Lexey Swall

The Cost of Commuting for Philadelphians

How SEPTA's fares compare with other major transit agencies—and what drives fare differences among city residents

Contents

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About this report

Overview

Public transit plays a vital role in Philadelphia. Each weekday, riders take roughly 819,000 trips on the buses, trolleys, and rail lines operated by the Southeastern Pennsylvania Transportation Authority's (SEPTA's) City Transit Division. And 24 percent of Philadelphia residents use public transit to get to work, the third-highest percentage among the 10 U.S. cities with a population greater than 1 million, according to census figures.

Among Philadelphians who take public transportation to work, 44 percent earn less than $25,000 per year. For them, in particular, fares can have a significant impact on household budgets.[1]

This report is based on a review of fares in Philadelphia and the seven other U.S. cities with the highest public transit ridership numbers—New York, Chicago, Los Angeles, San Francisco, Washington, Boston, and Seattle—to determine how those fares compare, how SEPTA's fares vary by neighborhood, and what that means for riders of different income levels.

Relative to prices in most of the other cities, the base fare on SEPTA's City Transit Division is low. But that tells only part of the story. There is substantial variation within Philadelphia—a city with a 26 percent poverty rate and a median household income of roughly $40,000—in the fares that residents pay. These differences stem from the payment method (cash, a prepaid account on a smart card known as SEPTA Key, or a monthly or weekly pass), which type of public transit riders use, and whether they must transfer.

Although people use transit for a variety of purposes, this report focuses on the journey between home and work. In terms of fares, the research found that SEPTA serves some Philadelphia workers at lower prices than others, with the key variables being the method of payment and the location of home and work.

Fares paid in cash or with a prepaid account on SEPTA Key are generally lowest for those who live near Center City or close to stops on the heavy rail (subway or elevated) and trolley network, and for those who work in Center City or University City. Fares are often higher for those who live farther from the center and from those rail and trolley lines—and who work outside central Philadelphia. The jobs held by lower-income Philadelphians—those paying less than $40,000 a year—are more likely to be located outside the city center than are jobs with higher salaries.

Among the key findings:

- The base fare on SEPTA's City Transit Division is one of the lowest of the peer cities—$2.50 per ride if paid in cash, or $2 using the authority's smart card. This means that Philadelphians who travel to their destination on a single bus or without leaving the heavy rail and trolley network pay substantially less than riders in many other cities.

- SEPTA charges more to riders who transfer from one transit line to another, except within the heavy rail and trolley network or when riders use monthly or weekly passes. As a result, people who make such transfers wind up paying more to reach their destinations than their counterparts in most of the other cities. Cash riders who transfer must pay a full additional fare of $2.50, and the roughly 20 percent of transfer riders who pay with funds preloaded on smart cards are charged $1. These fares are based on the number of vehicles used by the rider, not the distance traveled.

- Expressed as a percentage of income, the fares that Philadelphia residents pay are higher than those in all of the comparison cities. This happens in part because the median income in Philadelphia is lower than in the seven other cities.

- For many riders, the least expensive way to use the City Transit Division is with a weekly or monthly pass,

which 39 percent of riders (53 percent of fare-paying adults) had as of November 2018. Some low-income riders, however, may find it difficult to afford a $25.50 weekly pass or a $96 monthly pass. The most recent detailed information on the percentage of low-income commuters using passes comes from a 2010-11 survey by the Delaware Valley Regional Planning Commission (DVRPC). In that survey, about half of lower-income commuters said they used passes.

- The heavy rail system—consisting of the Broad Street and Market-Frankford lines—serves many areas of the city where poverty is high, and it gets residents of those areas to central Philadelphia quickly and relatively inexpensively via direct trips.

- Low-paying jobs, however, are dispersed throughout the city and the region. As a result, many low-income riders must make one or more transfers to get to work, incurring additional charges if the fare is paid in cash or with funds preloaded on smart cards, or they must make more expensive trips on Philadelphia's commuter rail system, known as Regional Rail.

- The areas in Philadelphia where costlier trips hit the hardest are those where incomes are low, many households do not have cars, and using SEPTA to get to work requires one or more transfers. Those neighborhoods are found mostly in West and North Philadelphia and along the Kensington Avenue corridor.

This report is intended to inform SEPTA officials and other stakeholders in the city, region, and state at a time when the transportation agency is facing several key challenges and choices.

