PDE.

Student-level data include:

School, district and sector: For each district a student was enrolled in during a school year, the district code and the school code for their last enrolled school within that district, reported by PDE. The school and district code indicate the school sector: traditional public school (TPS) or charter public school.

Demographics: Student's age, gender, and race/ethnicity (White, Black, Hispanic, Asian, other).

Grade level: Student's grade level (9, 10, 11, 12).

Poverty status: Student's family receives government benefits (e.g., SNAP, TANF).

FRPL status: Student receives free/reduced-price lunch (FRPL).

ELL status: Student is identified as an English language learner (ELL).

Special education status: Student has an individualized education plan (IEP) and receives special education services.

8th grade math proficiency: An indicator for whether a student was proficient or advanced on the Pennsylvania System of School Assessment (PSSA) math exam in their 8th grade year. Among the 107,871 unique students in the sample, 78 percent have 8th grade math PSSA data.

8th grade reading proficiency: An indicator for whether a student was proficient or advanced on the Pennsylvania System of School Assessment (PSSA) reading exam in their 8th grade year. Among the 107,871 unique students in the sample, 77 percent have 8th grade reading PSSA data.

School-level data include:

Enrollment: Total student enrollment in a school, as reported by CCD.

% Proficient in Math and Reading: The percentage of a school's tested students who were academically proficient (or advanced) in math and ELA on the Pennsylvania System of School Assessment (PSSA) Algebra I Keystone and Literacy Keystone exams. Algebra I Keystone and Literacy Keystone exams are administered at least once to students in grades 9-12 beginning in 2012-13.

% FRPL: The percentage of students in a school who receive free/reduced-price lunch (FRPL), as reported by CCD.

% Poverty: The percentage of students in a school who receive government benefits (e.g., SNAP, TANF).

% Racial/ethnic minority: The percentage of students in a school identified as Black and/or Hispanic, as reported by CCD.

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[10] This data does not include enrollment in alternative programs (e.g. Opportunity Network schools in Philadelphia).

Defining Student Mobility

The study team used detailed, student-level data from the Pennsylvania Department of Education (PDE) for all students who attended traditional public schools (TPS) and/or charter high schools in Philadelphia. From these student files, the study team constructed a student-level analytic file that included all students ever in traditional and/or charter public high schools in Philadelphia during the 2013-14 through 2016-17 school years. The data set includes 226,106 student*year observations.

From the student-level analytic file, the study team categorized students into one of six mobility types in each of the 2013-14 through 2016-17 school years, based on the school locations in which we observed students in the same and subsequent school years. Notably, the same student may experience multiple types of mobility. The mobility types include:

1. ***Within-Year Mobility (Phila.)***: These students attended more than one Philadelphia public high school during a single academic year. We can only observe within-year mobility for students who attended (1) at least one Philadelphia charter school and at least one TPS in the same year; and/or (2) at least two Philadelphia charter schools in the same year. We cannot observe within-year mobility for students who attended more than one Philadelphia TPS in the same year. We cannot observe the direction of mobility because we cannot identify the first school of record in a given school year.

2. ***Within-Year Mobility (PA)***: These students attended at least one high school in Philadelphia (TPS or charter) and at least one high school outside Philadelphia (TPS or charter) during an academic year (while remaining in Pennsylvania public education).

3. ***Across-Year Mobility (Phila.)***: These students attended more than one high school within Philadelphia (TPS or charter) in consecutive academic years. We do not observe this type of mobility for the 2016-17 school year because we do not have data from 2017-18.

4. ***Across-Year Mobility (PA)***: These students attended at least one high school within Philadelphia (TPS or charter) and at least one high school outside of Philadelphia (TPS or charter) in consecutive academic years (while remaining in Pennsylvania public education). We do not observe this type of mobility for 2016-17 because we do not have data from 2017-18.

5. ***Exit PA Public Schools***: These students exited public education in Pennsylvania at the end of the academic year.[11] PDE does not provide a reason for why these students exited public education in Pennsylvania. We do not observe this type of mobility for 2016-17 because we do not have data from 2017-18.

6. ***Dropout***: These students exited public education in Pennsylvania and were identified as school dropouts by PDE.[11] PDE indicates the following eight reasons a student reported dropping out of school, including: (1) academic problems; (2) behavior problems; (3) child, married, or pregnant; (4) disliked school; (5) enrolled but did not show; (6) runaway or expelled; (7) wanted to work; or (8) other reason.

[11] Since we do not observe students enrolled in an Alternative Education program, if a student moved to an Alternative program we identified that student's mobility type as either: (1) exit PA public schools, conditional on not being recorded as a dropout by PDE prior to the move to the Alternative program; or (2) dropout, conditional on PDE recording the student's mobility on dropping out.

What the study found

During the study period, one-third of Philadelphia high school students were mobile.

Among students who ever attended a Philadelphia high school during the 2013-14 through 2016-17 school years, 67 percent of students were never mobile while 33 percent changed schools at least once during the study period (Figure 1). Student mobility included at least one of the following mobility events: (1) changing schools within or across academic years; (2) dropping out of school; and (3) exiting public education in Pennsylvania. Across the four years of the study, 20 percent of Philadelphia high school students exited Pennsylvania public schools: seven percent of students dropped out of school, and an additional 13 percent of students exited public education in Pennsylvania for reasons not provided to Pennsylvania public school officials.[12]

Figure 1. Student Mobility Rates for Philadelphia Public School Students, by Mobility Type
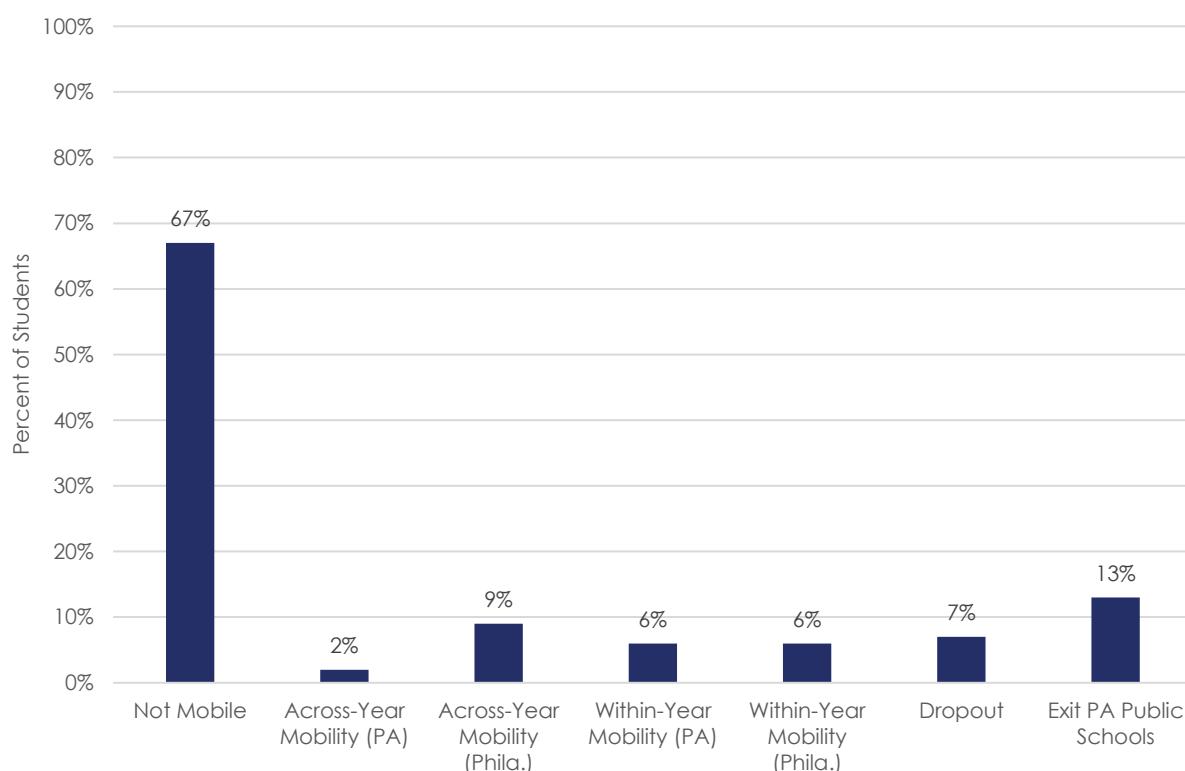
Source: PDE enrollment records, N=107,871 students
Note: Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Mobility-type categories are not mutually exclusive. Students who are mobile can experience more than one type of mobility event.

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[12] Pennsylvania public school students who are 16 years of age or younger are required to submit withdrawal forms to the Pennsylvania Department of Education. If a student does not submit a withdrawal form and exits public education in Pennsylvania, a reason for withdrawal would be unavailable and the student's mobility type would be listed as "Exit PA Public Schools" (Source: personal communication with DawnLynne Kacer of of the School District of Philadelphia).

Figure 2 shows the annual rates of student mobility for each year during the study period. In a typical year during the study period (i.e., *All Years*, which indicates the average annual mobility rate during the study period), five percent of Philadelphia high school students, on average, enrolled in a different Philadelphia public school (either TPS or charter) in the following school year (i.e., *across-year mobility, Philadelphia*). Just one percent of Philadelphia students, on average, exited Philadelphia public schools for a Pennsylvania public school located outside of Philadelphia (i.e., *across-year mobility, Pennsylvania*), while 10 percent of students in a typical year exited public education in Pennsylvania (including dropping out).

Figure 2. Student Mobility Rates for Philadelphia Public School Students, by Mobility Type and School Year
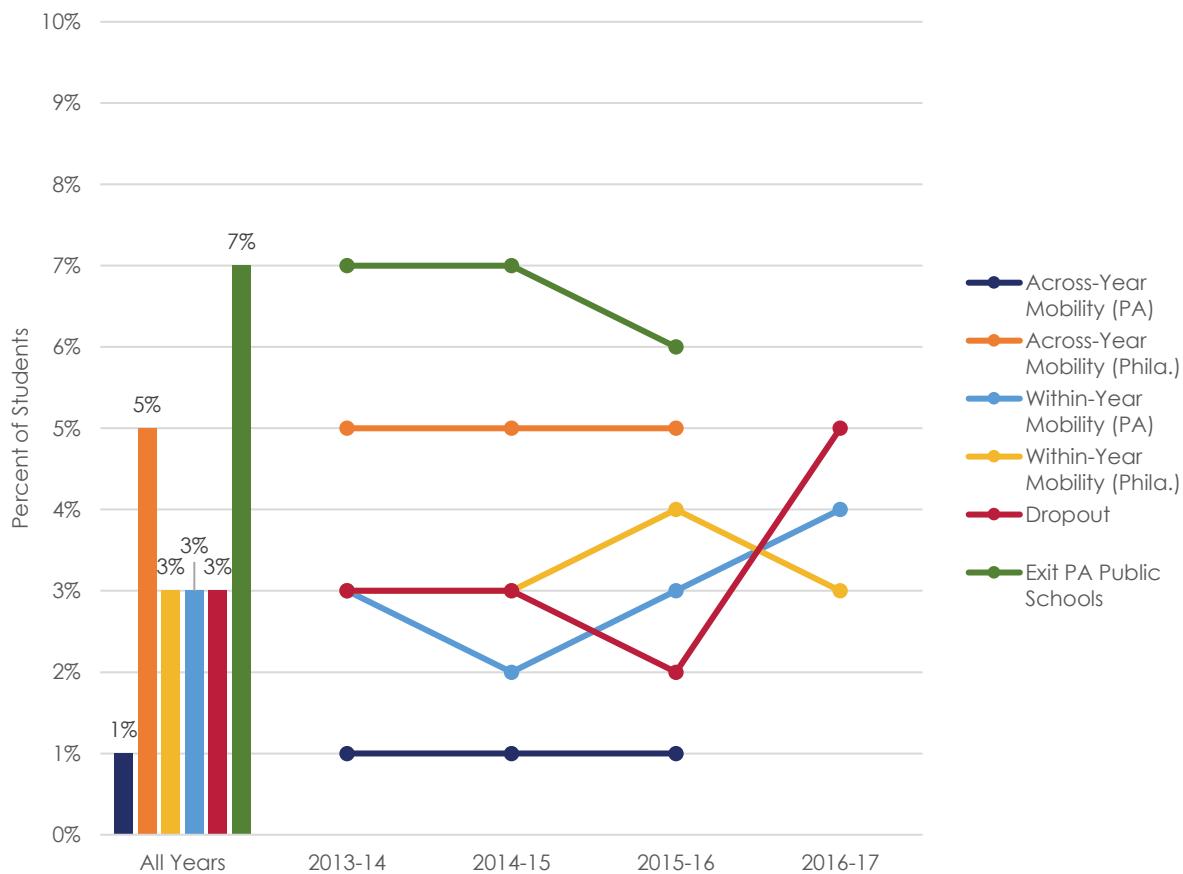

