How Long Will It Take Me to Get to School?

Transit Times to School District of Philadelphia High Schools

Acknowledgements

How this report was produced

This report is the result of a collaboration between the Philadelphia Education Research Consortium (PERC) and the Balitmore Education Research Consortium (BERC).

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.

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The Baltimore Education Research Consortium's mission is to facilitate and disseminate short- and long-term strategic research and data analyses that informs policies and practices that impact the educational and life outcomes of Baltimore's children. In partnership with founding members Morgan State University and Baltimore City Public Schools, and more recently eight additional Maryland universities, BERC assembles a diverse coalition of partners to formulate questions worth asking, contribute to conversations worth having, and highlight policy implications worthy of action.

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How Long Does It Take Philadelphia High Schoolers to Get to School?

Transit Times to School District of Philadelphia High Schools in 2018

Molly Pileggi, Marc L. Stein, Alyn Turner, and Nathaniel Dewey • August 2020

Summary

Many large districts now offer students choice in selecting high schools. In Philadelphia, if a student chooses not to attend their neighorhood school, other options include schools with specialized programming in the arts, sciences, or business fields, schools with career and technical education options, and competitive magnet schools.

But choosing an out-of-catchment school rather than a neighborhood school may require a longer or more complicated commute, particulary for students relying on public transit to get to school. Research has shown that commute time and complexity can influence attendance, academic achievement, engagement in school, and health factors associated with sleep.

This report uses School District of Philadelphia high school student enrollment and residence data to estimate student commutes to all 52 traditional district high schools via public transit.[1] We use transit data from the 2017-18 school year to estimate how long it would take for high schoolers to get to school using public transit based on where they live and under optimal conditions (i.e., no delays and use of all available routes). We also analyze how estimated commutes vary by type of school admission (i.e., Neighborhood, Citywide, or Special Admission) and student residential neighborhood (defined as the City Council District in which they live).

> **Fast Facts About Public Transit for SDP students in Philadelphia**
>
> - **SDP transportation policy** – All high school students who live 1.5 miles or farther from school are eligible for free SEPTA Student Transpasses, which are valid on all bus, subway or trolley routes on school days. Students living within 1.5 miles can purchase the same passes from SEPTA at a discounted rate.[2]
>
> - **SEPTA 400-series bus routes** – SEPTA offers several bus routes specifcially designed to help transport students across the city. These routes cut across the city in areas that would typically require at least one transfer to cover the same ground and only run a few times a day, timed to coincide with when students are going to / from school.

We do not examine student commutes to accelerated schools in SDP's Opportunity Network, since they are alternative high schools and don't meet our definition of "traditional" schools.[1] We also do

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[1] For the purposes of this report, we use the term "traditional" high school to refer to schools that held courses exclusively during the day and fit into one of the following SDP categories: Neighborhood, Citywide, or Special Admission high school. Schools in these categories may provide non-traditional programming, such as project-based learning, early college enrollment, work-based internships, or other innovative approaches, but for the sake of simplicity, in this report, they are all considered "traditional" high schools. Educational Options Programs (EOPs), entire schools serving students with alternative needs (e.g. Widener Memorial School), and other schools in SDP's Opportunity Network are not included in our analyses.

not include charter school students in this study, who represent about a third of all high schoolers in Philadelphia.

The findings of this study, described below, can help guide families and students to consider commute time and complexity when selecting schools. We also anticipate that the analysis of variation in commutes may be useful for policy makers at the School District of Philadelphia (SDP) and its School Board, City Council, and SEPTA (Philadelphia's transit authority) as they make ongoing decisions about system-wide school offerings, start times and scheduling options, and transit networks. School-specifc maps with estimated transit times can be found on our website and [downloaded directly here](#).

Key Findings

In the 2017-2018 school year:

- **On average, 60% of SDP high school students reported in surveys that they took public transit to school.** Responses varied by school from a minimum of 14% at Lankenau to a maximum of 95% at Constitution.

- **The average Philadelphia district high school student had an estimated public transit commute time of 28.9 minutes.** While nearly 30 minutes to get from door-to-door may seem like a long time, Philadelphia's average commute time is shorter than that of high schoolers in New York City (31.3 minutes) and Baltimore (36.2 minutes).[3] These differences add up: Compared to the average Philadelphia high school student, the average Baltimore high school student using public transportation would spend 44 more hours commuting over the course of a school year.

- **There is considerable variation in average student commute time within and between schools.** Bartram had the lowest average travel time of 16 minutes, but several other schools have similar patterns. Science Leadership Academy at Beeber had the second longest average travel time, along with four other schools that averaged estimated public transit commutes over 40 minutes.[4]

- **Average transit times vary based on where students live and how close they are to major commute corridors.** We found that students living in Northeast and Northwest Philadelphia (City Council Districts 8, 9, and 10) tended to have longer estimated public transit commutes. In contrast, students who lived along Philadelphia's main commute corridors—Broad Street or Market-Frankford—tended to have shorter commute times (parts of City Council Districts 1, 2, 3, and 5). These trends are likely driven by variation in both the density of schools in specific geographical areas and their proximity to transit lines.

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[2] "Transportation Eligibility Guidelines," School District of Philadelphia, accessed February 25, 2020, https://www.philasd.org/transportation/for-parents/transportation-eligibility-guidelines; "Kindergarten through 12th Grade Students".; Southeastern Pennsylvania Transportation Authority, accessed February 25, 2020 https://www.septa.org/fares/discount/students.html.

[3] Corcoran, Sean P. (2018). "School Choice and Commuting: How Far New York City Students Travel to School." Washington, D.C.: The Urban Institute.; Stein, Marc L., Jeffrey Grigg, Curt Cronister, Celeste Chavis, and Faith Connolly. 2017. "Getting to High School in Baltimore: Student Commuting and Public Transportation." Baltimore: Baltimore Education Research Consortium.

[4] With an average commute time of 70.5 minutes, Lankenau's pattern of students' public transit commutes looked much different than other SDP high schools. The district-wide student survey (https://www.philasd.org/research/programsservices/district-wide-surveys/) also shows that only a small population of students took public transit to get to the school in 2018, but the actual time it took students to get to the school via other modes is unknown.

- **Students attending Neighborhood high schools averaged much shorter and less complex commutes than students attending Citywide and Special Admission schools.** Students attending Neighborhood high schools had an average estimated commute time of 21.7 minutes, compared to 30.8 minutes for Citywide high school students and 38.0 minutes for students at Special Admission high schools. Neighborhood high school students also had the least complex routes to schools, with 70 percent living either within walking distance or close enough to be able to take a single public transit vehicle to school.

Implications for policy and practice

- **Students and families who plan to use public transit to get to school should carefully review, and perhaps even test out, their future commutes before selecting their high school.** If a student learns only after enrolling in a school that they have a long, unsustainable commute, they may be absent or late more often and may also be more likely to change schools to reduce their commute. Changing schools mid-year can have unintended consequences; recent research has shown that students who switch schools during high school are more likely to drop out than their non-mobile peers with similar characteristics and prior achievement.[5]

- **Ensure that the public is aware of the SEPTA 400-series routes, which are designed to support students.** SEPTA offers a specific series of bus routes to help transport students around the city. Our analysis assumes students know of and use these routes. However, these routes are not currently published to common mapping tools like Google Maps. For students unaware of these transit routes, the commute may be considerably longer or more complex than necessary. Students and families could benefit from more transparency about these transportation options when they are choosing a school, as these routes could help make more schools accessible to more students.

- **School principals and personnel should consider commute times and public transit schedules when deciding on school start times.** We analyzed school start times alongside estimated public transit commute times by school to estimate when students across the district need to leave home to get to school on time. We found a wide range, from about 6:00am to 8:45am. Understanding this variation may give school leaders and staff insight into their students' experiences. Also, while determining the most appropriate start time for a school is a complex decision, aligning school start and end times to coincide with public transit schedules might reduce the need for excessively early routes for the over 60% of high school students that rely on public transportation to get to school.

- **City Council members can utilize the variation in estimated school commute times and actual school enrollments to advocate for increased transportation options in their communities.** As our analyses show, SDP high school students in some City Council Districts face longer estimated commutes to school. Students in other Council Districts enrolled in relatively fewer SDP high schools, a possible sign of transportation options limiting accessibility. City Council members can use this information to explore how to provide more public transportation options to their constituents.

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[5] Steinberg, Matthew P., Pileggi, Molly & Neild, Ruth. (2019). *Student Mobility and Dropout in Philadelphia High Schools, 2013-14 through 2016-17.* Philadelphia: The Philadelphia Education Research Consortium

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Why this study

For many high school students, school choice offers access to a variety of schools and specialized programs. Like many large districts, the School District of Philadelphia (SDP) offers students choice in deciding which school is right for their educational needs, particularly when students reach high school. In addition to Neighborhood high schools, options in Philadelphia include schools with specialized programming in the arts, sciences, or business fields, schools with career and technical education options, and competitive magnet schools.

Over time in choice-rich urban districts like Philadelphia, the number of students attending neighborhood public high schools is declining.[6] Recent data show that SDP students exercise choice at high rates. In 2015-16 through 2018-19, almost 90% of eighth grade students applied to schools outside of their neighborhood-assigned schools.[7]

For students relying on public transit, choosing out-of-catchment schools is likely to require longer and more complicated commutes. With a decline in the number of students who choose neighborhood schools, a growing share of students in general are travelling longer distances to school.[8] As with students in other urban and choice-rich districts,[9] many Philadelphia high school students use public transportation to get to school. Recent estimates show that 60% of SDP high school students report taking public transportation to get to school.[10]

Commute time and complexity have wide-ranging effects on student absenteeism rates, academic achievement, engagement in school, and health factors associated with sleep. Students can face several challenges when using public transportation to get to school, including congested vehicles, unreliable route schedules, multiple vehicles needed to reach a destination, and missed transfers causing additional delays.[11] Long and complex commutes can cause increased rates of tardiness and absenteeism, which are both associated with lower academic achievement and engagement with school.[12] In fact, school absences are among the best predictors of whether a student will drop out of high school before earning a diploma.[13] Additionally, early school start

[6] Makarewicz, Carrie. 2013. "Vouchers, Magnet Schools, Charter Schools, and Options." *Transportation Research Record* 2327 (1): 1–8. https://doi.org/10.3141/2327-01.; Teske, Paul, Jody Fitzpatrick, and Tracey O'Brien. 2009. "Drivers of Choice: Parents, Transportation, and School Choice." Washington: Center on Reinventing Public Education.