From 2013 through 2017, SEPTA experienced a 9 percent decline in bus and rail ridership (excluding commuter rail), attributed to several factors, including low gas prices, increasing car ownership, and the rise of private ride-hailing services. The agency is now conducting an in-depth analysis of its bus network, aimed at reversing ridership losses.

One element of that analysis will be a decision on whether to retain or revise the transfer fee. The Key card system, now largely in place, gives SEPTA the technological capability to modify its fare structure in various ways. In its October 2018 strategic transportation plan, Philadelphia's city government urged elimination of the transfer fee as part of SEPTA's bus network redesign, saying that such a move would encourage the city's inclusive growth by helping to connect residents to jobs, education, and other activities reliably and affordably.

Philadelphia's transit fares, compared with those in other high transit ridership cities

In researching this report, Pew compared the fares that SEPTA commuters pay with those of the primary transit service providers serving seven other American cities. These cities, along with Philadelphia, have the most residents who get to work by public transit.[2] To provide a common baseline of fares paid by urban commuters, the comparisons were based on the fares for services that primarily serve city riders, not suburban ones. This included the fares for buses, light rail, and heavy rail that operate primarily within each city's boundaries. (See Appendix A for a complete list of services included in and excluded from the comparisons.)

Even though transit agencies typically have a base fare for boarding a vehicle, they rarely charge a uniform amount for all transit services and trip types.[3] The fare varies based on several factors, including the payment method, the trip structure, and the type of vehicle.

In Philadelphia, adult riders pay using one of three methods: cash (or the equivalent "Quick Trip" ticket), funds preloaded on the SEPTA Key card (referred to as the Travel Wallet), or a weekly or monthly pass, which is also stored on the Key card.[4] People 65 or older ride for free, thanks to a statewide program funded by the Pennsylvania Lottery, and students in kindergarten through 12th grade may ride for free to and from school if

their school distributes passes purchased through a SEPTA-operated program. Up to two children under age 4 traveling with a paying adult also ride for free.

According to the most recent data, 14 percent of SEPTA riders pay with cash; 21 percent with funds on a smart card (Travel Wallet) or tokens, the sale of which ended in 2018; and 39 percent with adult passes.[5] These data reflect rider behavior after the elimination of the paper transfer in August 2018—the last step in the implementation of the Key card system on the City Transit Division—and indicate that the distribution of fare payment methods has remained stable in the ensuing months. The remaining 27 percent of riders primarily used student passes, senior citizen IDs, or disability IDs. (See Figure 1.) This report deals primarily with the fares paid by working-age, nondisabled adults. Although people use public transit to reach a wide variety of destinations, the majority of trips on SEPTA's buses, subways, and trolleys are to or from work.[6]

Figure 1
SEPTA Ridership Fare Payment Distribution
Figures exclude Regional Rail

14% Cash

21% Travel Wallet/ token

27% Other

39% Weekly and monthly passes
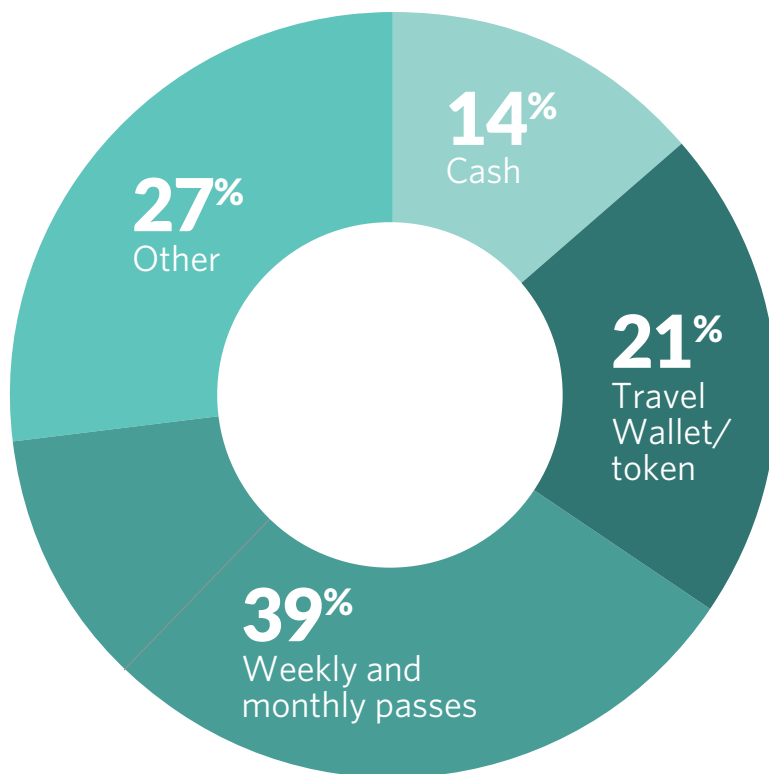
Source: SEPTA, "Revenue & Ridership Report: November 2018"