Source: PDE enrollment records, N=226,106 student-years
Note: Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17. *All Years* indicates the average annual mobility rate during the 2013-14 through 2016-17 period. Mobility-type categories are not mutually exclusive. Students who are mobile can experience more than one type of mobility event. We are unable to calculate the percentage of students with across-year mobility or who *Exit PA Public Schools* for 2016-17 since we do not observe students' school enrollment locations in 2017-18.

In Philadelphia public high schools, Black students, lower-achieving students, and ninth grade students are more likely to be mobile.

Black students are overrepresented among all types of student mobility (except dropout). Among students who ever attended a Philadelphia high school during the 2013-14 through 2016-17 school years, 57 percent were Black (Figure 3a). However, Black students make up 70 percent of students who attended more than one high school within Philadelphia (TPS or charter) in consecutive academic years (i.e., *across-year mobility (Philadelphia)*) and 69 percent of students who attended more than one high school within Philadelphia (TPS or charter) in the same academic year (i.e., *within-year mobility (Philadelphia)*).

Figure 3a. Percent of Philadelphia Public High School Students, by Mobility Type and Race/Ethnicity
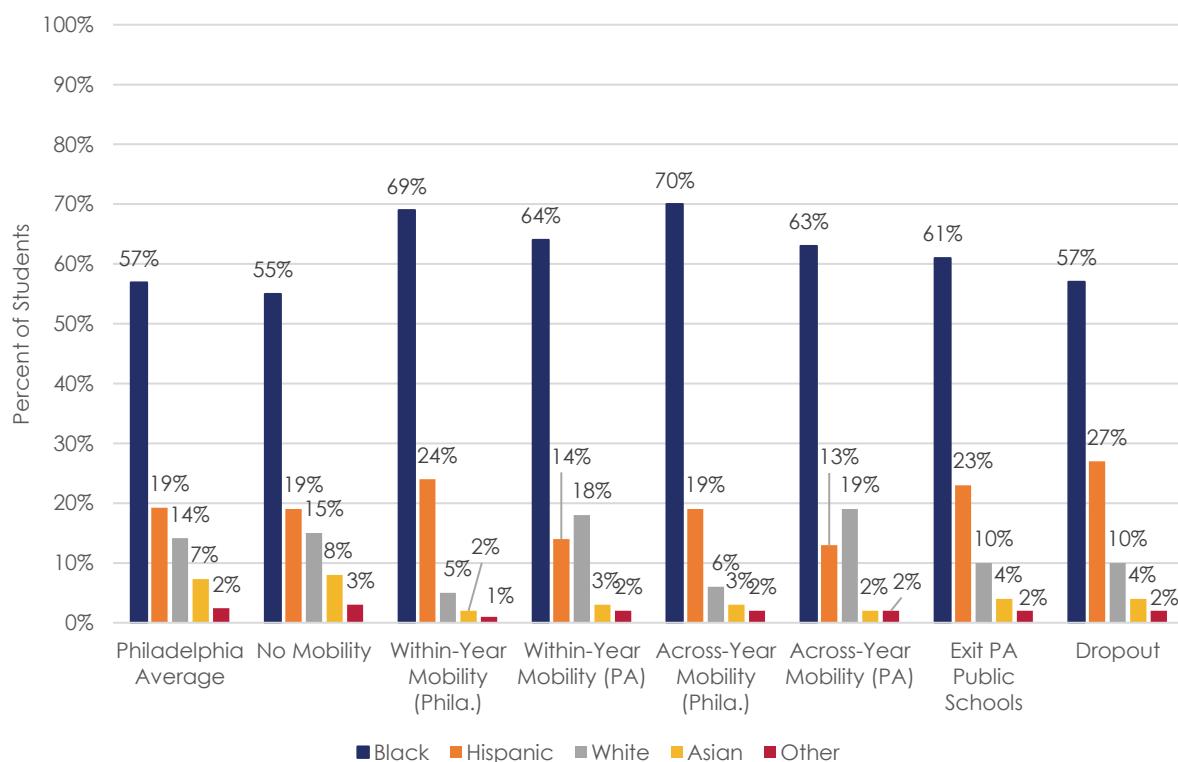

Source: PDE enrollment records, N=226,106 student-years
Note: Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Mobility-type categories are not mutually exclusive. Students who are mobile can experience more than one type of mobility event.

Mobile students were less likely to have scored proficient or above on their eighth grade PSSA exams. Among students who were never mobile during the study period, 51 percent and 60 percent were academically proficient on the eighth grade PSSA math and reading exams, respectively (Figure 3b). However, among students who attended more than one high school within Philadelphia (TPS or charter) in consecutive academic years (i.e., *across-year mobility (Philadelphia)*), 39 percent and 47 percent were academically proficient on their eighth grade PSSA math and reading exams, respectively. Among students who attended more than one high school within Philadelphia (TPS or charter) in the same academic year (i.e., *within-year mobility (Philadelphia)*), 32 percent and 44 percent were academically proficient on their eighth grade PSSA

math and reading exams, respectively. Further, among students who were identified by PDE as dropouts, just 30 percent and 39 percent were academically proficient on the eighth grade PSSA math and reading exams, respectively.

Figure 3b. Percent of Philadelphia Public High School Students, by Mobility Type and 8th Grade Achievement
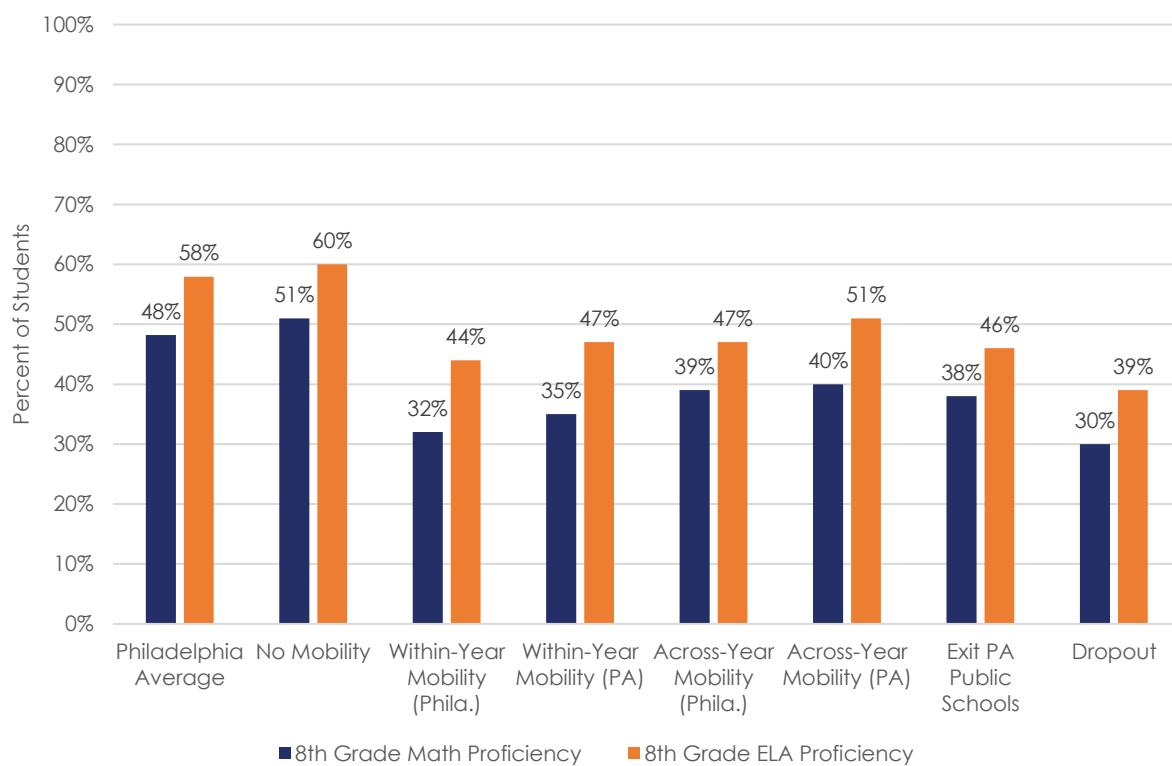
Source: PDE enrollment records, N=182,107 student-years
Note: Sample includes high school students (grades 9-12) who had an 8th grade achievement score on the math or ELA PSSA exam and who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Mobility-type categories are not mutually exclusive. Students who are mobile can experience more than one type of mobility event.

Ninth grade students are overrepresented among all types of student mobility (except dropout) Among students who ever attended a Philadelphia high school during the study period, 29 percent of students are in grade nine (Figure 3c). However, ninth graders make up 49 percent of students who attended more than one high school within Philadelphia (TPS or charter) in consecutive academic years (i.e., *across-year mobility (Philadelphia)*). Further, ninth graders make up 44 percent of students who attended more than one high school within Philadelphia (TPS or charter) in the same academic year (i.e., *within-year mobility (Philadelphia)*).