[7] Wills, Theodore, Negus, Sydney, and Lesnick, Joy. 2019. "School Selection in Philadelphia, 2015-16 to 2018-19: Applications for 9th Grade." Philadelphia: The School District of Philadelphia.

[8] Makarewicz 2013; Teske, Fitzpatrick, and O'Brien 2009

[9] Wilson, Elizabeth J, Julian Marshall, Ryan Wilson, and Kevin J Krizek. 2010. "By Foot, Bus or Car: Children's School Travel and School Choice Policy." *Environment and Planning A* 42 (9): 2168–85. https://doi.org/10.1068/a435.

[10] "School District of Philadelphia District-Wide Surveys." School District of Philadelphia, accessed Jan 2, 2020, https://dashboards.philasd.org/extensions/district-wide-surveys/index.html#/question-compare

[11] Stein, Marc L., Jeffrey Grigg, Curt Cronister, Celeste Chavis, and Faith Connolly. 2017. "Getting to High School in Baltimore: Student Commuting and Public Transportation." Baltimore: Baltimore Education Research Consortium.

[12] Stein, Marc L., and Jeffrey A. Grigg. 2019. "Missing Bus, Missing School: Establishing the Relationship Between Public Transit Use and Student Absenteeism." *American Educational Research Journal* 56 (5): 1834–60. https://doi.org/10.3102/0002831219833917.; Gottfried, Michael A. 2009. "Evaluating the Relationship Between Student Attendance and Achievement in Urban Elementary and Middle Schools." *American Educational Research Journal* 47 (2): 434–65. https://doi.org/10.3102/0002831209350494.; Gottfried, Michael A. 2017. "Linking Getting to School With Going to School." *Educational Evaluation and Policy Analysis* 39 (4): 571–92. https://doi.org/10.3102/0162373717699472.

[13] Allensworth, Elaine M., and John Q. Easton. (2005). *The On-Track Indicator as a Predictor of High School Graduation.* Chicago: The Consortium on Chicago School Research.; Neild, Ruth Curran, and Robert Balfanz. 2006. "Unfulfilled Promise: The Dimensions and Characteristics of Philadelphia's Dropout Crisis, 2000-2005." Philadelphia: Philadelphia Youth Network, The Johns Hopkins University, and University of Pennsylvania.; Stuit, David, Mindee O'Cummings, Heather Norbury, Jessica Heppen, Sonica Dhillon, Jim Lindsay, and Bo Zhu. 2016. "Identifying Early Warning Indicators in Three Ohio School Districts." Washington, D.C.: Institute of Education Sciences, Regional Educational Laboratory Midwest.

times have been found to affect student sleep and academic performance.[14] Such effects could be further exacerbated for students who need to wake up earlier in order to make longer commutes to school. Finally, the availability and complexity of student transportation can also influence student participation in enriching before- or after-school activities.[15]

This report explores how student commutes vary by type of high school (i.e., Neighborhood, Citywide, and Special Admission) and Philadelphia residential neighborhoods (as measured by City Council Districts). Variation in student transit times across the city and for different types of district high schools sheds light on the different experiences that students have getting to school. Additionally, we find evidence that the public transportation system does not serve all students equally in Phildelphia. For some high schools and neighborhoods, students face long, complex commutes via public transit, putting them at greater risk for excessive tardiness or absenteeism.

This report guides families, students, and local decision-makers to consider the commute time and complexity of Philadelphia district high school students who use public transportation to get to school. This study is the first to examine the public transit commutes of high schoolers in Philadelphia. We hope it will be helpful for families and students as they select which high school is the right fit for them. We anticipate that our analysis of variation may also be useful to local decision-makers at the School District of Philadelphia and its School Board, City Council, and SEPTA (Philadelphia's transit authority) in considering school-level policies, like school start times and tardiness policies given student transit realities, as well as system-wide opportunities to improve transit networks to equalize access for all students.

What the study examined

This study examines estimated high school student public transit commutes in the School District of Philadelphia (SDP). We explore both commute times (i.e., minutes) and complexity (i.e., number of vehicles used) to all 52 traditional high schools[16] in SDP based on SEPTA's public transporation network. Within SEPTA's network, we include data from all trolley, subway, and bus routes, including the 400-series bus routes that are specifically designed to help transport students across the city.[17] We also include walking time for students commuting by foot, but exclude Regional Rail lines because the SDP transit subsidy for students does not cover that mode of transportation.[18] Public transportation schedules were obtained from SEPTA and used timetables that were active in the spring of 2018.[19]

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[14] Edwards, Finley. 2012. "Do Schools Begin to Early? The Effect of Start Times on Student Achievement." *Education Next* 12 (3): 52–57.

[15] Pelcher, Allison, and Sonali Rajan. 2016. "After-School Program Implementation in Urban Environments: Increasing Engagement Among Adolescent Youth." *Journal of School Health* 86 (8): 585–94. https://doi.org/10.1111/josh.12411.

[16] For the purposes of this report, we use the term "traditional" high school to refer to schools that held courses exclusively during the day and fit into one of the following SDP categories: Neighborhood, Citywide, or Special Admission high school. Schools in these categories may provide non-traditional programming, such as project-based learning, early college enrollment, work-based internships, or other innovative approaches, but for the sake of simplicity, in this report, they are all considered "traditional" high schools. Educational Options Programs (EOPs), entire schools serving students with alternative needs (e.g. Widener Memorial School), and other schools in SDP's Opportunity Network are not included in our analyses.

[17] SEPTA's 400-series routes cut across the city in areas that would typically require at least one transfer to cover the same ground. These routes only run a few times a day, timed to coincide with when students are going to / from school.

[18] All high school students who live 1.5 miles or farther from school are eligible for free SEPTA Student Transpasses, which are valid on all bus, subway or trolley routes on school days and during school hours.

[19] SEPTA provides their schedules in GTFS format on their "Developers" page (http://www3.septa.org/developer). Schedules were accessed in the spring of 2018.

This report uses student-level school enrollment and home address data from the 2017-18 school year to estimate what each student's public transit commute time would have been under ideal circumstances (i.e., no delays and use of all available routes). Data reflect the estimated public transit commute times of all students who were enrolled in any of the 52 traditional public high schools in SDP at the end of the 2017-18 school year—a total of over 34,000 students. We do not include student commutes to accelerated schools in SDP's Opportunity Network, since they are alternative high schools and don't meet our definition of "traditional" schools.[16] We also do not include charter school students in this study, who represent about a third of all high schoolers in Philadelphia.

The research questions investigated in this report are:

- *How difficult are student commutes?* How long does it take for students to commute to high school using public transportation? How many transfers would students need to make to commute to high school using public transportation?

- *How do commutes vary across SDP schools?* How do commutes vary across types of high schools and programs (i.e., Neighborhood, Special Admission, Citywide)?

- *How do commutes vary across Philadelphia neighborhoods?* Do the residents of certain Philadelphia neighborhoods, defined in terms of their City Council Districts, have longer public transit commutes than their peers?

Limitations

This study does not examine actual commute times. Rather, we estimate optimal public transit commutes for students based on their residential address and which school they were enrolled in during the 2017-18 school year. Some of these students may not rely on public transit to get to school. Though we do not know which students rely on public transit to get to school, over half of students reported in the districts's 2017-18 survey that they took public transit to get to school (see Appendix A for school-specific results from this survey).

This study models high school student commutes to school on foot or using SEPTA's public transit network including buses, trolleys, and subways, but excluding Regional Rail lines. While Regional Rail lines include several stops in Philadelphia and could provide rapid transit to schools near those stops, SDP does not subsidize Regional Rail transportation at this time. Our report therefore focuses on the public transit options that are subsidized. However, excluding Regional Rail lines from our analysis may artificially increase some commute time estimates, since some students may utilize this option for their commutes.

In addition, this study focused on high school student enrollments at the end of the 2017-18 school year. We did not have data that allowed us to look at any cases where students might have attended a different school earlier in the year. Questions focused on the extent to which within-year mobility might be curtailed with more or better information about commute times at the outset are not addressed here.

Finally, we did not examine which high schools a student could reach within a reasonable commute time from home. Questions focused on accessibility could be important topics for future study to understand students' ability to access the school choice options present in Philadelphia.

Box 1

Data and Variables

This study used de-identified student-level data for all students enrolled in traditional district high schools in the School District of Philadelphia (SDP) at the end of the 2017-18 school year. The definition of "traditional" SDP district high schools[16] in this study excludes accelerated schools in SDP's Opportunity Network as well as Philadelphia charter schools. The study includes 34,133 students attending all 52 SDP traditional high schools. SDP provided student records used in this analysis. School information was obtained from Open Data Philly and from SDP's High School Directory.

Student-level data include:

Enrolled school: The last SDP school a student was enrolled in for the 2017-18 school year.

Residential address: The student's registered home address.

School-level data include:

Admissions type: Whether the high school is a Neighborhood, Citywide, or Special Admission high school.

CTE offerings: Whether the high school offers any Career and Technical Education programs (either as a Comprehensive CTE school or by offering specific CTE programs) or offers no CTE programs.

This study also uses public transportation route and schedule data for all bus, trolley, and subway routes run in Philadelphia County by Southeastern Pennsylvania Transit Authority (SEPTA). The route and schedule data were obtained from SEPTA to cover the transit options available in the Spring of 2018. The 400-series bus route data were provided by SEPTA in PDF format and then manually added to the publicly provided General Transit Feed Specification (GTFS) data acquired from SEPTA's website.

What the study found

The average Philadelphia district high school student has a public transit commute time of 28.9 minutes--shorter than in New York City and Baltimore.