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To make comparisons among cities, Pew decided to look at fares from a perspective that addresses potential variation in payment methods and rider behavior. These terms will be used throughout the report:

- **Cash fare:** The cost of a single trip purchased in cash at the point of use.

- **Lowest single-trip fare:** The best bargain for riders who do not purchase passes; this generally involves the use of a fare card (in Philadelphia, the SEPTA Key card's Travel Wallet function) rather than cash.[7]

- **Cheapest fare:** The lowest fare that a rider can get using any available payment method; this is often obtained by using a weekly or monthly pass. In this report, the fare per ride for a monthly pass is calculated

on the basis of a rider making 42 trips per month—two trips per day in an average month with 21 workdays.[8]

The trip structure affects the cost as well. For instance, a trip may consist of a ride on a single transit vehicle—in Philadelphia, a bus, trolley, or train—or may require a transfer between two or more vehicles to complete a trip. This is referred to in this report as "base fare + transfer."

Each combination of payment method and trip structure may result in a different fare in each city, and therefore a different set of fare comparisons among cities. (See Appendix B for a table detailing the comparison fares.)[9] In several cases (Boston, New York, Chicago, and Washington), the cost of a subway or light rail ride differs from the cost of a bus ride; in those cases, the rail fare is used for the comparisons.[10]

Senior and low-income fares

The transit agencies in this report take different approaches in setting fares for seniors and low-income riders.

Only SEPTA and the Chicago Transit Authority (CTA) offer free trips to all riders 65 or older. For SEPTA, this represents 9 percent of riders.[*] In the remaining systems, senior fares are typically 50 to 60 percent lower than standard fares. Seattle's King County Metro offers seniors a 64 percent discount: $1 per ride, compared with a standard fare of $2.75. The Los Angeles County Metropolitan Transportation Authority (LACMTA) gives seniors 80 percent off during off-peak periods and 57 percent off during peak hours.

And several of the agencies—not including SEPTA—offer reduced-rate or free rides based on income.

Boston's Massachusetts Bay Transportation Authority (MBTA) has discounted fares for riders 25 or younger who receive certain state and federal benefits. The San Francisco Municipal Transportation Agency (SFMTA) offers free trips to riders with family incomes at or below 100 percent of the Bay Area median if they are ages 5-18, seniors, or disabled; discounted rides are available to all residents with incomes at or below 200 percent of the federal poverty level. Similarly, Seattle has discounts for riders ages 19-64 with household incomes less than twice the federal poverty level. And New York recently made half-price fares available to working residents who are receiving cash assistance or Supplemental Nutrition Assistance Program benefits.[†]

[*] This figure excludes commuter rail. SEPTA, "Revenue & Ridership Report: November 2018."

[†] J. David Goodman and Jeffery C. Mays, "Of 800,000 Poor New Yorkers, Only 30,000 Can Get the New Half-Priced MetroCards," The New York Times, Jan. 4, 2019, https://www.nytimes.com/2019/01/04/nyregion/fair-fares-metrocard-discount-nyc.html.

Compared with the other cities, Philadelphia has a relatively low base fare of $2.50 for riders paying in cash, or $2 for those using the SEPTA Key card's Travel Wallet feature.

As Figure 2 shows, the $2.50 cash base fare in Philadelphia is the second-lowest among the eight cities; only Los Angeles, at $1.75, charges less. Both New York and Chicago have $3 base fares (in both cases, the fares are slightly lower for bus service: $2.75 and $2.50, respectively).[11] And even when fare cards and passes are added into the mix, Philadelphia's $2 Travel Wallet fare is relatively low.[12]