Figure 3c. Percent of Philadelphia Public High School Students, by Mobility Type and Grade Level
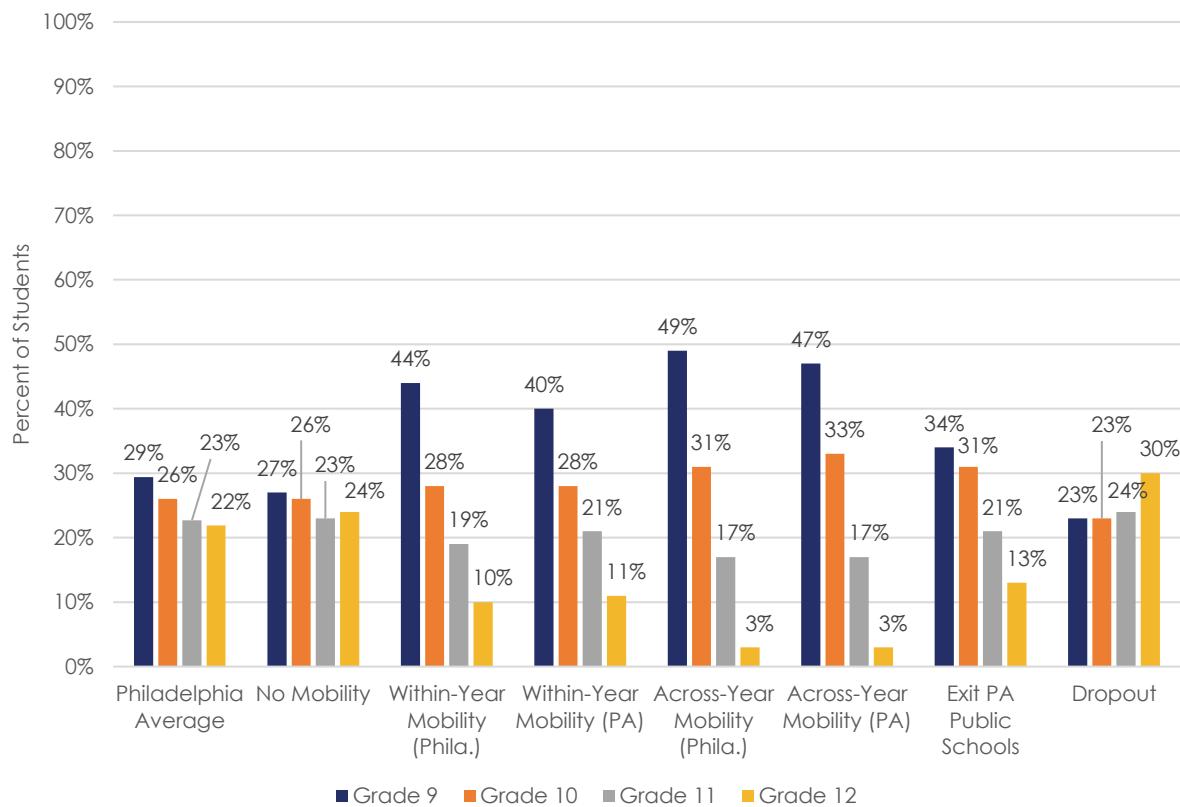
Legend: ■ Grade 9 ■ Grade 10 ■ Grade 11 ■ Grade 12

Source: PDE enrollment records, N=226,106 student-years

Note: Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Mobility-type categories are not mutually exclusive. Students who are mobile can experience more than one type of mobility event.

Mobile high school students in Philadelphia high schools are more likely to attend schools that serve higher percentages of low-income, lower-achieving, and minority students.

To understand whether student mobility rates vary across schools serving different student populations, we placed schools into one of three groups (i.e., terciles) for each of four school characteristics—free or reduced price lunch (FRPL), achievement, race/ethnicity, and enrollment. Tercile 1 includes schools with the lowest level of a school characteristic (e.g., low-poverty schools), and tercile 3 includes schools with the highest level of a school characteristic (e.g., high-poverty schools); see Table A4 for more detail.

In the schools with the highest percentages of low-income students—that is, schools serving the most students who receive free/reduced-price lunch (FRPL), with an average FRPL rate of 100 percent—27 percent of students were mobile in a typical school year (Figure 4). This compares to an annual student mobility rate of 15 percent in schools serving the fewest students in receipt of FRPL (an average FRPL rate of 70 percent). These patterns of average annual student mobility rates are nearly identical when student poverty is defined as the share of a school's students whose families have incomes below the poverty line (that is, receive government benefits) (Table A4).

Figure 4. Student Mobility Rates, by School Characteristics
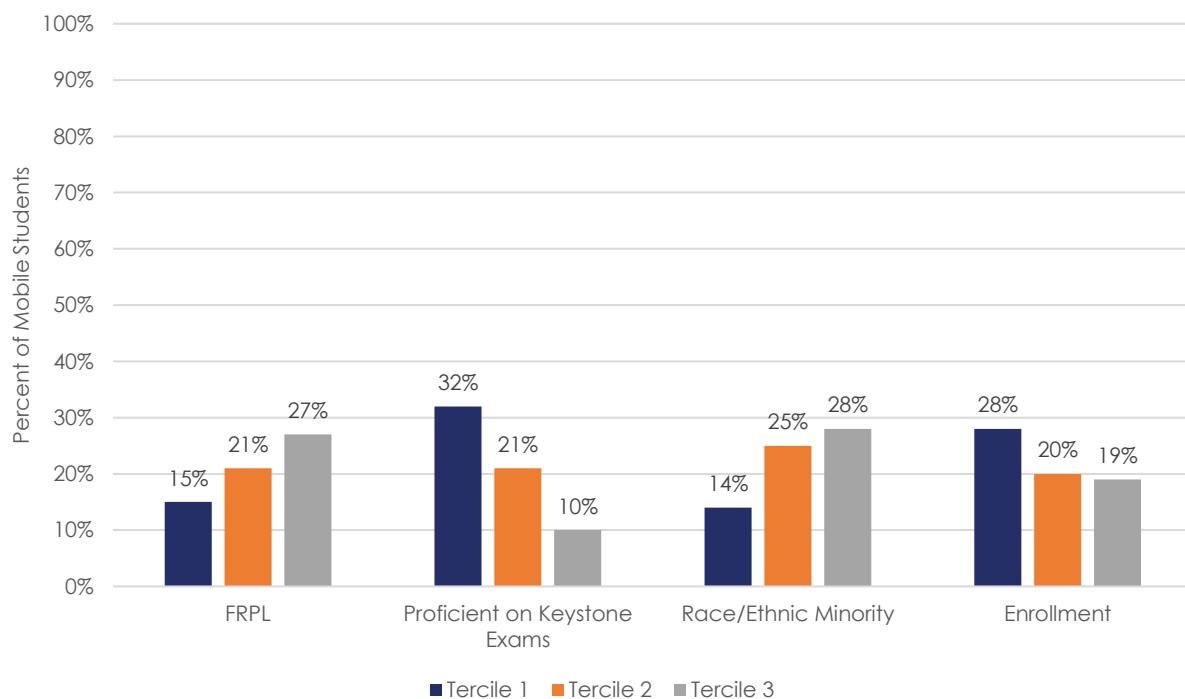
Source: PDE enrollment records, PDE school-level Keystone proficiency rates, and CCD school enrollment numbers, N=226,106 student-years
Note: Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years.

In schools serving the fewest academically proficient students—Tercle 1 schools with 17 percent of students, on average, achieving academic proficiency in the Algebra and Literacy Keystone exams—32 percent of students are mobile in a typical school year. This compares to an annual student mobility rate of 10 percent in schools serving the most academically proficient students – Tercile 3 schools with 77 percent of students achieving academic proficiency in algebra and literacy.

In schools serving the most racial/ethnic minority students—Tercile 3 schools with an average of 98 percent of students identified as Black or Hispanic—28 percent of students are mobile in a typical school year. This compares to an annual student mobility rate of 14 percent in schools serving the fewest racial/ethnic minority students—Tercile 1 schools with an average of 53 percent of Black or Hispanic students.

Schools with greater student enrollment have lower annual student mobility rates, on average. We note that the city's most selective public high schools, including Central, Girls, and Masterman, are among the largest in the city, while some of the city's historically lowest-achieving neighborhood high schools are among the smallest. Table A6 summarizes the schools with the highest and lowest student mobility rates during the study period.

Importantly, we also find that annual student mobility rates in TPS and charter high schools in Philadelphia are nearly identical: in TPS high schools, 20 percent of students are mobile in a typical year compared to 22 percent of students in charter high schools (Table A5). Yet, mobility rates varied widely across Philadephia public schools, with greater variation among traditional schools than charter schools (Figure A1). Notably, we are unable to observe within-year transfers across Philadelphia TPS high schools; as a result, mobility rates among students in Philadelphia TPS schools are likely understated. [13]

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[13] Beginning Fall 2019, SDP plans to include school-level rates of student mobility to their School Profiles (https://www.philasd.org/performance/programsservices/school-profiles/).

Mobile students who remain in Philadelphia public schools move to schools with similar peers. Students who exit Philadelphia for another Pennsylvania public school move to schools with fewer minority students and lower-poverty and higher-achieving peers.

Philadelphia high school students who attend different Philadelphia public schools in consecutive years enroll in schools with substantively similar school and peer characteristics (Table 1, Panel A). The schools that mobile students exit and enter are nearly identical in terms of student enrollment, with an average of 852 students in the schools they exited compared to an average of 836 students in the schools that they enter the next year. The schools that these students exit enrolled 84 percent of students, on average, who were identified as racial/ethnic minority (i.e., Black or Hispanic students), compared to 86 percent in the schools they enter. The share of low-income students—measured either by poverty or FRPL—is nearly identical across the schools that these mobile students enter and exit. Notably, students who are mobile across years in Philadelphia enter schools with fewer academically proficient students, on average (28 percent), than the schools that they exit (34 percent).

Table 1. School Characteristics, by Schools Exited and Entered among Across-Year Mobile Philadelphia High School Students

	Philadelphia Average			Schools Exited	Schools Entered
	All Schools	SDP	Charter		
Panel A: *Across-Year Mobility to another Philadelphia school (n=8,058 students)*					
Enrollment	1,061.4	1,086.8	1,016.0	852.3	835.6*
	(698.0)	(797.7)	(465.9)	(588.2)	(603.7)
Race/Ethnic Minority	0.76	0.74	0.80	0.84	0.86***
	(0.25)	(0.22)	(0.28)	(0.19)	(0.17)
FRPL	0.86	0.90	0.79	0.91	0.89***
	(0.14)	(0.10)	(0.18)	(0.10)	(0.17)
Poverty	0.77	0.78	0.75	0.82	0.83*
	(0.15)	(0.16)	(0.14)	(0.13)	(0.11)
Achievement	0.44	0.43	0.47	0.34	0.28***
	(0.27)	(0.29)	(0.21)	(0.23)	(0.19)
Panel B: *Across-Year Mobility to a Pennsylvania public school outside of Philadelphia (n=1,201 students)*					
Enrollment	1,061.4	1,086.8	1,016.0	1,029.7	4,041.1***
	(698.0)	(797.7)	(465.9)	(671.1)	(3,506.1)
Race/Ethnic Minority	0.76	0.74	0.80	0.78	0.39***
	(0.25)	(0.22)	(0.28)	(0.24)	(0.24)
FRPL	0.86	0.90	0.79	0.88	0.54***
	(0.14)	(0.10)	(0.18)	(0.13)	(0.28)
Poverty	0.77	0.78	0.75	0.79	0.56***
	(0.15)	(0.16)	(0.14)	(0.14)	(0.26)
Achievement	0.44	0.43	0.47	0.38	0.50***
	(0.27)	(0.29)	(0.21)	(0.24)	(0.23)

Note: Each cell reports mean (standard deviation) of school-level characteristics. Sample includes Philadelphia high school students who were mobile across years, who we observe in just one school in each of two consecutive years and who did not have a within-year mobility event. Differences in school characteristics between the schools that mobile students exit and the schools that mobile students enter (within a panel) are statistically significant at the *10%, **5%, and ***1% levels.