Across all School District of Philadelphia traditional high school[20] students in 2017-18, the average public transit commute time was 28.9 minutes. In comparison, similar studies found that the average commute time for high school students in New York was 31.3 minutes and in Baltimore was 36.2 minutes.[21] While a 2 to 7 minute difference might not seem significant, the cumulative additional time spent commuting each year is considerable. For example, the 7.3 minute difference between the average commute in Philadelphia and Baltimore adds up to **44 additional hours** that Baltimore students spent in transit from home to school over the course of a 180-day school year.
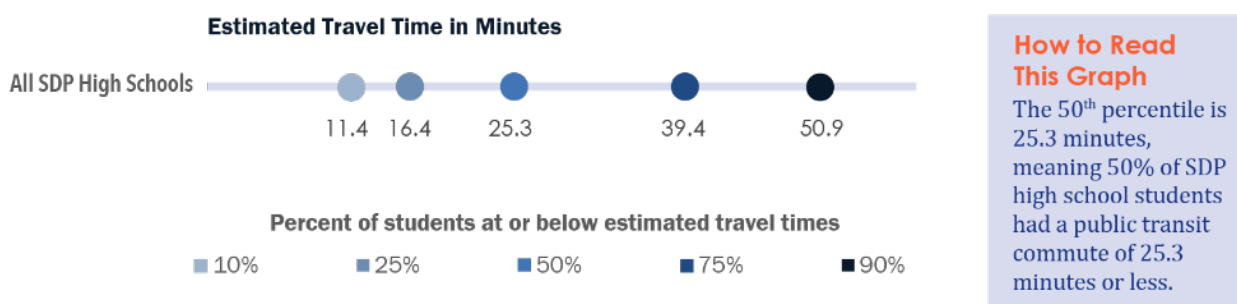
Over 40% of Philadelphia district high school students have a public transit commute of over 30 minutes.

Estimated public transit commute times for most Philadelphia high school students ranged from 11 to 51 minutes, with commute times of more than 30 minutes for two-fifths of students (41%).

Ten percent of Philadelphia district high school students – or nearly 3,500 students – have a public transit commute of 50 minutes or longer.

To better understand public transit commutes for SDP students, we show in Figure 1 below the estimated commute times for all students in SDP high schools, displaying variation by the 10th, 25th, 50th, 75th, and 90th percentile of transit times. To interpret this graphic, note that because the 50th percentile is 25.3 minutes, half SDP high schoolers took 25.3 minutes or less to get to school.

Figure 1. Estimated public transit travel time in minutes for SDP high schoolers by percent of students, 2017-18

Estimated Travel Time in Minutes

All SDP High Schools

11.4 16.4 25.3 39.4 50.9

Percent of students at or below estimated travel times

■ 10%   ■ 25%   ■ 50%   ■ 75%   ■ 90%

How to Read This Graph
The 50th percentile is 25.3 minutes, meaning 50% of SDP high school students had a public transit commute of 25.3 minutes or less.

Note. Author calculations using data for all School District of Philadelphia traditional high school[20] students enrolled at the end of the 2017-18 school year. Sample size = 34,133 students.

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[20] For the purposes of this report, we use the term "traditional" high school to refer to schools that held courses exclusively during the day and fit into one of the following SDP categories: Neighborhood, Citywide, or Special Admission high school. Schools in these categories may provide non-traditional programming, such as project-based learning, early college enrollment, work-based internships, or other innovative approaches, but for the sake of simplicity, in this report, they are all considered "traditional" high schools. Educational Options Programs (EOPs), entire schools serving students with alternative needs (e.g. Widener Memorial School), and other schools in SDP's Opportunity Network are not included in our analyses.

[21] Corcoran, Sean P. (2018). "School Choice and Commuting: How Far New York City Students Travel to School." Washington, D.C.: The Urban Institute.; Stein, Marc L., Jeffrey Grigg, Curt Cronister, Celeste Chavis, and Faith Connolly. 2017. "Getting to High School in Baltimore: Student Commuting and Public Transportation." Baltimore: Baltimore Education Research Consortium.

This figure shows:

- For half of all SDP high school students, public transit commutes were 25.3 minutes or less in 2017-18.
- Estimated commute times were over 50 minutes for 10 percent of SDP high school students. This means that more than 3,400 students had a public transit commute of 50 minutes or longer each way.
- The longest estimated commute was just over 2 hours (not shown).

Estimated commute times varied widely by school, with average travel times ranging from 16.3 to 45.6 minutes.

A school's average public transit travel time is impacted by both where students live and how accessible the school building is to transportation options. Figure 2 below shows the estimated length of public transit commutes for enrolled students for each high of the 52 high schools included in our study. Generally speaking, higher areas of the curves represent more students at the given estimated travel time. In the first graph, we highlight in black the school with the shortest average commute time (Bartram). In the second we highlight the school with the second longest average commute (Science Leadership Academy at Beeber) and in the third we highlight the school with the longest average commute time (Lankenau).[22] In each graph, the grey traces represent distributions for all other schools in the study. While we highlight the extremes here, average commute times for all 52 schools in our study can be found in Appendix A.

Figure 2. Estimated public transit commute time distributions for Bartram, SLA at Beeber, and Lankenau High Schools, 2017-18

Figure 2a. Bartram

Average: 16 minutes
10th Percentile: 7 minutes
50th Percentile: 14 minutes
90th Percentile: 26 minutes

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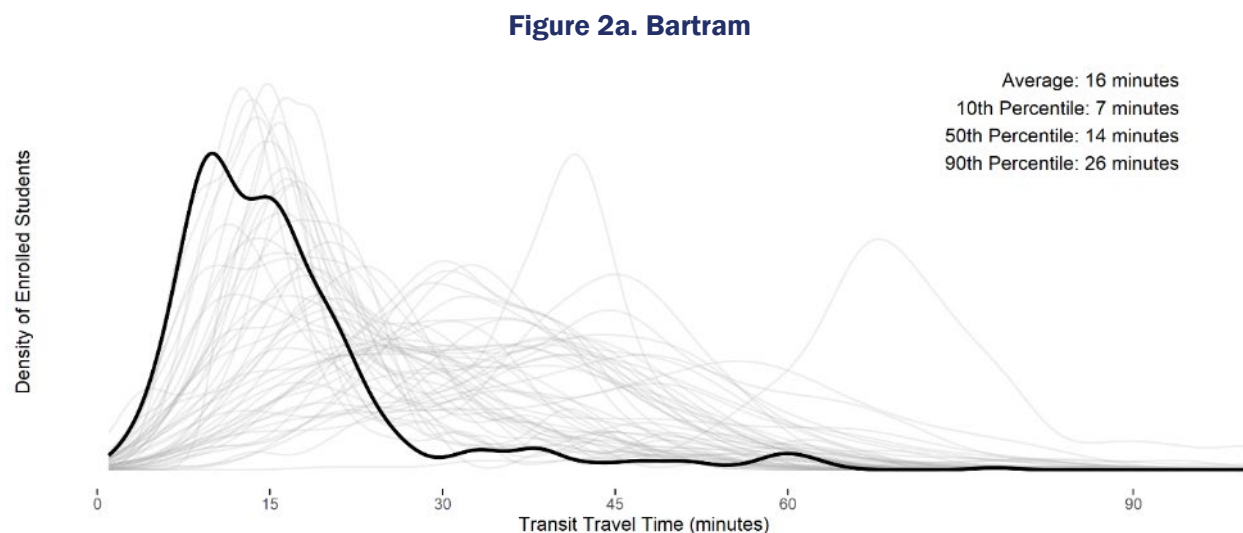
[22] A complete listing of average school commute times, the time a student with the average commute would need to leave home, and the percentage of students who decribed using public transit or walking to school in the district-wide survey can be found in Appendix A.

6 | H o w   L o n g   D o e s   i t   T a k e   t o   G e t   t o   S c h o o l ?

Figure 2b. Science Leadership Academy at Beeber
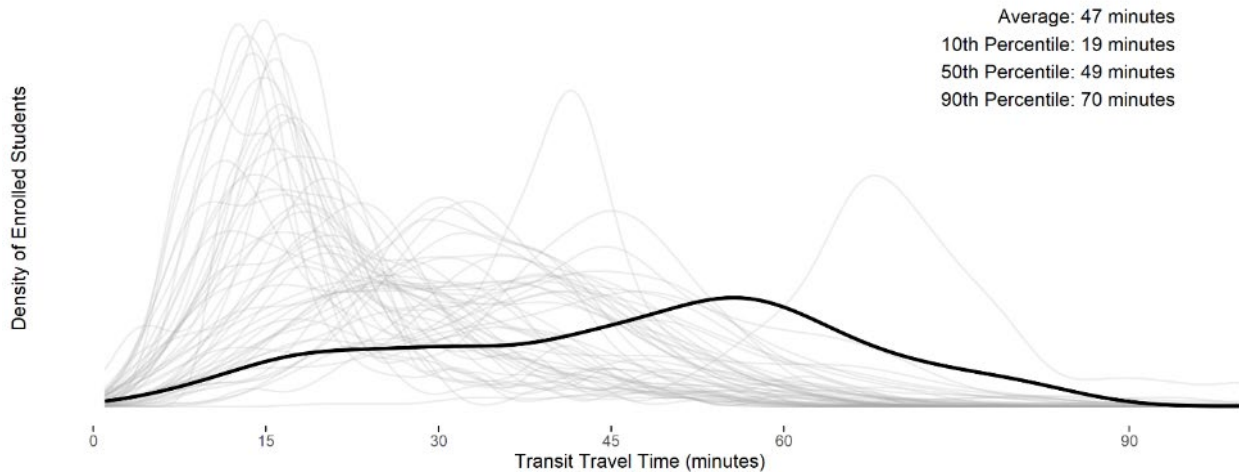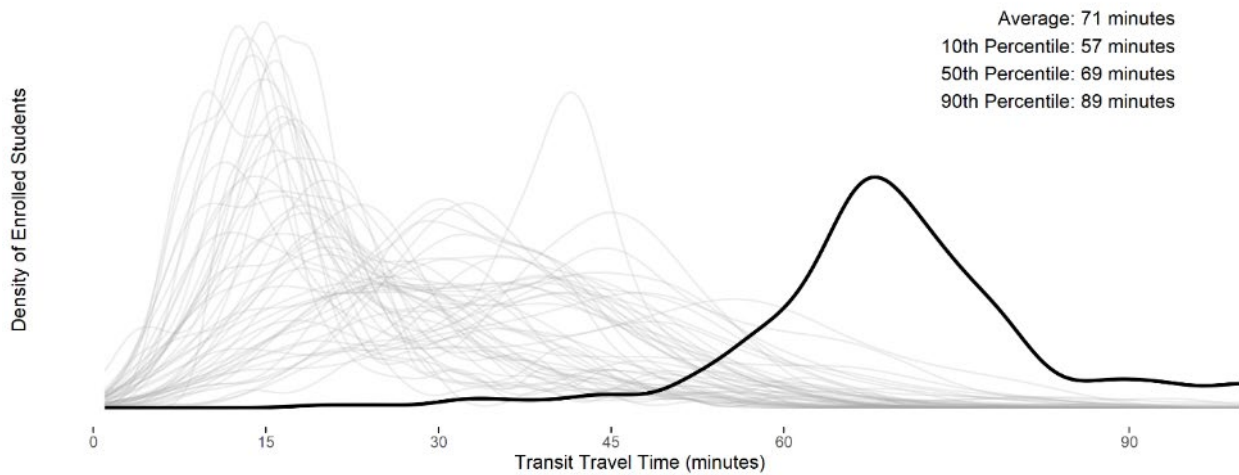
Average: 47 minutes
10th Percentile: 19 minutes
50th Percentile: 49 minutes
90th Percentile: 70 minutes