Figure 2

Comparison of Base Fare Based on Variation in Payment Type

For the eight cities with the largest number of transit commuters

Cash fare
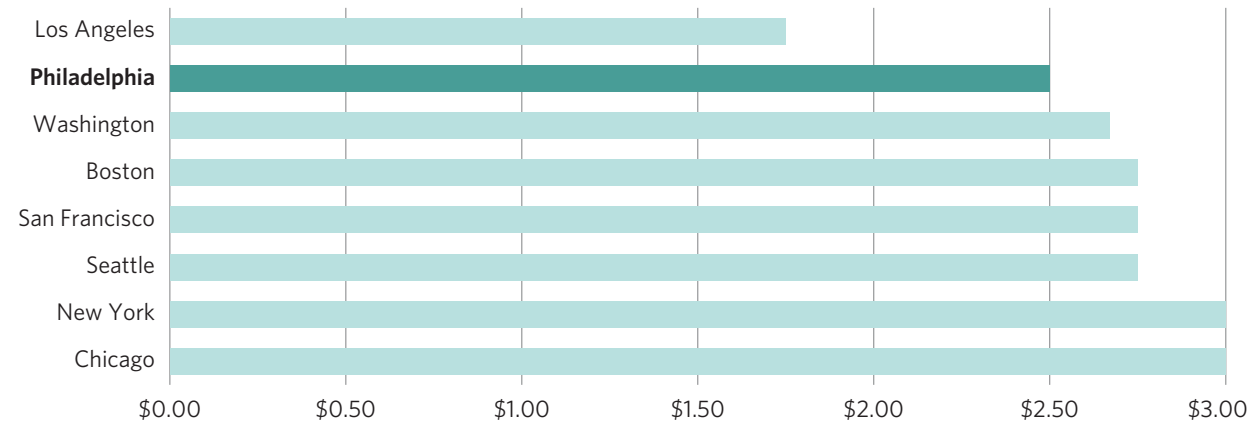
Lowest single-trip fare
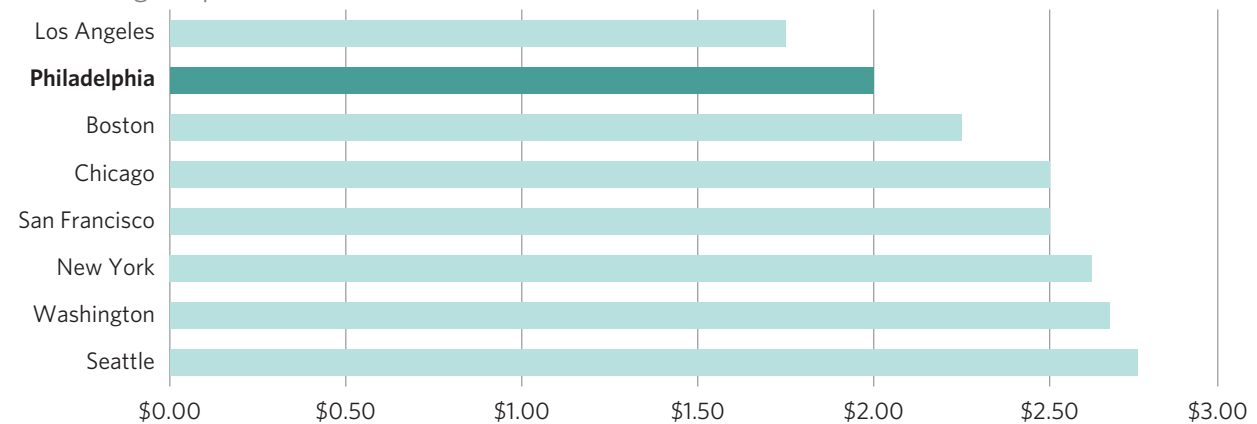
Cheapest fare
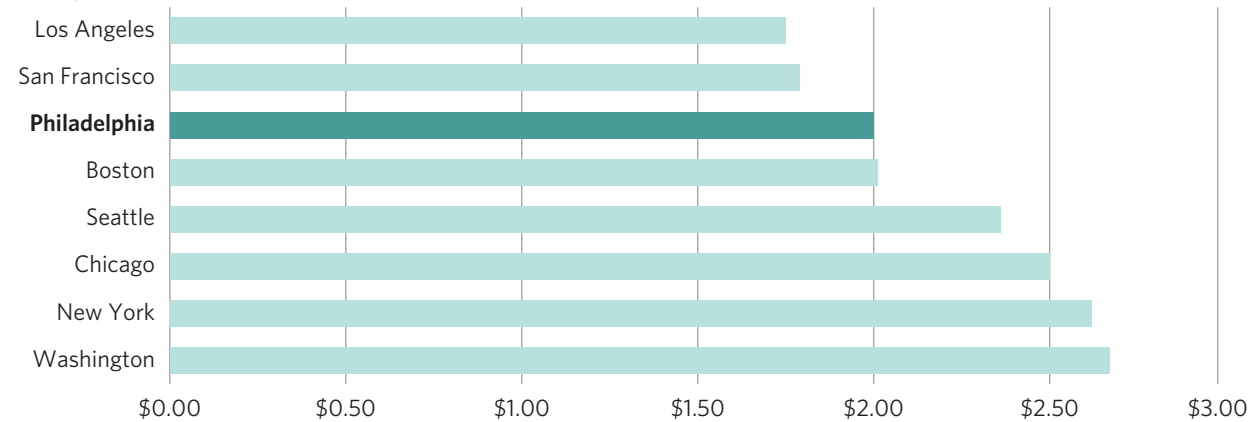
Note: Fares are for each city's primary transit service provider.