In comparison, students who exit Philadelphia for another Pennsylvania public school in consecutive years move to schools that serve fewer racial/ethnic minority students – 39 percent in the schools they enter compared to 78 percent in the schools they exited (Table 1, Panel B). These mobile students enter schools with lower-poverty peers – 54 percent of students in the schools they enter receive FRPL compared to 88 percent of students in the Philadelphia schools they exited. Further, these mobile students also enroll in schools with higher-achieving peers – 50 percent of students in schools they enter are academically proficient in algebra and literacy compared to just 38 percent of students in the Philadelphia schools that they exited.

Notably, significantly more Philadelphia public school students who change schools in consecutive years remain in Philadelphia than exit Philadelphia for another Pennsylvania public school. During the study period, nine percent of Philadelphia high school students changed high schools within Philadelphia in consecutive years, while just two percent of Philadelphia high school students exited Philadelphia for a Pennsylvania public high school (Figure 1).

Mobile Philadelphia high school students attend an average of two schools during their high school careers.

Among students who ever attended a Philadelphia public high school during the study period (i.e., Full Sample), the typical Philadelphia high school student attended 1.2 high schools during his/her high school career (Figure 5). In comparison, Philadelphia high school students who changed schools at least once during their high school career and remained in Pennsylvania public education (i.e., did not exit Pennsylvania public schools or drop out of school) attended an average of 2.2 high schools.

Among Philadelphia high school students who began ninth grade in the 2013-14 school year (i.e., 2013/14 cohort)—and for whom we observe four years of their high school career trajectory—the average number of high schools attended is 1.5. In comparison, mobile students in the 2013/14 cohort who remained in Pennsylvania public education attended an average of 2.4 high schools during their high school career, nearly identical to the full sample of students.

Figure 5. Number of Pennsylvania High Schools Attended, for Students Ever Enrolled in Philadelphia High Schools
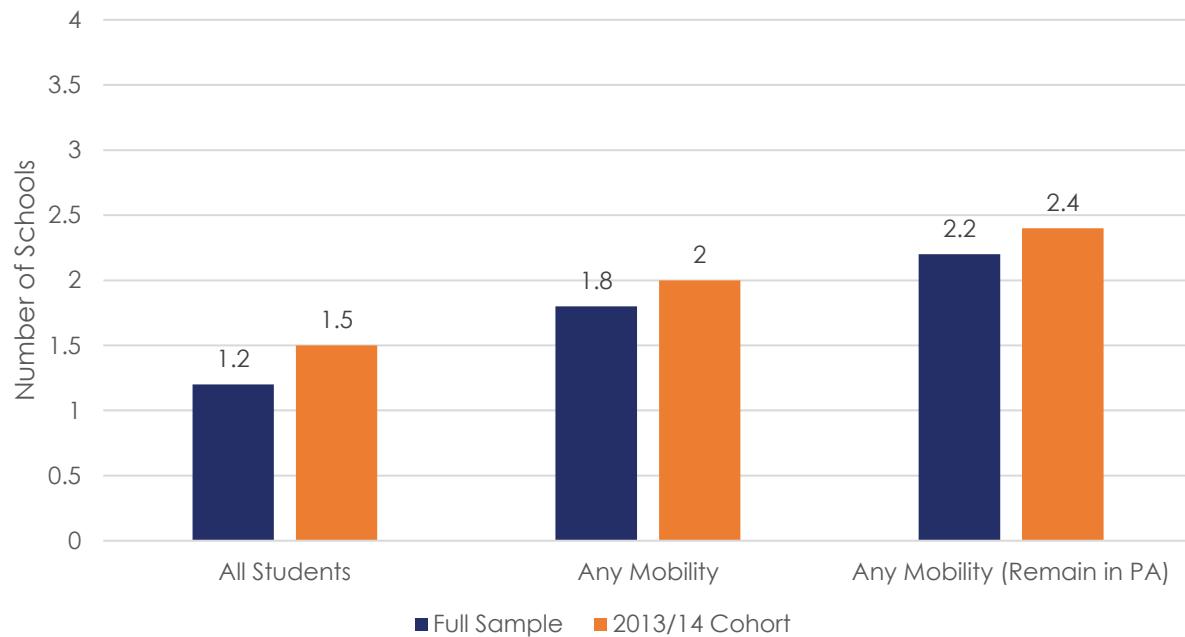
Source: PDE enrollment records, N=226,106 student-years
Note: *Full Sample* includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. *2013/14 Cohort* includes students who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year. Number of schools is the number of Pennsylvania public schools recorded in the PDE enrollment records, noting that if a student moved within a district during a year, we would only observe the last school enrolled.

Among the 2013/14 cohort of Philadelphia high school students, 10 percent attended three or more schools during their high school career.

Among all students who attended a Philadelphia public high school during the study period (i.e., Full Sample), 80 percent attended one high school; 16 percent attended two high schools; and four percent attended three or more high schools (Figure 6). Among the 2013/14 cohort who remained in Pennsylvania public education, 65 percent of students attended one high school during their high school career, 25 percent attended two high schools and 10 percent attended three or more high schools (Figure 6).

The percentage of students in the 2013/14 cohort who attended one high school is lower than the full sample of students because the full sample includes students in all grades in each year, and we show in this report that mobility rates are highest among ninth grade students.[14]

Figure 6. Percent of Philadelphia Public High School Students, by Number of High Schools Attended
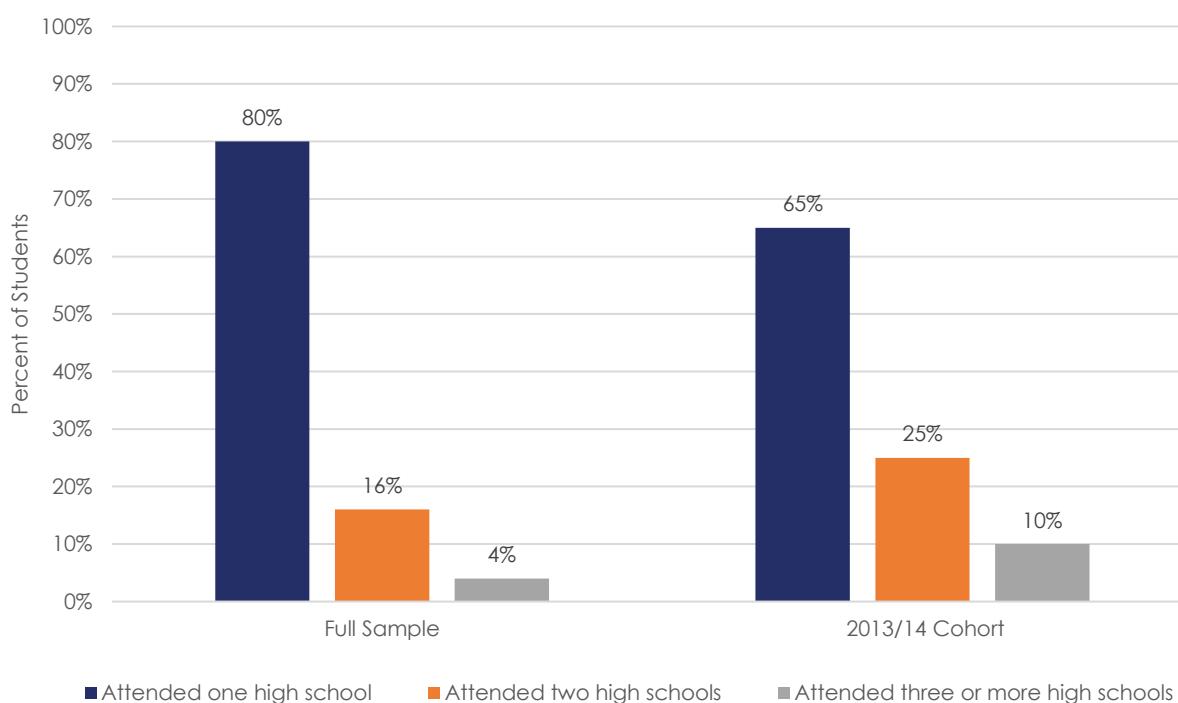

Source: PDE enrollment records, N=226,106 student-years
Note: *Full Sample* includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. *2013/14 Cohort* includes students who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year. Number of schools is the number of Pennsylvania schools recorded in the PDE enrollment records, noting that if a student moved within a district during a year, we would only observe the last school enrolled.

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[14] During the 2013-14 through 2006-17 period, 5 high schools closed and 9 schools altered their grade configurations (4 high schools reduced grade levels and 5 high schools added grade levels). These school changes may have induced student mobility by offering additional schooling options for students to select, and may have influenced the overall rates of student mobiliy during the study period.

In the 2013/14 cohort, student mobility is concentrated among younger high school grades.

With the exception of dropout, each type of student mobility is more prevalent among ninth grade students than students in older high school grades. Among students in the 2013/14 cohort, five percent of ninth grade students changed schools within Philadelphia—*within-year mobility (Philadelphia)*—during their ninth grade year; this compares to one percent of twelfth grade students (Figure 7; Table A11).

Among students in the 2013/14 cohort, 9 percent of ninth grade students attended a different school in the next year while remaining in Philadelphia (*across-year mobility (Phila.)*); in comparison, six percent of tenth grade students and four percent of eleventh grade students attended a different school in the next year while remaining in Philadelphia (Figure 6; Table A9). Further, eight percent of students in ninth grade exited Pennsylvania public education that year, while six percent of tenth grade and four percent of eleventh grade students exited Pennsylvania public education.

Figure 7. Mobility Rates among Students in the 2013/14 Cohort, by Mobility Type and Grade Level
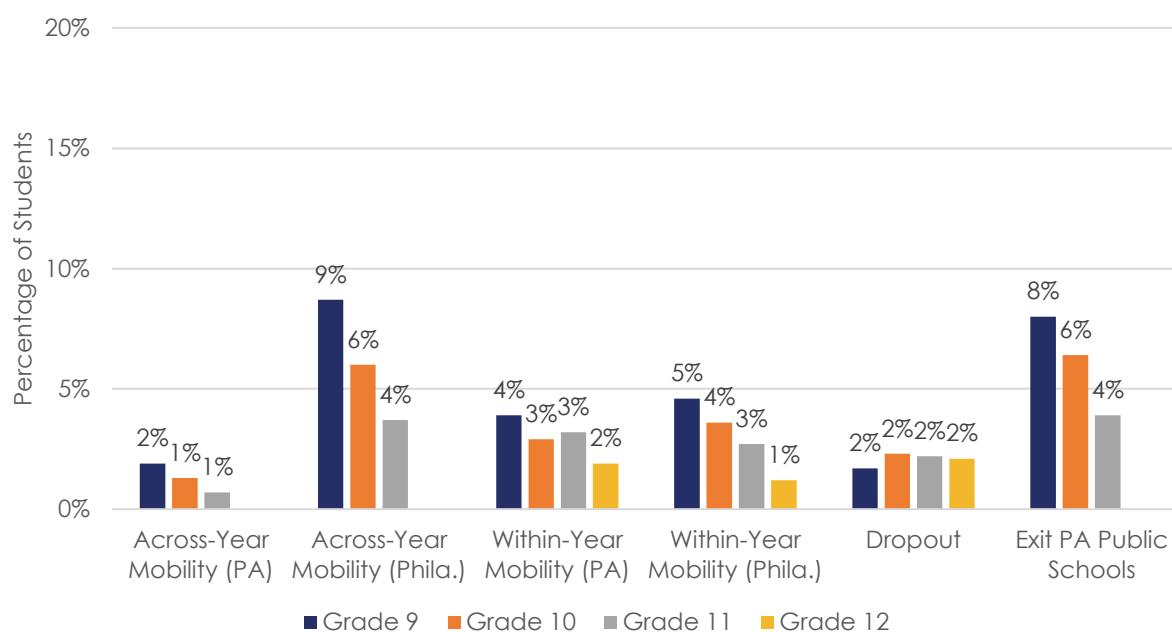
Source: PDE enrollment records, N= 15,173 students
Note: Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

Among students in the 2013/14 cohort, only half remain in the same Philadelphia high school for their entire high school career.