Figure 2c. Lankenau

Average: 71 minutes
10th Percentile: 57 minutes
50th Percentile: 69 minutes
90th Percentile: 89 minutes

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year. Graphs represent the kernel density distribution for each school. Generally speaking, higher areas of the curves represent more students at the given estimated travel time. Grey traces represent kernel density distributions for all other schools in the study.

Notably:

- **Almost all students at Bartram had estimated commutes of less than 30 minutes.** Bartram had the lowest average commute of 16.3 minutes (Figure 2a). Several other schools also had average commute times in the 16-17 minute range, including Furness, Kensington High, Strawberry Mansion, and Sayre.

- **Science Leadership Academy at Beeber students had the second highest average commute time of 46.5 minutes (Figure 2b).** Four other SDP high schools had average student commute times of over 40 minutes. All are Special Admission high schools and thus draw students from across the city.

- **Almost all students enrolled at Lankenau would have to commute over an hour to get to school using public transit.**[23] Lankenau had by far the highest average estimated public transit commute time of 70.5 minutes. As shown in Appendix A, very few students at Lankenau reported taking public transit to get to school (14%), perhaps because of the long public transit commute time.

Variation in public transit commute times of students enrolled in the same school differ significantly.

Within-school variation is important since a school could have a low overall average commute time, but still enroll some students with very long commutes. As can be seen in Figure 2, we report commute times at three percentiles: 10th, 50th, and 90th. The percentile times indicate what percent of students had estimated commutes of that length or shorter. To understand variation in estimated commute times, we looked at the overall shape of the school graphs as well as the difference in estimated commutes between the 90th and 10th percentiles. This difference can be interpreted as the range of commute times within a school.

Again using Bartram, SLA Beeber and Lankenau as examples, we note the following:

- **Most students at Bartram have similar estimated commute lengths (Figure 2a).** The difference between the 90th and 10th percentile is only 19 minutes, the smallest within-school variation in estimated commute times of all SDP high schools in our study. This similarity can also be seen in the shape of the graph in Figure 2a, which shows a steep peak concentrated around 15 minutes.

- **Most Lankenau students also have fairly similar estimated public transit commutes times (Figure 2c).** The Lankenau graph shows a similar peak, though slightly more spread out than the Bartram graph and shifted much farther to the right to reflect longer commute times. The difference between the 90th and 10th percentile commute at Lankenau is 32 minutes, about in the middle of the range of all schools in our study.

- **Students at Science Leadership Academy at Beeber had highly varied estimated commute times (Figure 2b).** This level of variation in student commute times can be seen by the flatness of the curve in Figure 2b. The 90th to 10th percentile difference is 51 minutes, second highest of all SDP high schools.

Estimated public transit commute times, including the 10th-90th percentile times, for all SDP high schools can be found in Appendix A.

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[23] The SDP High School Directory (https://www.philasd.org/studentplacement/wp-content/uploads/sites/19/2019/09/HS-Directory-2020.pdf) references "shuttle busses" used to transport students from North and Northwest Philadelphia locations, but those routes are not included in this model as schedules are not published and they are not public transportation offerings.

Explaining Variation in Student Commutes

Varied transportation access can make students with fewer transit options more at risk of tardiness and absenteeism. In this section, we examine two types of variation—by residential location and school admission type—in greater depth to explain some of the variation in estimated commute times reported above.

A. Variation in Commute Times by Residential Location

The difference in commute times between schools can be explained in part by their locations in the city of Philadelphia. Variation in student transit times across the city reflect in part the variation in public transportation options by neighborhood. For example, Lankenau, the school with the longest average public transit commute time, is located in the far northwest corner of Philadelphia and in an area that is not directly serviced by any public transportation routes.[24] On the other hand, Bartram, with the shortest average commute time, is located in Southwest Philadelphia and is less than two blocks from two trolley lines and several bus routes.

In this section, we define district high school students' "residential location" as their City Council District. Defining residential location in this way is intended to help inform Council District members of how their constitutents are impacted by transit and high school options.

Average estimated transit times varied based on where students lived.

To examine how much commute times varied based on where students live, Table 1 shows the estimated public transit commutes of students living in each City Council District (a map of the Council District locations precedes the table). The first two columns of Table 1 show average travel time in minutes and the percentage of students with estimated commute times longer than the district average of 28.9 minutes. We also present the number and percent of students in each Council District to show how high school students are distributed across the city. Finally, we present the number of schools with resident student enrollment by Council District to show the degree to which students from each district are attending schools across SDP.

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[24] The closest Regional Rail stop to Lankenau is still a 25 minute walk from Lankenau, with no other public transit routes servicing that area. Therefore, even if Regional Rail routes were included in this model, the estimated public transit commutes would remain long.

Table 1. Estimated commute characteristics for Philadelphia high school students in 2017-18, by students' home City Council District[25]
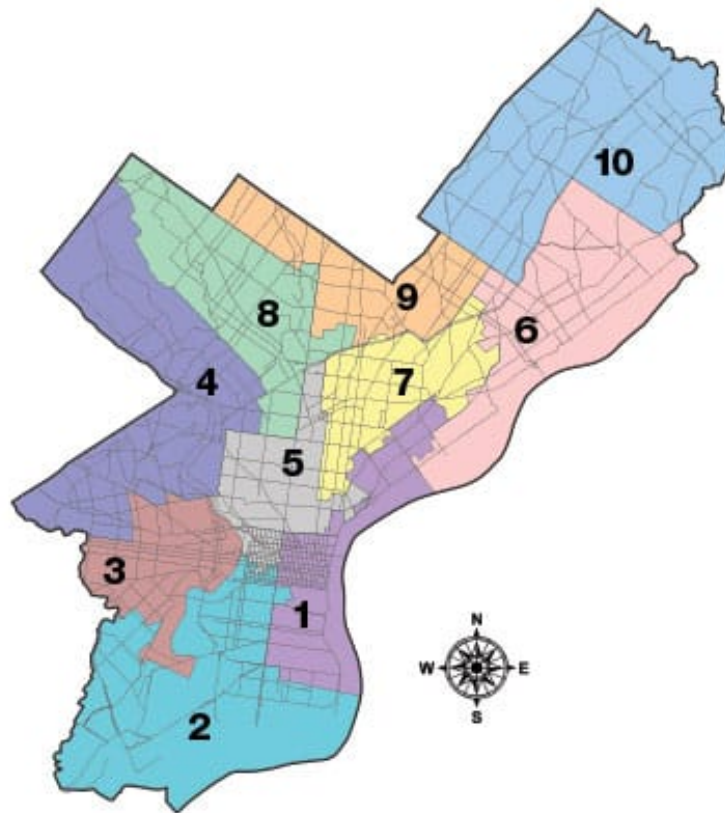
City Council District	Average Travel Time in Minutes	% of Students with Transit Times Longer than the District Average	Students		Number of Schools with Resident Student Enrollment
			Number	% of Study Sample	
All Districts	28.9	42.9%	34,133	100%	52
1	23.1	28.8%	2,837	8.3%	47
2	31.1	49.3%	2,605	7.6%	51
3	27.7	43.1%	3,082	9.0%	52
4	31.8	51.4%	2,509	7.3%	52
5	25.1	32.0%	2,734	8.0%	52
6	29.7	42.7%	3,956	11.6%	46
7	25.8	35.7%	5,139	15.1%	52
8	33.2	58.2%	3,182	9.3%	52
9	31.5	49.4%	4,806	14.1%	51
10	30.3	40.0%	3,286	9.6%	37

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year.

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[25] *District Map*, Map Archives of the City Council Philadelphia. Accessed March 30, 2020. http://phlcouncil.com/media_category/maps/

Notably:

- **Commute times vary by City Council District.** For example, nearly 60 percent of District 8 (covering the Germantown/Chestnut Hill neighborhoods) students had transit times longer than the district average, compared to only 29 percent of students living in District 1 (covering neighborhoods along the Delaware River from Port Richmond through South Philly).

- **Small differences in average commute times can make a big difference over the course of a year.** For example, there is a 10-minute difference in the average estimated travel time for students living in City Council District 8 compared to that for students living in Council District 1. That 10 minute difference translates to **60 hours** of additional transit time for students using public transit in City Council District 8 compared to District 1 over the course of a 180-day school year.

- **Students from nearly all areas of the city were commuting to nearly all high schools.** Nearly all City Council Districts had students attending about 50 unique high schools within SDP, of the 52 available. The exception to this pattern is City Council District 10, located in far Northeast Philadelphia, where students were enrolled in only 37 of 52 schools.

These trends in average transit times reflect variation in the proximity of transit to student residence. For example, in Council districts 1, 3, and 5 (covering much of North, South, and West Philadelphia), Broad Street and Market Street serve as the city's primary transportation corridors with many public transit stops along them. Students living in these areas likely have transit options nearby that they use to get to school. In Council Districts 8, 9, and 10 (covering much of Northeast and Northwest Philadelphia), transit options are fewer and more spread out.