Source: Individual transit agency websites, accessed Aug. 31, 2018

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If the trip requires a transfer, however, the picture changes considerably.[13] In this case, a SEPTA rider using cash is required to pay a second full fare. As a result, the total fare, at $5, is higher than all peer cities except New York and nearly twice the cost of the least expensive cities, San Francisco and Seattle. A trip requiring two transfers, which is not uncommon, would cost $7.50 if paid in cash on SEPTA. (See Figure 3.)[14]

Figure 3

Comparison of Base Fare Plus Transfer Based on Variation in Payment Type

For the eight cities with the largest number of transit commuters

Cash fare

Lowest single-trip fare

Cheapest fare

| City	Fare
Los Angeles	$1.75
San Francisco	$1.78
Boston	$2.00
Philadelphia	$2.29
Seattle	$2.35
Chicago	$2.50
New York	$2.62
Washington	$3.62
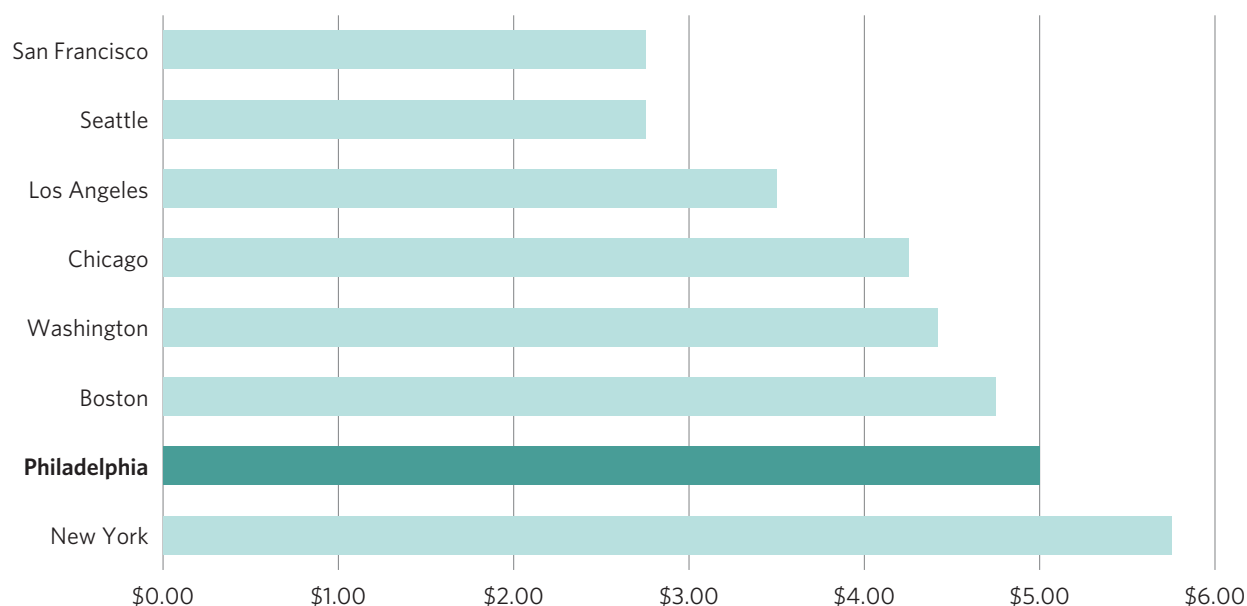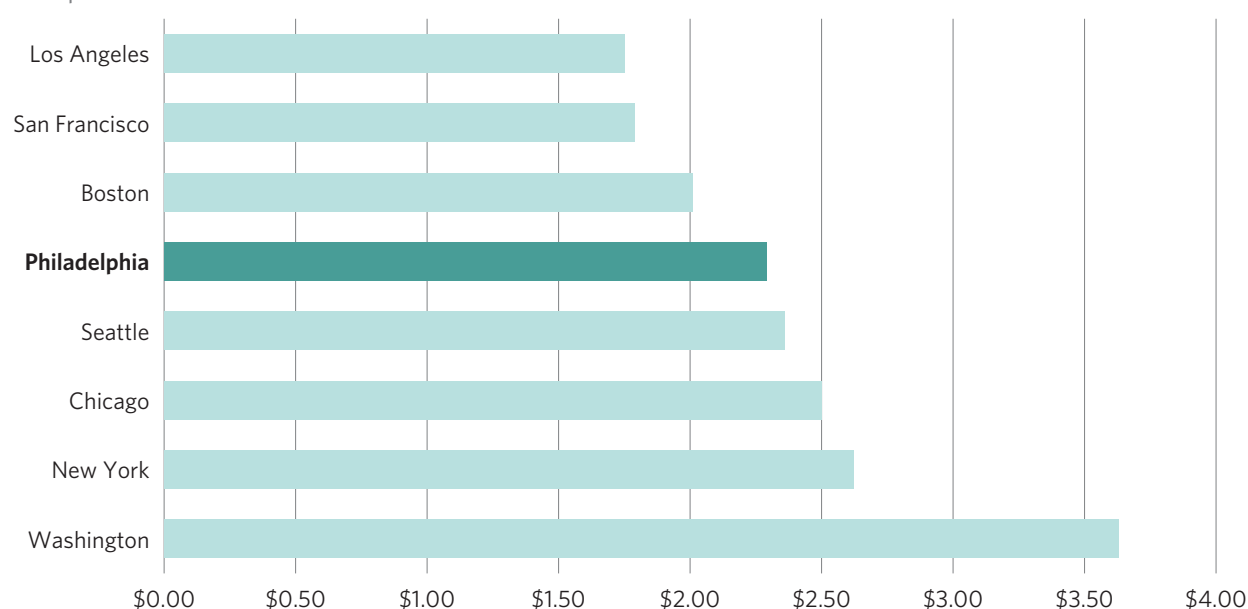
Source: Individual transit agency websites, accessed Aug. 31, 2018