Among Philadelphia high school students who were in ninth grade for the first time in the 2013-14 school year, 52 percent were never mobile, remaining in the same Philadelphia high school for their entire high school career (Figure 8). Approximately one-quarter of students (26 percent) attended at least one different Philadelphia high school during their high school career, while 13 percent of students attended both a traditional and charter public high school in Philadelphia. Twenty-five percent of students who began as ninth graders in the 2013-14 school year exited Pennsylvania public schools: 18 percent exited public education in Pennsylvania while an additional seven percent of students were identified as school dropouts.[15]

Figure 8. Mobility and Exit Rates among Philadelphia Public School Students in the 2013/14 Cohort
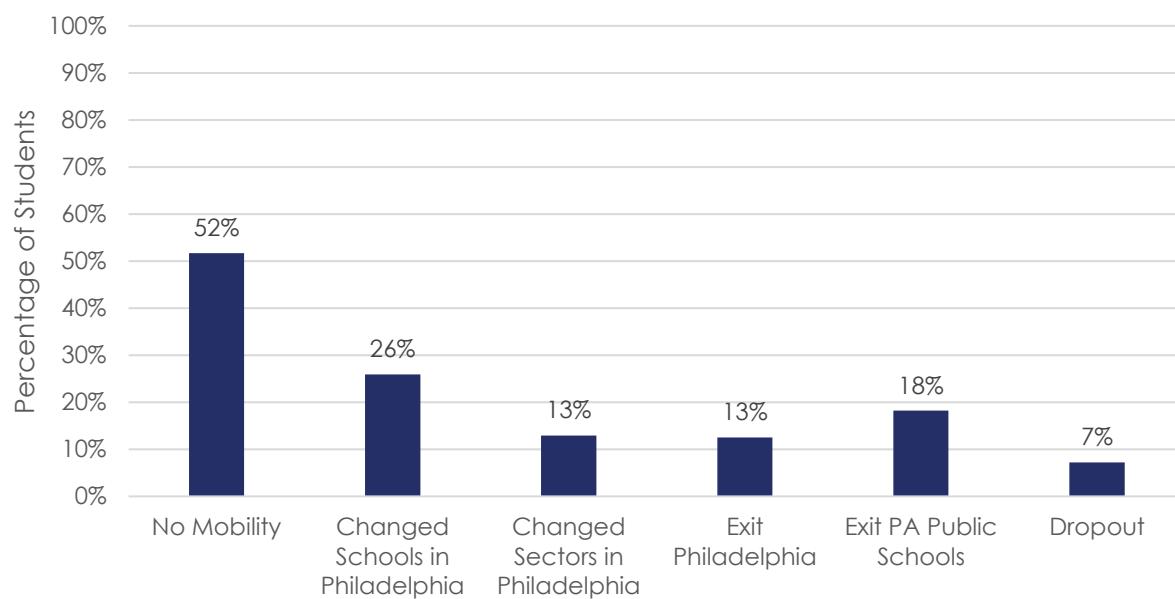
Source: PDE enrollment records, N= 15,173 students
Note: Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

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[15] Among the seven percent of students in the 2013/14 cohort who were identified by PDE as dropping out, the majority (68 percent) provided no specific reason for dropping out (Figure A2). Among students who did identify a reason for dropping out, nine percent of dropouts were due to behavior problems while 14 percent of dropouts had enrolled but did not attend school in the subsequent year.

Mobile Philadelphia high school students are twice as likely to drop out of school as their non-mobile peers.

Among all students who attended a Philadelphia public high school during the study period (i.e., Full Sample), 11 percent of students with any within- or across-year mobility drop out of school (an additional 13 percent exit public education in Pennsylvania). In comparison, six percent of non-mobile students drop out (an additional 10 percent exit public education in Pennsylvania) (Table 2, Panel A).[16]

To refine this comparison, we focus on students in the 2013/14 cohort; doing so allows us to follow students throughout their high school careers in Pennsylvania. Among students in the 2013/14 cohort with any within- or across-year mobility, 11 percent drop out of school (an additional 19 percent exit public education in Pennsylvania). In comparison, five percent of non-mobile students in the 2013/14 cohort drop out of school (an additional 18 percent exit public education in Pennsylvania).

Table 2. Percent of Students who Dropout or Exit Pennsylvania Public Schools, by Any Mobility and Types of Mobility

	Full Sample		2013/14 Cohort	
	Exit PA Public Schools	Dropout	Exit PA Public Schools	Dropout
Panel A: *Any Mobility*				
Any Within/Across-Year Mobility	13%	11%	19%	11%
No Within/Across-Year Mobility	10%	6%	18%	5%
Panel B: *Types of Mobility*				
Within-Year Mobility (Philadelphia)	13%	9%	19%	9%
Within-Year Mobility (PA)	14%	13%	20%	14%
Across-Year Mobility (Philadelphia)	11%	13%	16%	11%
Across-Year Mobility (PA)	16%	12%	21%	11%

Source: PDE enrollment records
Notes. *Full Sample* includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. *2013/14 Cohort* includes students who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year. Each cell reports the percentage of students with a given mobility event who dropout or exit PA public schools. There are 248,531 student*year*school observations in the Full Sample (107,871 unique students) and 58,238 student*year*school observations in the 2013/14 Cohort (15,173 unique students).

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[16] Throughout this report, all analyses of student mobility exclude the mobility of students within a school year and within an LEA. The within- and across-year mobility analyzed here includes just those mobile students who either moved across school years or during a school year but to a different LEA.

The likelihood of dropout increases as a student experiences additional mobility events.

Among the 2013/14 cohort, students who had more within- or across-year mobility events during their high school careers are more likely to drop out (Figure 9). Among those with one mobility event, 10 percent drop out of school; for those with two mobility events, 13 percent drop out of school; for those with three mobility events, 16 percent drop out of school; and for those with at least four mobility events, seven percent drop out of school. Notably, just 98 of the 15,173 students in the 2013/14 cohort had four or more within/across-year mobility events.[17]

Figure 9. Percent of Students in the 2013/14 Cohort who Drop Out or Exit Pennsylvania Public Schools, by the Count of Mobility Events
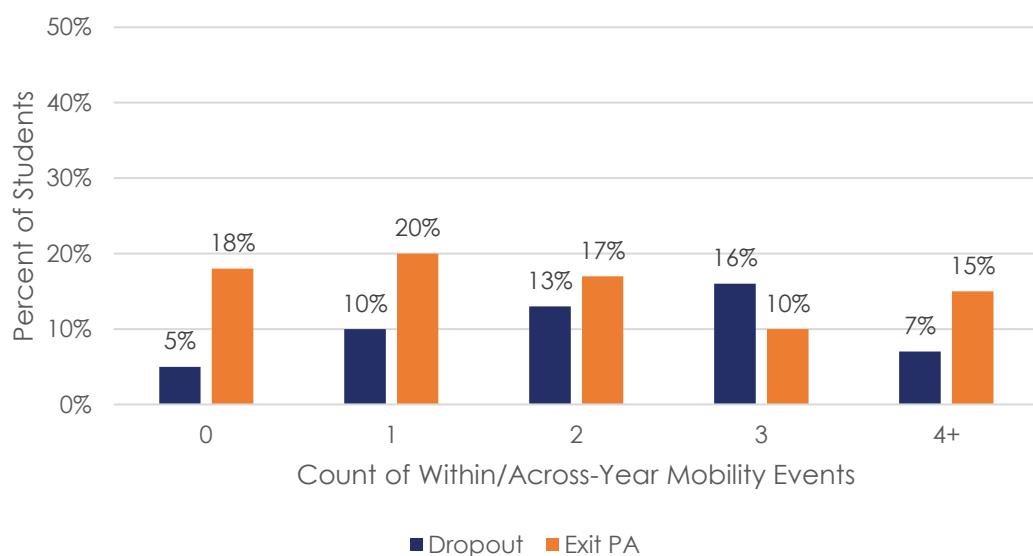
Source: PDE enrollment records, N = 15,173 students
Note: Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

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[17] Among the 2013/14 cohort that includes 15,173 unique students, 3,520 students (23 percent) have one within- or across-year mobility event; 1,148 students (8 percent) have two within- or across-year mobility events; and 275 studeents (2 percent) have three within- or across-year mobility events.

Student mobility is positively associated with dropout among Philadelphia high school students, even after controlling for student demographics, poverty and academic achievement.

Mobile Philadelphia high school students are 5.7 percentage points more likely to drop out of school than their non-mobile peers, even after statistically controlling for student demographic characteristics (gender, race/ethnicity), poverty status, special education status, English language learner status, and eighth grade achievement. This corresponds to a 140 percent increase in the estimated likelihood of dropout (Figure 10, Table A12).

In comparison, the association between student mobility and exit from Pennsylvania public education is more modest. Specifically, among students of the same gender, race/ethnicity, special education status, poverty status, ELL status and eighth grade achievement, mobile students are 0.9 percentage points more likely to exit public education in Pennsylvania than their non-mobile peers; this corresponds to a seven percent increase in the likelihood of exiting Pennsylvania public education.

Figure 10. Estimated Probability of Dropout and Exit from PA Public Education, by Mobility Status
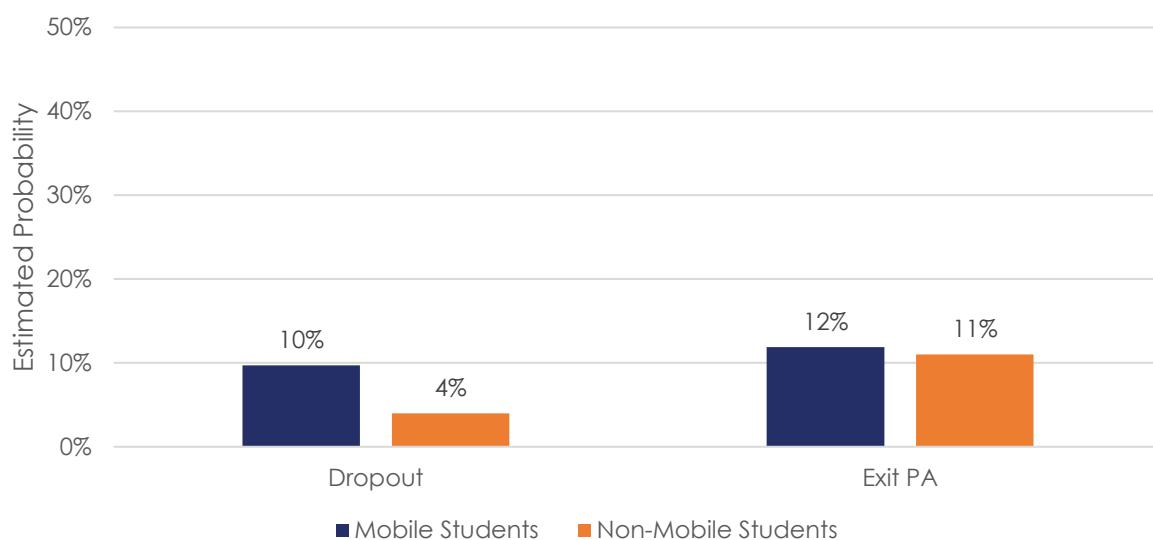
Source: PDE enrollment records, N = 82,744 students for the *Dropout* analysis and 70,181 students for the *Exit PA Public Schools* analysis.
Note: Sample includes students in grades 9-12 with available achievement data for the 8th grade PSSA exams and who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years.