Transit times are also impacted by how many schools are present in a geographical area and how close a chosen school is to modes of transit. While we do not explictly report the number of schools "nearby" (i.e., with relatively short public transit commute times), geographically we know that many high schools in Philadelphia are also clustered along the main public transit corridors in Philadelphia: the Broad Street and Market Street corridors. The abundance of school options along these corridors means that students who live along these corridors might not need to spend as much time commuting to a school that meets their needs (e.g., some of Districts 1, 2, 3 and 5).[26]

Appendix B provides several maps that help highlight this variation in commute time based on a student's place of residence.

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[26] In Council Districts 8, 9, and 10 (Northeast and Northwest Philadelphia), there are fewer school options, with only 11 of the 52 SDP traditional high schools in those three districts.
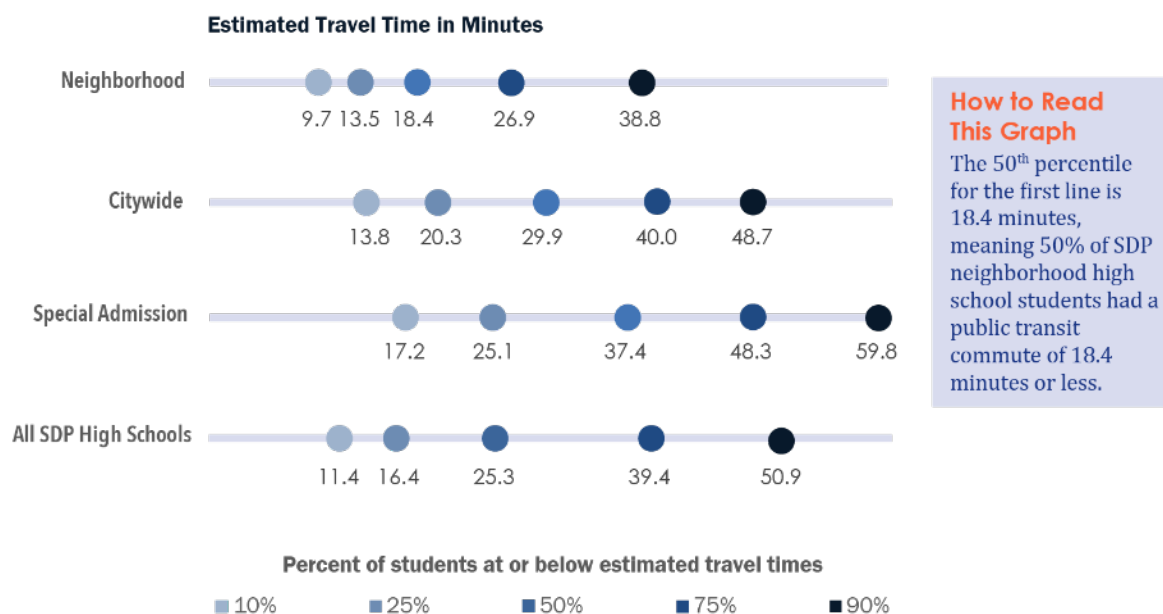
B. Variation in Commute Times by School Type

School commute times are also associated with school admission type. High schools in SDP admit students in different ways.[27] Neighborhood schools admit students based on catchment area, though some Neighborhood schools have specialized programs that draw students from around the city. Citywide schools admit students from the whole city, regardless of student residence address. Special Admission schools accept applicants based on criteria that may include grades, attendance, state test results, or disciplinary records. These differences result in variation in student commuting patterns.

Students attending Neighborhood high schools averaged much shorter commutes than students attending Citywide and Special Admission schools.

Only one-fifth (20%) of students at Neighborhood high schools had commutes longer than 30 minutes, compared to half (50%) of students at Citywide schools and two-thirds (66%) of Special Admission students (results not shown).

Figure 3 displays variation in public transit times by percent of students grouped by school type. The first three groups each represent a different school type: Neighborhood, Citywide, and Special Admission. For comparison, we also provide a fourth graph that displays average commute times for all schools (as shown in Figure 1 above). On each line is marked the 10th, 25th, 50th, 75th, and 90th percentiles of estimated public transit commute time for students attending each scool type.

Figure 3. Estimated public transit commute time in minutes for SDP high schoolers by percent of students and school type, 2017-18

Estimated Travel Time in Minutes

Neighborhood — 9.7 13.5 18.4 26.9 38.8
Citywide — 13.8 20.3 29.9 40.0 48.7
Special Admission — 17.2 25.1 37.4 48.3 59.8
All SDP High Schools — 11.4 16.4 25.3 39.4 50.9

Percent of students at or below estimated travel times
■ 10% ■ 25% ■ 50% ■ 75% ■ 90%

How to Read This Graph
The 50th percentile for the first line is 18.4 minutes, meaning 50% of SDP neighborhood high school students had a public transit commute of 18.4 minutes or less.

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year. Sample sizes for each school group were: Neighborhood = 16,766; Citywide = 5,198; Special Admission = 12,169; All SDP high schools = 34,133 students.

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[27] "High School Directory: Fall 2020 Admissions." 2019. Philadelphia: The School District of Philadelphia. Accessed Jan 15, 2020 https://www.philasd.org/studentplacement/wp-content/uploads/sites/19/2019/09/HS-Directory-2020.pdf

Notably:

- **Students attending Neighborhood high schools have the shortest estimated transit times, followed by those attending Citywide and Special Admission schools.** Because Neighborhood schools are mostly attended by youth who live within the school's catchment, students attending Neighborhood schools were estimated to have the shortest median travel time of the three groups at 18.4 minutes. With a median commute time of 29.9 minutes, students enrolled in Citywide admission schools have significantly longer public transit commutes. Students at Special Admission schools tended to have the longest commutes, with a median time of 37.4 minutes.

Relative to their peers attending Neighborhood high schools, the difference of 10 minutes per commute for Citywide students and nearly 20 minutes for Special Admission students translates to 60 hours and 120 hours more time commuting during a full school year, respectively.

Students at Neighborhood high schools have similar estimated commute times to their peers, while students at Citywide and Special Admission schools have more varied commute times.

We also examined variation in estimated commute times within school type groupings. Variation by type is important to consider because average commute times can mask significant differerences in commute times.

Notably:

- **Within-group estimated public transit commute times were most similar for students in Neighborhood schools, whereas travel times varied more signficantly for students attending Citywide and Special Admission schools (Figure 3).** Most Neighborhood high school students' estimated commute times fell in a 29-minute range, from 10 to 39 minutes in total. In comparison, the bars for Citywide and Special Admission schools cover a wider range of times, meaning students had more varied commute times, covering 35-minute and 43-minute spans respectively.

C. Commute Complexity by School Admission Type

The complexity of a student's commute can also affect attendance, achievement, and engagement in school.[28] A transit route is more complex if it requires a student to take multiple vehicles or make multiple transfers (e.g. a bus to a subway line). This increase in complexity can also lengthen a commute when delays in one line result in missing a transfer.

More than half of Citywide and Special Admission students would need at least two vehicles to get to school if using public transit.

To analyze how transit complexity differs by school type, Figure 4 displays the percentage of students enrolled in each type of school that would need to take 0, 1, or 2 or more public transit

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[28] Stein, Marc L., and Jeffrey A. Grigg. 2019. "Missing Bus, Missing School: Establishing the Relationship Between Public Transit Use and Student Absenteeism." *American Educational Research Journal* 56 (5): 1834–60. https://doi.org/10.3102/0002831219833917.

vehicles to commute to school. A student taking zero public transit vehicles would get to school most quickly by walking.

Figure 4. Percentage of Philadelphia high school students by the number of public transportation vehicles required in their estimated commutes, by school type

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year. A student would be estimated to take zero vehicles if they could walk to school in a shorter time period than taking any public transit route.

Notably:

- **Very few students at Citywide and Special Admission schools lived close enough to walk to school.** For 20 percent of students at Neighborhood high schools, walking was their quickest commute. In contrast, only 5 and 3 percent of students, respectively, lived within walking distance of Citywide and Special Admission schools.

- **Most students at Neighborhood high schools could either walk or take a single public transit vehicle to get to school, while more than half of Citywide and Special Admission students would need at least two vehicles if using public transit.** More than 70 percent of Neig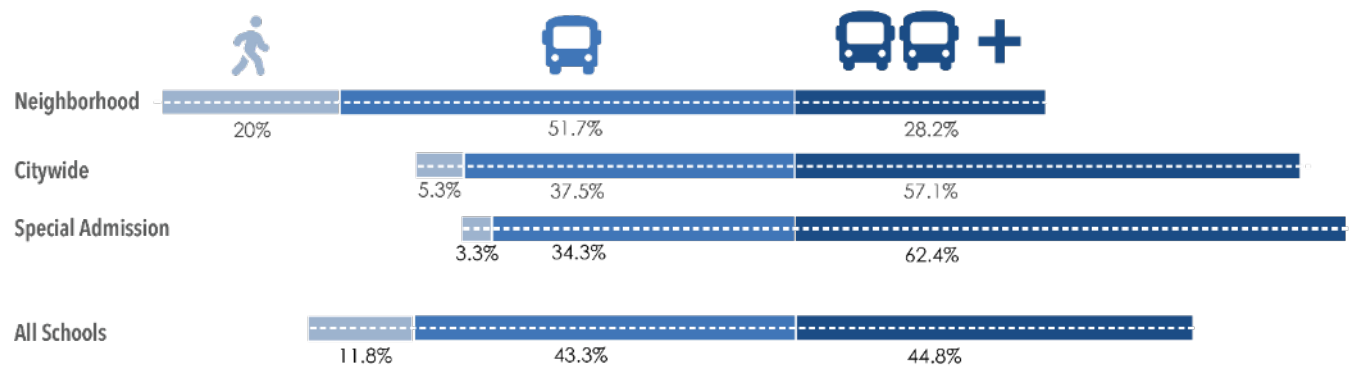hborhood high school students were estimated to commute to school without transferring between public transit vehicles. In comparison, 43 and 38 percent of Citywide and Special Admission high school students, respectively, had these minimally complex commutes to school. More than half of students at these types of schools would need to rely on 2 or more public transit vehicles to get to and from school.