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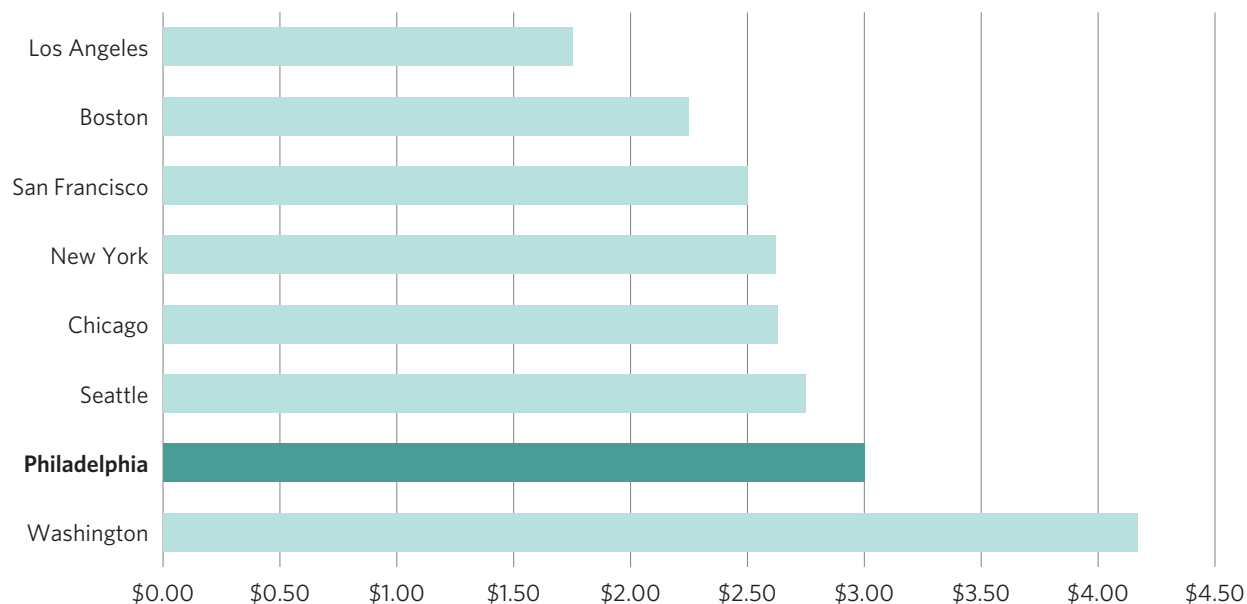For years, Philadelphia riders using cash could transfer for $1. But SEPTA eliminated that option, which involved a paper transfer slip, in August 2018 as part of its transition to the SEPTA Key card. A $1 transfer fee is now available only for those who use the Key card's Travel Wallet, which gives them the lowest single-trip fare for such a journey—$3 in this case (the $2 base fare on the smart card plus the transfer fee). That is the second-highest single-trip fare among the peer cities, behind only Washington.[15] Based on the assumptions used in this report, the cheapest fare for a transfer ride in Philadelphia—which comes via a monthly pass—is $2.29, putting SEPTA squarely in the middle of the transit agencies in terms of cost.[16]