Implications for policy and practice

The disproportionately high rate of mobility among the most academically and economically disadvantaged ninth grade students in Philadelphia is an area for ongoing attention.

Student mobility is associated with lower academic achievement and an increased likelihood of dropping out of school. Evidence that mobility is concentrated among the most disadvantaged Philadelphia high school students suggests that student mobility might contribute to the inequality of schooling outcomes. Since mobility is further concentrated among ninth grade students, city and state policymakers should identify ways to provide additional supports to the city's most vulnerable students for whom changing schools early in their high school careers will likely have serious consequences for high school persistence and completion.

The high rates of student mobility in some of the city's high schools should inform policy efforts to support schools serving the city's most vulnerable populations.

Student mobility not only has detrimental consequences for mobile students, but also for non-mobile students who attend schools with high concentrations of mobile peers. Policy efforts should seek to identify the highest-risk school settings—those schools serving the most disadvantaged students—and implement strategies designed to limit student mobility. Such policies would also aim to improve student engagement while in school and could take the form of providing better information about high school options from which students and their families can use to select better high school matches.

The fact that student mobility is not sector-specific should inspire Philadelphia's education community – both charter and traditional school leaders – to work together to address the persistent problems associated with high rates of student mobility.

The student mobility that we observe in this study is not disproportionately concentrated in the charter or traditional public school sectors in Philadelphia. Instead, mobility is concentrated in schools serving the lowest-achieving, highest-poverty students, independent of a school's sector. This suggests that city leaders should work together by taking a citywide approach to reducing student mobility. City leaders should work with high schools in the charter and traditional sectors to improve the high school match between students and schools, while also addressing the academic and economic factors that are not sector-specific but which shape the extent and persistence of student mobility throughout Philadelphia.

Students who move to another Philadelphia school do not enroll in higher-quality schools—a fact that can inform efforts to limit student mobility and improve the high school match process early in a student's high school career.

Despite prior evidence that the adverse costs associated with student mobility may be mitigated by transfers to higher-quality schools, Philadelphia high school students who change schools while remaining in the city's public education sector do not enter higher-quality schools. This finding should inform education leaders on the detrimental effect of school switching within Philadelphia,

while also providing impetus for city leaders to help students and their families identify the best school match for students prior to entering high school.

The fact that the dropout rate among mobile high school students is twice as high as their non-mobile peers should inform efforts by education leaders to identify and support these at-risk students.

Philadelphia high school students who experience at least one mobility event during their high school careers are twice as likely to dropout than non-mobile students, even when comparing students who are observationally equivalent in terms of their demographic characteristics, poverty status, and academic achievement levels. City and state education leaders should work to identify students who have experienced a mobility event and dedicate additional supports and resources toward these mobile students who have a significantly greater risk of school detachment and dropout.

Appendix A: Additional Tables and Figures

Table A1. Characteristics of Philadelphia High School Students, by Year

Student Characteristics	All Years	School Year			
		2013-14	2014-15	2015-16	2016-17
Age	15.7 (1.5)	15.7 (1.4)	15.8 (1.9)	15.7 (1.3)	15.7 (1.3)
Female	0.50	0.50	0.50	0.49	0.49
White	0.14	0.14	0.14	0.14	0.14
Black	0.57	0.58	0.58	0.56	0.56
Hispanic	0.19	0.18	0.19	0.20	0.20
Asian	0.07	0.07	0.07	0.07	0.07
Other	0.02	0.02	0.02	0.03	0.03
Poverty	0.81	0.78	0.77	0.78	0.91
FRPL	0.88	0.75	0.90	0.93	0.92
ELL	0.08	0.07	0.08	0.08	0.09
Special Education	0.18	0.17	0.18	0.18	0.18
Grade 9	0.29	0.29	0.29	0.29	0.30
Grade 10	0.26	0.26	0.26	0.26	0.26
Grade 11	0.23	0.23	0.23	0.23	0.23
Grade 12	0.22	0.22	0.22	0.21	0.22
8th Grade Math Proficiency	0.48	0.58	0.56	0.45	0.34
8th Grade ELA Proficiency	0.58	0.65	0.63	0.55	0.49
Charter	0.36	0.36	0.36	0.37	0.36
Student*Year Observations	226,106	56,363	56,412	55,820	57,511
Philadelphia High Schools	102	91	95	92	93

Notes. Sample includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Each cell reports proportion, except for age which reports mean (standard deviation). *Poverty* is the proportion of students who receive government benefits (e.g., TANF, SNAP); *FRPL* is the proportion of students who receive free/reduced-price lunch; *ELL* is the proportion of students who are identified as English language learners; *Special Education* is the proportion of students who receive special education services. *8th Grade (Math or ELA) Proficiency* is the proportion of students (with available 8th grade achievement data) who were proficient or advanced on the PSSA math (ELA) exam in their 8th grade year. *Charter* is the proportion of students who attended a charter high school. Among the 102 Philadelphia high schools open across the study period, 57 schools are TPS high schools and 45 schools are charter high schools.

Table A2. Student Mobility, by Mobility Type and Year

Mobility Type	All Students	All Years	School Year 2013-14	2014-15	2015-16	2016-17
Not Mobile	0.67	0.82	0.80	0.79	0.80	0.89
Within-Year Mobility (Philadelphia)	0.06	0.03	0.03	0.03	0.04	0.03
Within-Year Mobility (PA)	0.06	0.03	0.03	0.02	0.03	0.04
Across-Year Mobility (Philadelphia)	0.09	0.05	0.05	0.05	0.05	n/a
Across-Year Mobility (PA)	0.02	0.01	0.01	0.01	0.01	n/a
Exit PA Public Schools	0.13	0.07	0.07	0.07	0.06	n/a
Dropout	0.07	0.03	0.03	0.03	0.02	0.05
Student*Year Observations	107,871	226,106	56,363	56,412	55,820	57,511
Philadelphia High Schools	102	102	91	95	92	93

Notes. Sample includes high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Each cell reports proportion. See Box #3 for definitions for each student mobility type. We do not report across-year mobility for the 2016-17 school year since we do not observe students' school enrollment locations in the 2017-18 school year. There are 107,871 unique students (and 226,106 student*year observations) in the study sample. The proportion of students with different types of mobility does not sum to one because the same student may experience multiple types of mobility within and across years. Students may either exit PA public schools or dropout, but do not experience both types of mobility.

Table A3. Student Characteristics, by Mobility Type

Student Characteristics	No Mobility	Within-Year Mobility (Phila.)	Within-Year Mobility (PA)	Across-Year Mobility (Phila.)	Across-Year Mobility (PA)	Exit PA Public Schools	Dropout
Age	15.7 (1.4)	15.3*** (1.2)	15.5*** (1.2)	15.1*** (1.1)	15.2*** (1.1)	15.9*** (1.4)	17.3*** (3.2)
Female	0.50	0.51	0.50	0.48***	0.46***	0.45***	0.41***
White	0.15	0.05***	0.18***	0.06***	0.19***	0.10***	0.10***
Black	0.55	0.69***	0.64***	0.70***	0.63***	0.61***	0.57**
Hispanic	0.19	0.24***	0.14***	0.19	0.13***	0.23***	0.27***
Asian	0.08	0.02***	0.03***	0.03***	0.02***	0.04***	0.04***
Other	0.03	0.01***	0.02***	0.02***	0.02	0.02***	0.02***
Poverty	0.81	0.81	0.72***	0.85***	0.81	0.79***	0.81
FRPL	0.88	0.88	0.74***	0.91***	0.86*	0.87	0.90***
ELL	0.08	0.07***	0.03***	0.08	0.03***	0.09***	0.14***
Special Education	0.17	0.18*	0.22***	0.20***	0.22***	0.18**	0.23***
Grade 9	0.27	0.44***	0.40***	0.49***	0.47***	0.34***	0.23***
Grade 10	0.26	0.28***	0.28***	0.31***	0.33***	0.31***	0.23***
Grade 11	0.23	0.19***	0.21***	0.17***	0.17***	0.21***	0.24**
Grade 12	0.24	0.10***	0.11***	0.03***	0.03***	0.13***	0.30***
1st year of HS	0.28	0.40***	0.34***	0.47***	0.39***	0.29**	0.19***
2nd year of HS	0.26	0.29***	0.30***	0.31***	0.37***	0.28***	0.19***
3+ year of HS	0.46	0.31***	0.36***	0.23***	0.24***	0.43***	0.62***
8th Grade Math Proficiency	0.51	0.32***	0.35***	0.39***	0.40***	0.38***	0.30***
8th Grade ELA Proficiency	0.60	0.44***	0.47***	0.47***	0.51***	0.46***	0.39***
Charter	0.35	1.00***	0.28***	0.30***	0.33	0.36*	0.19***
Student*Year Observations	185,561	7,490	6,917	8,347	1,742	11,163	7,590
Philadelphia High Schools	100	97	82	97	95	96	94

Notes. Sample includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Differences between students with any mobility type compared to students with no mobility, by student characteristics, are statistically significant at the *10%, **5%, and ***1% levels. All students who had a within-year mobility (Philadelphia) event attended at least one charter public school since we are unable to observe within-year mobility (Philadelphia) across more than one Philadelphia TPS schools.

Table A4. Student Mobility, by Mobility Type and School Characteristics

	Tercile 1 (lowest)	Tercile 2	Tercile 3 (highest)
Panel A: *Enrollment*			
No Mobility	0.72	0.80	0.81***
Within-Year Mobility (Philadelphia)	0.08	0.07	0.06***
Within-Year Mobility (PA)	0.03	0.03	0.03*
Across-Year Mobility (Philadelphia)	0.09	0.05	0.04***
Across-Year Mobility (PA)	0.01	0.01	0.01***
Exit PA Public Schools	0.09	0.06	0.06***
Dropout	0.04	0.04	0.03***
Mean (SD) of Quartile	333.0 (103.4)	629.8 (81.0)	1,518.7 (659.0)
Student*Year*School Observations	35,474	73,142	125,518
Philadelphia High Schools	34	34	33
Panel B: *Race/Ethnic Minority*			
No Mobility	0.86	0.75	0.72***
Within-Year Mobility (Philadelphia)	0.03	0.07	0.11***
Within-Year Mobility (PA)	0.02	0.03	0.04***
Across-Year Mobility (Philadelphia)	0.03	0.06	0.06***
Across-Year Mobility (PA)	0.01	0.01	0.01***
Exit PA Public Schools	0.05	0.08	0.08***
Dropout	0.02	0.05	0.04***
Mean (SD) of Quartile	0.53 (0.18)	0.92 (0.04)	0.98 (0.01)
Student*Year*School Observations	104,650	64,981	64,503
Philadelphia High Schools	34	34	33
Panel C: *FRPL*			
No Mobility	0.85	0.79	0.73***
Within-Year Mobility (Philadelphia)	0.06	0.08	0.05***
Within-Year Mobility (PA)	0.02	0.03	0.04***
Across-Year Mobility (Philadelphia)	0.03	0.05	0.07***
Across-Year Mobility (PA)	0.01	0.01	0.01***
Exit PA Public Schools	0.05	0.07	0.09***
Dropout	0.01	0.03	0.06***
Mean (SD) of Quartile	0.70 (0.14)	0.89 (0.04)	1.00 (0.00)
Student*Year*School Observations	76,539	85,937	71,270
Philadelphia High Schools	34	33	33