Implications for policy and practice

Given the wide range of transit times across the city, students and families should carefully review, and perhaps even test out, what their public transit commutes to school would be before selecting their high school.

Many high schools in the School District of Philadelphia offer unique programs or school environments that might attract students from across the city. When students and families are making choices about which high school is best for them, it is important that they include their daily commute as a factor when deciding which school to attend.

As our analyses show, school choice can make a significant difference in commute time. For instance, if a student was weighing a choice between going to The LINC or Building 21, they could have a very different commute to each school. If their public transit commute times matched the

schools' estimated averages (21.5 minutes for The LINC and 37.4 minutes for Building 21, as displayed in Appendix A), that would add up to a 95 hour difference in time spent commuting over the course of the school year.

Some K-8 and middle schools in Philadelphia have recognized the importance of assessing the future commuting burden for their 8th graders, using part of a school day to have them test out high school commutes before they finalize their choice. While not explicitly analyzed here, a more informed choice with respect to commute time may reduce the need to transfer schools mid-way through the year. Reducing within-year transfer rates would go a long way to improving outcomes for students; recent research has shown that high school students who transfer schools are more likely to drop out than their non-mobile peers with similar characteristics and prior achievement.[29]

Ensure that the public is aware of the SEPTA 400-series routes, which are designed to support students.

SEPTA has developed 400-series bus routes to help transport students to schools around the city. These routes run several buses a day and are timed around school start and end times. They are designed to simplify transportation to and from schools in parts of the city that would otherwise require a student to take several transit lines (e.g. a bus from Northwest Philly to the Broad Street line to a trolley line).

Our analysis assumes the knowledge and regular use of these routes to get to school. However, these routes are not currently published to common mapping tools like Google Maps. Furthmore, while students and families can find out about these routes by contacting individual schools or reviewing SDP's High School Directory, the schedules of these routes are only available in paper or PDF schedules published by SEPTA.

We found that commute times are longer when these routes are not included in our estimates (results available upon request). To maximize accessibilty and minimize commute times, students and families could benefit from more transparency about these transportation options when they are selecting their schools.

School principals and personnel should consider transit options when determining school start times.

According to SDP's student survey in 2018, a majority (60%) of high school students take public transportation to get to and from school.[30] While the determination of school start times must take many factors into account, school principals and district personnel should be sure to consider public transporation options and schedules when setting school start and end times. To help illustrate how commute times interact with school start times, the table in Appendix A shows the time that a student with an average commute time to the school would need to leave home in order to arrive at school on time. For example, a Bartram student with the average estimated commute time would need to leave home at 7:38am to arrive on time. In comparison, a George Washington student with the average commute time would need to leave home at 7:11am to arrive on time for school.

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[29] Steinberg, Matthew P., Pileggi, Molly & Neild, Ruth. (2019). *Student Mobility and Dropout in Philadelphia High Schools, 2013-14 through 2016-17.* Philadelphia: The Philadelphia Education Research Consortium

[30] "School District of Philadelphia District-Wide Surveys." School District of Philadelphia, accessed Jan 2, 2020, https://dashboards.philasd.org/extensions/district-wide-surveys/index.html#/question-compare

While public transporation schedules can change, aligning school start and end times to coincide with those schedules can reduce commute times and tardiness. Principals and district personnel should understand both the average commute time as well as variation within schools, in order to ensure all students' experiences are considered.

District personnel can also keep the overall transportation network in the city in mind when deciding where schools should be located if new schools are being opened. Locating schools near multiple public transit lines will likely make it more accessible to students from more neighborhoods around the city. For example, Girls High is a Special Admission school, a group of schools which our analysis shows tend to have higher estimated commute times, that had an average estimated commute time of 31.5 minutes (See Appendix A). This puts it at the low end of commute times compared to other Special Admission schools. Girls High is located just a few blocks from Fern Rock Transportation Center, which is a hub for a subway line and several bus routes, as well as a Regional Rail station. Situating schools near transit hubs can make them more accessible to students from different neighborhoods around the city.

City Council members can utilize these findings to advocate for increased transportation options in their communities.

As our analyses show, SDP high school students in some City Council Districts face longer estimated commutes to school. In particular, in Council Districts 4 and 8, more than half of all students have estimated commute times longer than the average SDP student. These longer commute times might also be impacting which schools students consider when they are deciding which high school to apply to. In Council District 10 in particular, resident students are enrolled in fewer of the available SDP high schools compared to all other Districts. This could be a sign that students don't feel they can get to as many schools in a managable time using the existing transit network.

City Council members can use this information about student enrollments and estimated commute times to advocate for providing more public transportation options to their constituents. These additional options could be traditional bus routes offered throughout the day or could be additional 400-series routes focused on and timed to support students getting to and from school, providing they are adequately publicized and integrated into common mapping applications.

Appendix A: Average Transit Times by School, 2017-18

Table A1. SDP Neighborhood high school estimated public transit commute statistics and student reported mode of transportation, 2018

	Estimated Public Transit Commute Statistics					Time student would leave home if they had the commute time matching the school's			According to 2018 District Survey, percent of students who	
	Average Travel Time	Standard Deviation	10th Percentile	50th Percentile	90th Percentile	Average	10th Percentile	90th Percentile	Took Public Transit to School	Walked to School
Bartram	16.3 min	10.9 min	7.1 min	14.2 min	25.5 min	7:38a	7:47a	7:28a	40%	48%
Edison	20.7	10.1	11.9	18.3	33.7	7:20	7:29	7:07	34%	30%
Fels	25.9	12.7	9.9	24.6	42.2	7:19	7:35	7:03	51%	23%
Frankford	20.7	10.5	10.4	17.9	35.1	7:39	7:50	7:25	43%	34%
Franklin HS	23.4	10.2	10.9	21.5	38.4	7:42	7:54	7:27	70%	7%
Furness	17	10.8	7.9	13.6	32.8	7:43	7:52	7:27	29%	52%
George Washington	23.9	15.3	8.8	20.9	43.3	7:11	7:26	6:52	44%	23%
Kensington CAPA	19.9	9.4	10.0	17.7	34.1	7:40	7:50	7:26	60%	12%
Kensington H.S.	16.8	8.8	8.7	15.0	28.4	7:43	7:51	7:32	41%	34%
Kensington Health	19.4	9.0	10.2	17.1	33.0	7:31	7:40	7:17	43%	23%
Lincoln	24.7	12.6	13.5	20.7	41.5	7:10	7:22	6:54	36%	25%
MLK	19.8	10.1	9.2	17.6	32.2	7:40	7:51	7:28	47%	36%
Northeast	21.6	10.9	11.2	18.7	37.0	7:20	7:31	7:05	33%	25%
Overbrook High	19.6	12.2	8.0	17.1	35.2	7:21	7:33	7:06	49%	30%
Penn Treaty	21.9	11.1	10.2	20.0	38.0	7:18	7:30	7:02	45%	28%
Roxborough	35.5	14.9	13.4	35.9	52.1	7:24	7:47	7:08	76%	10%
Sayre	17.4	13.6	7.2	13.5	32.5	7:43	7:53	7:28	24%	68%

	Estimated Public Transit Commute Statistics					Time student would leave home if they had the commute time matching the school's			According to 2018 District Survey, percent of students who	
	Average Travel Time	Standard Deviation	10th Percentile	50th Percentile	90th Percentile	Average	10th Percentile	90th Percentile	Took Public Transit to School	Walked to School
South Philadelphia	20.4	12.8	7.9	15.2	38.6	7:34	7:46	7:15	45%	38%
Strawberry Mansion	16.8	10.0	8.1	14.4	27.8	7:43	7:52	7:32	31%	56%
Vaux High	20.1	10.6	7.1	18.4	39.0	7:40	7:53	7:21	43%	47%
West Philadelphia	18.5	10.6	8.8	15.9	30.7	7:41	7:51	7:29	49%	39%
Neighborhood Overall	21.7	12.3								

Note. Estimated public transit commute statistics produced by author calculations using data for all School District of Philadelphia students enrolled in Neighborhood high schools at the end of the 2017-18 school year (N=16,766 students). Average time student leaves home calculated by subtracting the average student travel time from the start time of the school day. District survey results obtained from https://dashboards.philasd.org/extensions/district-wide-surveys/index.html#/home.

Table A2. SDP Citywide high school estimated public transit commute statistics and student reported mode of transportation, 2018

	Estimated Public Transit Commute Statistics					Time student would leave home if they had the commute time matching the school's			According to 2018 District Survey, percent of students who	
	Average Travel Time	Standard Deviation	10th Percentile	50th Percentile	90th Percentile	Average	10th Percentile	90th Percentile	Took Public Transit to School	Walked to School
Building 21	37.4 min	14.1 min	17.9 min	38.2 min	54.8 min	7:19a	8:08a	7:31a	73%	5%
Constitution	31.0	9.5	18.7	30.6	42.1	6:59	7:31	7:08	95%	0%
Dobbins	30.5	14.2	11.9	29.1	50.3	6:55	7:18	6:40	74%	16%
HS of the Future	34.9	13.5	18.1	34.3	51.6	7:24	7:12	6:38	86%	4%
LINC	21.5	12.4	9.9	17.1	38.0	7:49	7:36	7:08	50%	19%
Mastbaum	25.2	12.2	10.1	23.4	42.1	7:25	7:40	7:08	60%	17%
PMA	30.1	12.5	13.5	29.9	45.6	7:10	7:27	6:54	73%	9%
Randolph	32.7	12.5	16.6	32.4	48.8	6:57	7:13	6:41	79%	6%
Robeson	25.7	10.4	14.4	23.0	41.1	7:04	7:16	6:49	78%	5%
Swenson	36.7	12.0	23.3	34.4	51.8	7:13	7:27	6:58	64%	2%
U School	31.9	14.0	14.2	31.5	50.9	8:23	8:41	8:04	73%	7%
Workshop	26.6	14.8	12.5	21.8	49.3	7:48	8:03	7:26	73%	12%
Citywide Overall	**30.8**	**13.5**								

Note. Estimated public transit commute statistics produced by author calculations using data for all School District of Philadelphia students enrolled in Citywide high schools at the end of the 2017-18 school year (N=5,198 students). Average time student leaves home calculated by subtracting the average student travel time from the start time of the school day. District survey results obtained from https://dashboards.philasd.org/extensions/district-wide-surveys/index.html#/home.

Table A3. SDP Special Admission high school estimated public transit commute statistics and student reported mode of transportation, 2018

	Estimated Public Transit Commute Statistics					Time student would leave home if they had the commute time matching the school's			According to 2018 District Survey, percent of students who	
	Average Travel Time	Standard Deviation	10th Percentile	50th Percentile	90th Percentile	Average	10th Percentile	90th Percentile	Took Public Transit to School	Walked to School
Bodine	32.8 min	12.4 min	15.8 min	32.4 min	48.7 min	7:12a	7:29a	6:56a	77%	5%
CAPA	39.9	15.5	18.5	41.1	57.3	7:14	7:35	6:57	79%	4%
Carver	41.0	12.6	21.7	42.7	55.1	7:09	7:28	6:55	78%	4%
Central	43.1	14.2	23.8	43.1	61.2	7:17	7:36	6:59	79%	2%
FLC	34.4	11.6	21.3	33.7	48.5	7:20	7:33	7:06	86%	4%
GAMP	38.8	9.1	26.3	40.2	48.9	7:23	7:36	7:13	41%	16%
Girls	31.5	13.1	16.0	30.4	49.5	6:40	6:56	6:22	83%	4%
Hill-Freedman	34.4	20.0	12.0	28.0	65.5	7:26	7:48	6:55	54%	15%
Lankenau	70.5	14.0	56.9	69.1	88.7	6:04	6:18	5:46	14%	2%
Masterman	37.3	17.3	17.5	33.2	62.2	7:38	7:57	7:13	56%	7%
Motivation	25.1	14.0	10.8	22.6	48.4	7:40	7:54	7:17	72%	13%
Palumbo	31.8	14.0	14.5	32.5	50.0	7:28	7:46	7:10	70%	11%
Parkway C.C.	32.4	10.5	20.0	31.6	44.7	7:46	7:58	7:33	84%	0%
Parkway N.W.	26.4	15.4	10.7	22.2	51.0	7:14	7:29	6:49	58%	16%
Parkway W.	29.4	17.4	13.4	24.3	46.9	7:16	7:32	6:58	70%	17%
Rush	39.8	19.4	15.6	39.7	62.6	7:10	7:34	6:47	49%	6%
Saul	44.4	17.6	18.8	45.6	66.8	7:26	7:51	7:03	76%	4%
SLA	34.7	14.8	17.2	33.9	53.9	7:40	7:58	7:21	79%	7%
SLA at Beeber	46.5	19.3	18.6	49.5	70.3	7:28	7:56	7:05	69%	9%
Special Admit Overall	**38.1**	**16.7**								

Note. Estimated public transit commute statistics produced by author calculations using data for all School District of Philadelphia students enrolled in Special Admission high schools at the end of the 2017-18 school year (N=12,169 students). Average time student leaves home calculated by subtracting the average student travel time from the start time of the school day. District survey results obtained from https://dashboards.philasd.org/extensions/district-wide-surveys/index.html#/home.

Appendix B: Citywide Maps Showing Estimated Student Commute Times to their Enrolled Schools

The two maps below display how estimated student commute times varied based on where in Philadelphia the student resided. We present two different maps here, because they each tell a slightly different story about student commute times in Philadelphia.

First, Figure B1 shows the data grouped by US Census Block group, by averaging the commute time of all students living within in the same Census Block group. Darker red colors correspond to longer commute times.

Figure B1. Average Estimated Student Commute Times, by Census Block Group
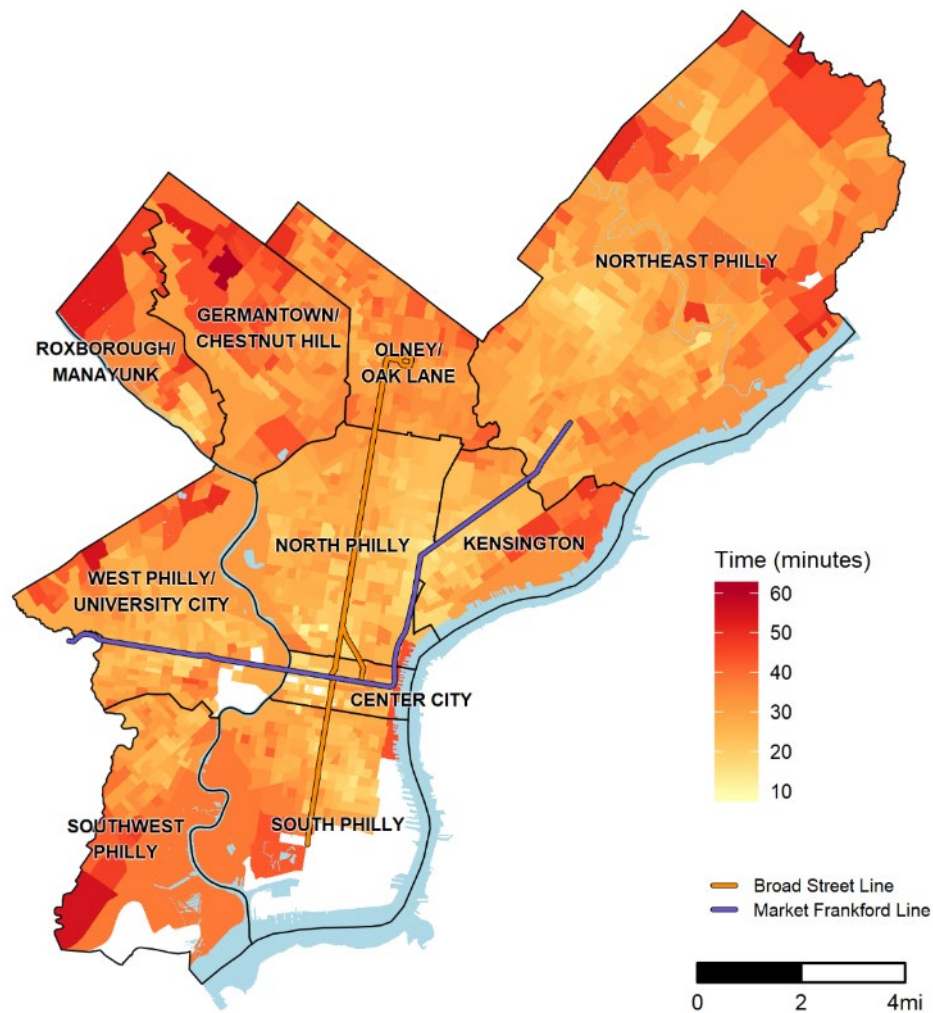
Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year (N=34,133 students). White areas are Block Groups that have no SDP high school student residents.

Notably:

- Average commute times tended to be shortest in North Philly, Center City, and along the Market-Frankford Line in Kensington and West Philly. This is likely impacted by the

proximity of multiple transit lines and the presence of multiple schools in those neighborhoods.

- Average commute times tended to be longest near the boundaries of this map, especially in Roxborough/Manayunk, Germantown/Chestnut Hill, Northeast, and Southwest Philadelphia.

Figure B1 does a helpful job showing the overall picture within the city, but because the results are averaged by all students living in an area, it also covers up the amount of variation in students' commutes in each Census Block group. To investigate that variation, Figure B2 shows the same commute time data, but averages the times for students living in the same *city* block. Because city blocks are much smaller than Census Block groups, some of the points displayed represent only one or two students. To avoid directly identifying student addresses, we therefore randomized the student address data by 2-3 blocks in any direction before preparing this map. Green represents shorter commute times, while red represents commute times of an hour or longer.

Figure B2. Average Estimated Student Commute Times, by Address Block
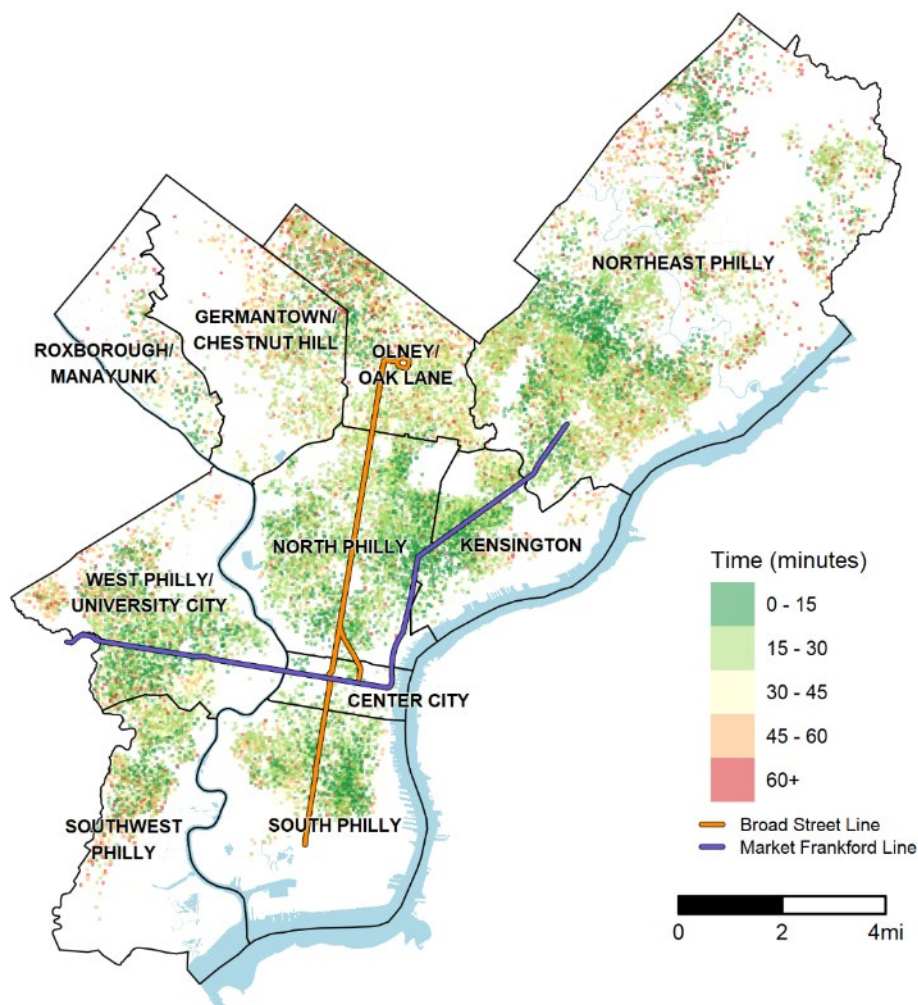
Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year (N=34,133 students). White areas are blocks that have no SDP traditional high school student residents.