Panel D: *Poverty*			
No Mobility	0.85	0.75	0.74***
Within-Year Mobility (Philadelphia)	0.04	0.11	0.06***
Within-Year Mobility (PA)	0.02	0.03	0.04***
Across-Year Mobility (Philadelphia)	0.03	0.06	0.06***
Across-Year Mobility (PA)	0.01	0.01	0.01***
Exit PA Public Schools	0.05	0.07	0.08***
Dropout	0.02	0.03	0.06***
Mean (SD) of Quartile	0.63 (0.11)	0.82 (0.04)	0.93 (0.02)
Student*Year*School Observations	102,682	55,840	75,612
Philadelphia High Schools	34	34	33
Panel E: *Achievement*			
No Mobility	0.68	0.79	0.90***
Within-Year Mobility (Philadelphia)	0.08	0.08	0.04***
Within-Year Mobility (PA)	0.05	0.03	0.01***
Across-Year Mobility (Philadelphia)	0.08	0.04	0.02***
Across-Year Mobility (PA)	0.01	0.01	0.01***
Exit PA Public Schools	0.11	0.07	0.03***
Dropout	0.07	0.03	0.01***
Mean (SD) of Quartile	0.17 (0.04)	0.37 (0.10)	0.77 (0.14)
Student*Year*School Observations	68,644	87,743	75,737
Philadelphia High Schools	32	32	31

Notes. Sample includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Group differences, by tercile of school characteristics and student mobility type, statistically significant at the *10%, **5%, and ***1% levels.

Table A5. Student Mobility, by Mobility Type and Sector

	TPS	Charter
No Mobility	0.80	0.78***
Within-Year Mobility (Philadelphia)	0.04	0.12***
Within-Year Mobility (PA)	0.03	0.02***
Across-Year Mobility (Philadelphia)	0.05	0.04***
Across-Year Mobility (PA)	0.01	0.01***
Exit PA Public Schools	0.07	0.07
Dropout	0.04	0.02***
Student*Year*School Observations	150,189	83,948
Philadelphia High Schools	57	45

Notes. Sample includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. Group differences, by sector and student mobility type, statistically significant at the *10%, **5%, and ***1% levels. Since we are unable to observe within-year mobility among TPS schools in Philadelphia, the within-year mobility (Philadelphia) rates are not comparable across TPS and charter high schools in Philadelphia.

Table A6. Philadelphia Public Schools with Highest and Lowest Student Mobility Rates

Schools with the lowest mobility rates	Average Student Mobility Rate	Schools with the highest mobility rates	Average Student Mobility Rate
Julia R Masterman	1%	South Philadelphia	35%
Widener Memorial	4%	Edison	35%
Arts Academy at Benjamin Rush	5%	John Bartram	35%
MAST Community Charter School	5%	The U School: Innovative Lab	37%
Philadelphia Academy Charter	5%	William L Sayre	37%
Central	6%	Martin Luther King	38%
GAMP	6%	World Communications Charter	41%
Creative and Performing Arts	6%	Strawberry Mansion	42%
Swenson Arts & Technology	7%	Benjamin Franklin	43%
Carver	7%	Overbrook	45%
Franklin Towne Charter	8%	The SD of Philadelphia Virtual Academy	50%
Academy at Palumbo	9%	ACT Academy Cyber Charter	57%
Constitution	9%	ASPIRA Bilingual Cyber Charter	66%
William W Bodine	9%	Esperanza Cyber Charter	81%

Notes. Schools that closed in any academic year during the study period are excluded from this list. Student mobility rates in traditional public schools (TPS) cannot be directly compared to student mobility rates in charter schools because we are unable to observe student mobility that occurs within the traditional public school system in a given school year. As a result, student mobility rates in TPS are likely underestimated.

Table A7. Number of High Schools Attended among Philadelphia High School Students

		Philadelphia Schools		PA (non-Philadelphia) Schools	
	All Schools	TPS	Charter	TPS	Charter
Panel A: *Students in at least 2 schools during the study period*					
Full Sample	2.2 (0.5)	1.1 (0.7)	0.7 (0.8)	0.3 (0.5)	0.2 (0.4)
2013/14 Cohort	2.4 (0.6)	1.2 (0.8)	0.8 (0.8)	0.3 (0.6)	0.2 (0.4)
Panel B: *Students who had any mobility during the study period (including exiting PA or dropout)*					
Full Sample	1.8 (0.7)	0.9 (0.6)	0.6 (0.7)	0.2 (0.4)	0.1 (0.3)
2013/14 Cohort	2.0 (0.8)	1.0 (0.7)	0.6 (0.7)	0.2 (0.5)	0.1 (0.4)
Panel C: *Students who had any mobility, but remained in PA education*					
Full Sample	2.2 (0.5)	1.0 (0.7)	0.8 (0.8)	0.3 (0.5)	0.2 (0.4)
2013/14 Cohort	2.4 (0.7)	1.1 (0.8)	0.8 (0.8)	0.3 (0.6)	0.2 (0.4)
Panel D: *All students*					
Full Sample	1.2 (0.6)	0.8 (0.5)	0.4 (0.6)	0.1 (0.3)	0.0 (0.2)
2013/14 Cohort	1.5 (0.7)	0.8 (0.6)	0.5 (0.6)	0.1 (0.4)	0.1 (0.3)

Notes. Each cell reports the mean (standard deviation) count of high schools attended. *Full Sample* includes students in grades 9-12 who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years. *2013/14 Cohort* includes students who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

Table A8. Frequency of Mobility among Across-Year Movers in the 2013/14 Cohort, by Mobility Type

	All Schools	Philadelphia Schools		PA (non-Philadelphia) Schools	
		TPS	Charter	TPS	Charter
Panel B: *Students who had any across-year mobility during the study period (including exiting PA or dropout)*					
Across-Year Mobility (Philadelphia)	2.4 (0.6)	1.5 (0.8)	0.7 (0.8)	0.1 (0.4)	0.1 (0.3)
Across-Year Mobility (PA)	2.9 (0.9)	1.0 (0.7)	0.5 (0.6)	0.9 (0.9)	0.5 (0.6)
Exit PA Public Schools	1.5 (0.8)	0.9 (0.6)	0.4 (0.6)	0.1 (0.4)	0.1 (0.3)
Dropout	1.8 (0.9)	1.1 (0.7)	0.4 (0.6)	0.1 (0.4)	0.1 (0.4)
Panel C: *Students who had any across-year mobility, but remained in PA education*					
Across-Year Mobility (Philadelphia)	2.4 (0.7)	1.5 (0.8)	0.7 (0.9)	0.1 (0.4)	0.1 (0.3)
Across-Year Mobility (PA)	3.0 (0.9)	1.0 (0.7)	0.5 (0.6)	1.0 (0.9)	0.5 (0.6)

Notes. Each cell reports the mean (standard deviation) count of high schools attended. Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year and who were ever mobile across school years during the study period (2013-14 through 2016-17 school years).

Table A9. Mobility among Across-Year Movers in the 2013/14 Cohort, by Grade and Mobility Type

	All Students				Students with any across year mobility			
Panel A: *Grade*	Grade 9	Grade 10	Grade 11	Grade 12	Grade 9	Grade 10	Grade 11	Grade 12
Across-Year Mobility (Philadelphia)	8.7%	6.0%	3.7%	n/a	20.1%	17.5%	14.2%	n/a
Across-Year Mobility (PA)	1.9%	1.3%	0.7%	n/a	4.3%	3.8%	2.8%	n/a
Exit PA Public Schools	7.9%	6.4%	3.9%	n/a	18.2%	18.9%	15.2%	n/a
Dropout	1.7%	2.3%	2.2%	2.1%	3.9%	6.6%	8.4%	10.6%
Panel B: *Year in HS*	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Across-Year Mobility (Philadelphia)	8.6%	6.5%	4.3%	n/a	22.1%	18.3%	14.1%	n/a
Across-Year Mobility (PA)	1.6%	1.7%	0.9%	n/a	4.1%	4.6%	2.8%	n/a
Exit PA Public Schools	6.1%	7.1%	6.3%	n/a	15.5%	19.9%	20.9%	n/a
Dropout	0.8%	1.2%	2.7%	3.9%	1.9%	3.3%	9.0%	17.8%

Notes. Each cell reports the percentage of students by grade level with a given mobility event. Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

Table A10. Frequency of Mobility among Cross-Sector Movers in the 2013/14 Cohort, by Mobility Type

	All Schools	Philadelphia Schools		PA (non-Philadelphia) Schools	
		TPS	Charter	TPS	Charter
Within-Year Mobility (Philadelphia)	2.5 (0.7)	1.2 (0.4)	1.2 (0.5)	0.1 (0.3)	0.1 (0.2)
Within-Year Mobility (PA)	2.9 (0.9)	0.9 (0.7)	0.6 (0.6)	0.6 (0.7)	0.7 (0.6)
Across-Year Mobility (Philadelphia)	2.7 (0.8)	1.3 (0.6)	1.1 (0.6)	0.1 (0.4)	0.2 (0.4)
Across-Year Mobility (PA)	3.1 (1.0)	1.0 (0.7)	0.6 (0.6)	0.8 (0.8)	0.7 (0.6)
Exit PA Public Schools	2.4 (0.7)	1.1 (0.5)	0.9 (0.6)	0.2 (0.5)	0.3 (0.5)
Dropout	2.5 (0.7)	1.1 (0.5)	0.8 (0.6)	0.2 (0.4)	0.4 (0.6)

Notes. Each cell reports the mean (standard deviation) count of high schools attended. Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year and who were ever mobile across sectors during the study period (2013-14 through 2016-17 school years).

Table A11. Mobility among Cross-Sector Movers in the 2013/14 Cohort, by Grade and Mobility Type

|	All Students				Students with any across sector mobility			
Panel A: *Grade*	Grade 9	Grade 10	Grade 11	Grade 12	Grade 9	Grade 10	Grade 11	Grade 12
Within-Year Mobility (Philadelphia)	4.6%	3.6%	2.7%	1.2%	18.4%	15.5%	12.4%	6.0%
Within-Year Mobility (PA)	3.9%	2.9%	3.2%	1.9%	12.0%	9.2%	10.4%	6.9%
Across-Year Mobility (Philadelphia)	8.7%	6.0%	3.7%	n/a	18.4%	13.8%	9.1%	n/a
Across-Year Mobility (PA)	1.9%	1.3%	0.7%	n/a	5.4%	3.7%	2.5%	n/a
Exit PA Public Schools	7.9%	6.4%	3.9%	n/a	7.9%	7.6%	5.9%	n/a
Dropout	1.7%	2.3%	2.2%	2.1%	2.3%	3.5%	4.4%	3.9%
Panel B: *Year in HS*	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Within-Year Mobility (Philadelphia)	4.4%	3.6%	3.0%	1.5%	20.1%	16.1%	12.3%	6.8%
Within-Year Mobility (PA)	3.4%	3.0%	3.4%	2.3%	11.4%	9.6%	10.8%	8.0%
Across-Year Mobility (Philadelphia)	8.6%	6.5%	4.3%	n/a	20.1%	15.4%	10.2%	n/a
Across-Year Mobility (PA)	1.6%	1.7%	0.9%	n/a	5.1%	4.9%	2.8%	n/a
Exit PA Public Schools	6.1%	7.1%	6.3%	n/a	4.7%	9.3%	9.6%	n/a
Dropout	0.8%	1.2%	2.7%	3.9%	0.7%	1.3%	4.6%	8.2%

Notes. Each cell reports the percentage of students by grade level with a given mobility event. Sample includes students in the 2013/14 cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year.

Table A12. Association between Student Mobility, Dropout and Exit from Pennsylvania

|	Exit PA Public Schools			Dropout		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: *Extensive Margin*						
Any Mobility	0.026***	0.016***	0.009***	0.060***	0.059***	0.057***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Panel B: *Intensive Margin*						
Mobility Events	0.011***	0.005**	-0.000	0.040***	0.040***	0.038***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Panel C: *Mobility Type*						
Within-Year (Philadelphia)	0.032***	0.022***	0.015***	0.024***	0.021***	0.017***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Within-Year (PA)	0.031***	0.022***	0.016***	0.067***	0.067***	0.063***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Across-Year (Philadelphia)	-0.007*	-0.012***	-0.017***	0.057***	0.055***	0.052***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Across-Year (PA)	0.031***	0.021**	0.017*	0.037***	0.037***	0.034***
	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
P-Value from F-test: *Within-Year (*Philadelphia*) = Within-Year (PA) Across-Year (*Philadelphia*) = Across-Year (PA)*	0.000	0.000	0.000	0.000	0.000	0.000
Student Characteristics	No	Yes	Yes	No	Yes	Yes
Student Achievement	No	No	Yes	No	No	Yes
Student*Year Observations	70,181	70,181	70,181	82,744	82,744	82,744

Notes. Each column within a panel represents a separate regression. Coefficients are reported with robust standard errors in parentheses. Sample includes all high school students (grades 9-12) who attended a Philadelphia high school (traditional or charter school) in any year during the study period, 2013-14 through 2016-17 school years, with available 8th grade PSSA achievement data. Student characteristics include student race, gender, poverty status, FRPL status and special education status. Student achievement includes an indicator for whether a student was academically proficient on the math and reading portions of the 8th grade PSSA exams. Coefficients are statistically significant at the *10%, **5%, and ***1% levels.

Figure A1. Distribution of Student Mobility Rates, by School Sector
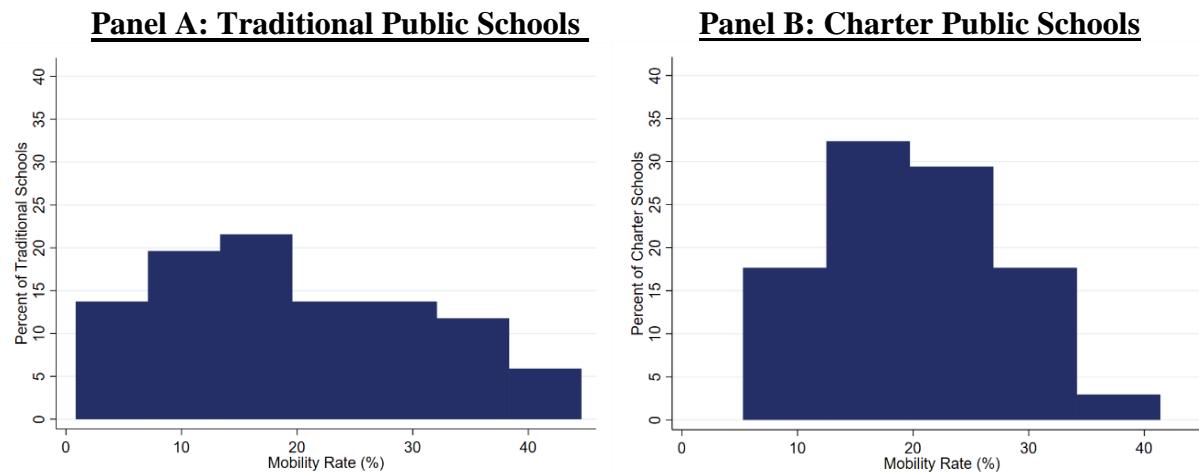
Notes. Panel A shows the school-level distribution of student mobility rates for traditional public schools; Panel B shows the school-level distribution of student mobility rates for charter public schools. Among traditional public schools, the school-level mean (standard deviation) student mobility rate is 20 percent (11.6 percent); among charter public schools, the school-level mean (standard deviation) student mobility rate is 20 percent (7.9 percent). The median school-level student mobility rates are 18 percent and 20 percent for traditional and charter public schools, respectively. There are 51 traditional public schools and 34 charter public schools in the sample. Schools that closed in any academic year during the study period and cyber charters are excluded from this sample. Student mobility rates in traditional public schools (TPS) cannot be directly compared to student mobility rates in charter schools because we are unable to observe student mobility that occurs within the traditional public school system in a given school year. As a result, student mobility rates in TPS are likely underestimated.

Figure A2. Dropout Reasons among 2013/14 Cohort
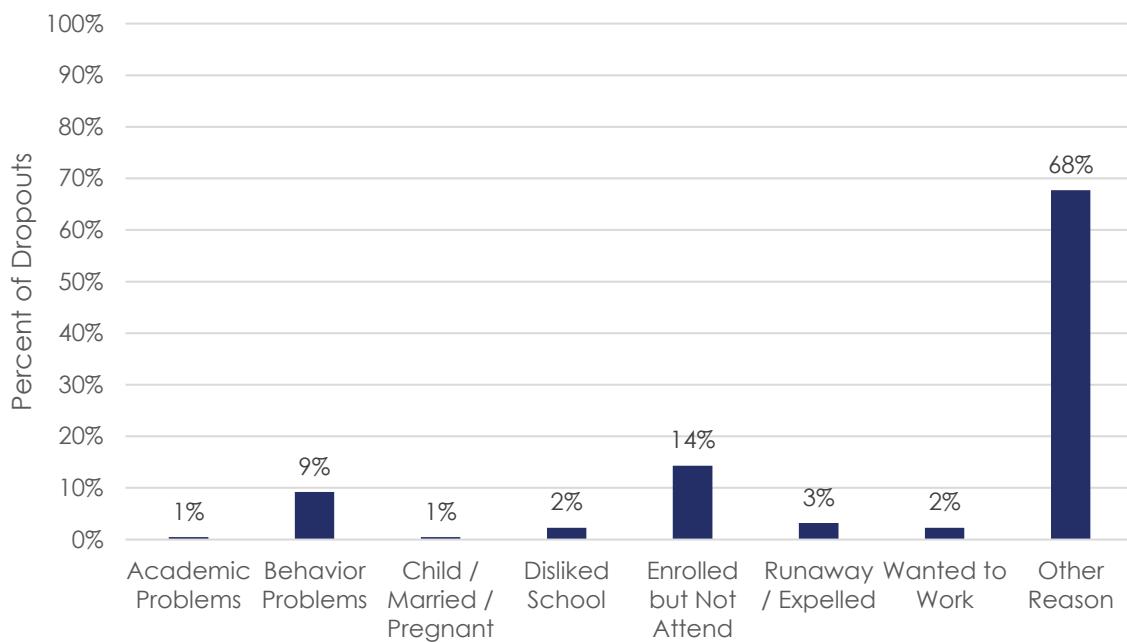
Notes. Sample includes the 1,091 students in the 2013/14 Cohort who were in grade 9 and attended a Philadelphia high school (traditional or charter school) during the 2013-14 school year and then reported to PDE that they dropped out of school.

Appendix B: Statistical Models for Regression Analysis

To examine the association between student mobility and exit from Pennsylvania public education, we estimate a series of linear regression models. We examine three margins of student mobility: (i) any mobility, which captures the extensive margin of mobility; (ii) the number of mobility events, which captures the intensive margin of mobility; and (iii) the type of mobility, which enables insight into whether different types of student mobility have different associations with student exit. We also examine two outcomes which capture different types of exit from Pennsylvania public education: (i) dropout, which includes students who exited public education in Pennsylvania and were identified by PDE as school dropouts; and (ii) exit PA public schools, which includes students who exited public education in Pennsylvania at the end of the academic year and whom PDE does not provide a reason for why these students exited public education in Pennsylvania. We detail each of the regression models below.

(1a) $Dropout_i = \beta_0 + \beta_1(AnyMobility_i) + \mathbf{\Gamma X_i} + \varepsilon_i$

(1b) $ExitPA_i = \beta_0 + \beta_1(AnyMobility_i) + \mathbf{\Gamma X_i} + \varepsilon_i$

In equation (1a), *Dropout* equals 1 if student *i* dropped out of school (zero otherwise). *AnyMobility* equals 1 if student *i* experienced any mobility event, including within-year mobility (Philadelphia and/or PA) and across-year mobility (Philadelphia and/or PA), and zero otherwise. The omitted reference category includes students with no across- or within-year mobility events. **X** is a vector of student characteristics, including race, gender, poverty status, FRPL status, special education status, English language learner status, and 8th grade math and 8th grade reading achievement. In equation (1b), *ExitPA* equals 1 if student *i* exited public education in Pennsylvania (and zero otherwise). All other variables are defined as in equation (1a). This analysis provides insight into the conditional association between any mobility and dropout and exiting PA public schools (i.e., the extensive margin of mobility). We estimate these models with and without controls for **X**. To do so, we pool the data across years with one observation per student; by ignoring the time dimension of the data, we estimate a series of cross-sectional regressions.

(2a) $Dropout_i = \beta_0 + \beta_1(MobilityEvents_i) + \mathbf{\Gamma X_i} + \varepsilon_i$

(2b) $ExitPA_i = \beta_0 + \beta_1(MobilityEvents_i) + \mathbf{\Gamma X_i} + \varepsilon_i$

In equations (2a) and (2b), *MobilityEvents* equals the count of mobility events student *i* experienced, including within-year mobility (Philadelphia and/or PA) and across-year mobility (Philadelphia and/or PA). All other variables are defined as in equation (1a). This analysis provides insight into the conditional association between the count of mobility events and dropout and exiting PA public schools. Namely, to what extent is the probability of dropout and/or exiting PA public schools increasing in the intensity of mobility (i.e., the intensive margin of mobility). As in equations (1a) and (1b), we estimate these models with and without controls for **X**.

(3a) $Dropout_i = \beta_0 + \sum_{j=1}^{J} \gamma_j (MobilityType_i^j) + \mathbf{\Gamma X_i} + \varepsilon_i$

(3b) $ExitPA_i = \beta_0 + \sum_{j=1}^{J} \gamma_j (MobilityType_i^j) + \mathbf{\Gamma X_i} + \varepsilon_i$

In equations (3a) and (3b), *MobilityType* denotes the jth type of student mobility, where *j* ∈ {within-year mobility (Philadelphia), within-year mobility (PA), across-year mobility (Philadelphia), across-year mobility (PA)}. All other variables are defined as in equation (1a). This analysis provides insight into the extent to which the probability of dropout and/or exiting PA public schools vary across different types of student mobility. We then conduct an f-test of the *MobilityType* coefficients to examine whether the association between mobility type and the outcomes vary by type of student mobility. As in equations (1a) and (1b), we estimate these models with and without controls for **X**.