Notably:

- In almost all areas of the city that have traditional high school[31] student residents, there are students with short commutes (dark green dots) and students with long commutes (red dots).
- Germantown/Chestnut Hill, Olney/Oak Lane, and far Northeast Philly have more city block averages in the region of 45 minutes or higher (orange and red dots) than other areas of the map, but there are blocks with long average commute times distributed throughout the entire map.

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[31] For the purposes of this report, we use the term "traditional" high school to refer to schools that held courses exclusively during the day and fit into one of the following SDP categories: Neighborhood, Citywide, or Special Admission high school. Schools in these categories may provide non-traditional programming, such as project-based learning, early college enrollment, work-based internships, or other innovative approaches, but for the sake of simplicity, in this report, they are all considered "traditional" high schools. Educational Options Programs (EOPs), entire schools serving students with alternative needs (e.g. Widener Memorial School), and other schools in SDP's Opportunity Network are not included in our analyses.

Appendix C: Estimated Commute Characteristics by School Type and CTE Offering

School Average Transit Time, by School Type

Table C1 shows how estimated student transit times varied by school type. It groups schools into 10-minute bands of average estimated travel times and by admission type. The number of schools and the percentage of schools of that type are presented for each of the Neighborhood, Citywide and Special Admission schools.

Table C1. Average student travel times to Philadelphia high schools in 2018, by school type

Average travel time	Neighborhood Schools		Citywide Schools		Special Admission Schools	
	Number	% of Neighborhood schools	Number	% of Citywide schools	Number	% of Special Admission schools
15-24 minutes	19	90%	1	8%	0	0%
25-34 minutes	1	5%	10	77%	9	47%
35-44 minutes	1	5%	2	15%	8	42%
45 minutes or more	0	0%	0	0%	2	11%

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year (N=34,133 students).
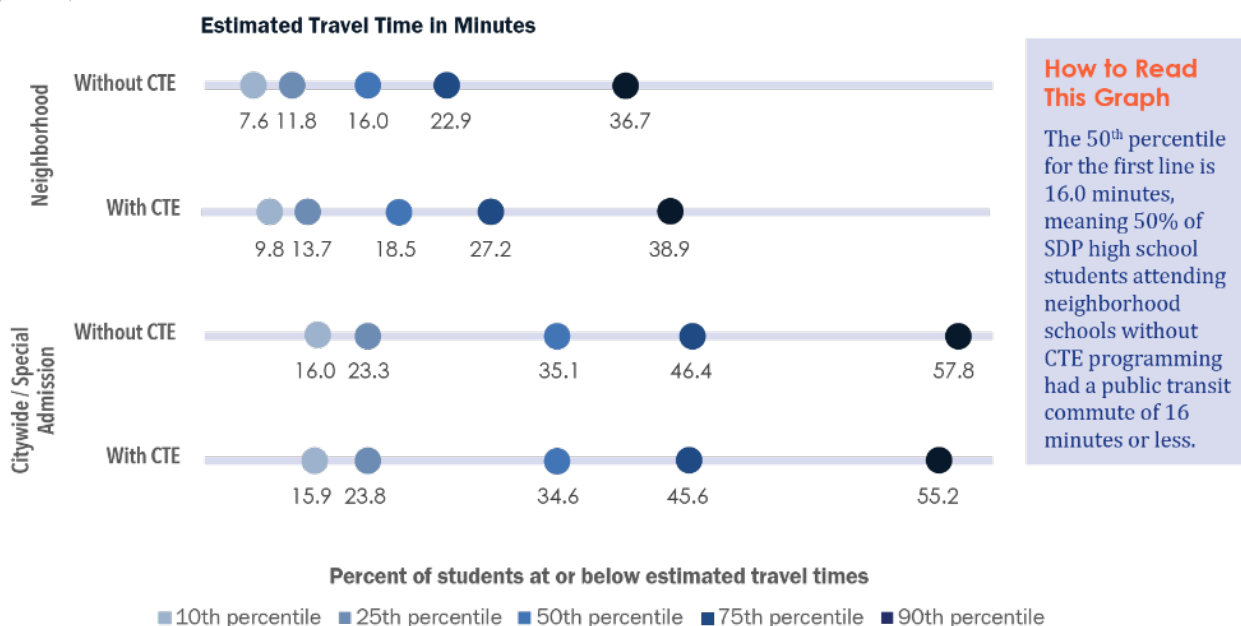
Notably:

- **Most Citywide schools have longer average estimated travel times than Neighborhood schools.** With most students attending Neighborhood schools living nearby, nearly all Neighborhood schools (90 percent) had an average student travel time in the shortest time band of 15-24 minutes. Most Citywide schools (77 percent) fell into an average travel time band that was 10 minutes higher, at 25-34 minutes.
- **Most Special Admission schools have longer average estimated travel times than most Citywide or Neighborhood schools.** In the highest time spans displayed here, just over half of Special Admission schools (53%) had average travel times of 35 minutes or more.

These findings are consistent with the main analysis of the commute time distributions. Grouping the average times by school also illustrates that while certain schools (e.g. Lankenau) might have an outsized effect on the group average commute time, individual schools still fall in to these consistent patterns.

Student Transit Times, by School Type and CTE Offering

To determine whether transit times varied by specific types of school programming, we compared transit times for youth attending schools with and without Career and Technical Education (CTE) programs. Figure C1 compares these commute times, sorted by type of school.

Figure C1. Estimated travel time in minutes for SDP high schoolers by school type and CTE status, 2018

Estimated Travel Time in Minutes

Neighborhood	Without CTE	7.6 11.8 16.0 22.9 36.7
	With CTE	9.8 13.7 18.5 27.2 38.9
Citywide / Special Admission	Without CTE	16.0 23.3 35.1 46.4 57.8
	With CTE	15.9 23.8 34.6 45.6 55.2

Percent of students at or below estimated travel times

■ 10th percentile ■ 25th percentile ■ 50th percentile ■ 75th percentile ■ 90th percentile

How to Read This Graph

The 50th percentile for the first line is 16.0 minutes, meaning 50% of SDP high school students attending neighborhood schools without CTE programming had a public transit commute of 16 minutes or less.

Note. Author calculations using data for all School District of Philadelphia traditional high school students enrolled at the end of the 2017-18 school year. Sample sizes: Neighborhood schools, without CTE = 894 students; Neighborhood schools, with CTE: = 15,872 students; Citywide / Special Admission schools, without CTE = 10,434; Citywide / Special Admission schools, with CTE = 6,933.

Notably:

- **Within each school type, schools with and without CTE programming had similar distributions of estimated student commute times.** Most estimated commute times for students at Neighborhood schools fell into a 29-minute range, whether or not the school offered CTE programming. In comparison, the range of estimated student commutes at Citywide and Special Admission schools was 42-minutes at schools with CTE programming and 39-minutes for schools with CTE programming.

These analyses suggest that school type (Neighborhood vs. Citywide or Special Admission) has a stronger impact on average transit time than the offering of CTE programs. We arrived at similar results when we examined variatiation in transit times for schools offering Arts or STEM programming.

Appendix D: Description of Methods

In order to calculate student travel times to schools using public transport we first built a public transportation routing network using the OpenTripPlanner (OTP) suite of open source transportation network software.[32] OTP allows for the generation of multi-modal trip routing and estimation using General Transit Feed Specification (GTFS) schedule data from local transit authorities and street network data from OpenStreetMap (OSM). For this project we downloaded GTFS data, which was valid from February 25th, 2018 to June 9th, 2018, from the Southeastern Pennsylvania Transit Authority (SEPTA) developer webpage.[33] We also downloaded OpenStreetMap data for the state of Pennsylvania from the Geofabrik download server.[34] Using the osmconvert tool,[35] we generated a final road network data file within a bounding box centered on the I-476 and I-276 highways surrounding Philadelphia County.

The publically available GTFS data that we downloaded from SEPTA did not contain schedule information on the 400-series routes that are developed to expand travel options for students to area schools. Given the potential importance of these routes for some students, we developed an additional GTFS file for these routes based on published information about these routes (e.g. stops, stop locations, stop times, etc.) located on the SEPTA website.[36]

School commute time estimation

In order to make route estimation efficient, tractable, and maximally extensible we developed a regular grid of control points which were used as origin locations in place of actual student residential locations. The grid was scaled to dimensions of .001 decimal degree and was generated within the bounding box used to download OSM data. In Philadelphia, this is roughly at the scale of a single block face in an urban row home neighborhood. These scaling dimensions provide a balance between estimation errors and computational efficiency as actual errors in estimates are likely small enough to be ignorable.

Clipping the grid to the shape of Philadelphia County provided us with approximately 47,000 grid points covering the entire city that proxy residential locations. For each of these origin points we used our OTP router to estimate routes to all of the 52 traditional high schools operated by the School District of Philadelphia in the 2017-18 school year. Each route was estimated to arrive at the given school exactly at the school's morning start time. For each of the approximately 1.6 million routes generated, we were able to capture estimates of total travel time and number of transfers required for the given route.

To produce the final analytic dataset of estimated student travel times we spatially merged our grid of control points to a file provided to us by the School District of Philadelphia that contained the latitude and longitude of the address of record and the enrolled school for approximately 34,000 students. Once we identified the nearest grid point for each residential location, we then selected the route and transit estimates associated with each student's enrolled school to arrive at the final transit estimates for each student.

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[32] https://www.opentripplanner.org/

[33] http://www3.septa.org/developer/

[34] https://download.geofabrik.de

[35] https://wiki.openstreetmap.org/wiki/Osmconvert

[36] http://septa.org/strategic-plan/reports/2018-Route-Statistics.pdf