Alternative fare structures and transfer fees

The fare structures in big-city transit systems can be complicated. And they vary from one place to another.

For SEPTA and most of the cities in this report, fares are "flat" (that is, independent of distance), although they may vary based on the mode of transit and/or the number of boardings needed to reach a destination. Alone among the cities, Washington employs a distance-based fare for its heavy rail Metro system; such fare structures are common in commuter rail but rare in urban transit.

Several transit agencies—not including SEPTA—engage in fare capping, putting a limit on the cumulative fare over a set period as long as the fare is paid using a smart card. For example, in Portland, Oregon, all rides after the first two on any day are free; similarly, there is no charge for any ride after the 40th in a single month. This feature effectively gives riders the discounted prices available to monthly pass holders without the upfront cost of a pass.

Continued on the next page

The transition to smart cards in recent years has enabled many transit agencies to customize fare structures. During those transitions, agencies have typically encouraged smart card adoption by offering discounts compared with fares paid in cash. Agencies want riders to use cards instead of cash for several reasons, including operational cost savings and improved data collection.[*] Among the systems studied in this report, SEPTA provides the biggest smart card discount on the base fare: 20 percent.

Other agencies offer discounts to riders making transfers. In New York, Los Angeles, San Francisco, and Seattle, transfers made with a fare card are always free. In Boston and Chicago, they are free or nominally priced, depending on the transit mode. The exceptions are Philadelphia, where a transfer costs $1 for SEPTA Key users, and Washington, where bus-to-bus transfers are free but a transfer between bus and rail costs the full price minus 50 cents.

SEPTA also charges among the most for transfers paid in cash. Along with SEPTA, MBTA and LACMTA always charge a full fare ($2.50 in SEPTA's case) for a transfer. In San Francisco and Seattle, transfers are free. Transfers from rail to bus are free in Chicago, as are bus-to-bus transfers in New York. Washington has a discount for rail-to-bus transfers.[†]

[*] Alexis Perrotta, "Fare Collection and Fare Policy," Transit Leadership Summit Research Papers, 2013, https://transitleadership.org/docs/TLS-WP-Fare-Collection-and-Fare-Policy.pdf; Daniel Fleishman et al., "TCRP Report 10: Fare Policies, Structures, and Technologies" (Washington: Transportation Research Board, National Academy Press, 1996), http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=980; California PATH Program, Institute of Transportation Studies, University of California, Berkeley,"Evaluating the Costs and Benefits of Transit Smart Cards" (2008), https://merritt.cdlib.org/d/ark%3A%2F13030%2Fm5jd4xwt/2/producer%2FPRR-2008-14.pdf.

[†] In Washington, a rail trip is possible only with a smart card, for which a rider must pay $2, but which provides a 50-cent discount on a subsequent transfer to a bus.

Philadelphia is among the poorest of America's large cities and has the highest poverty rate of those included in this study.[17] That fact, along with SEPTA's fares, means that as a percentage of median household income, Philadelphia's fares are higher than those in all peer cities, regardless of payment type or trip structure. (See Figure 4.)

Figure 4

Comparison of Annual Expenditure on Base Fare as a Percentage of Median Household Income Based on Variation in Payment Type

For the eight cities with the largest number of transit commuters
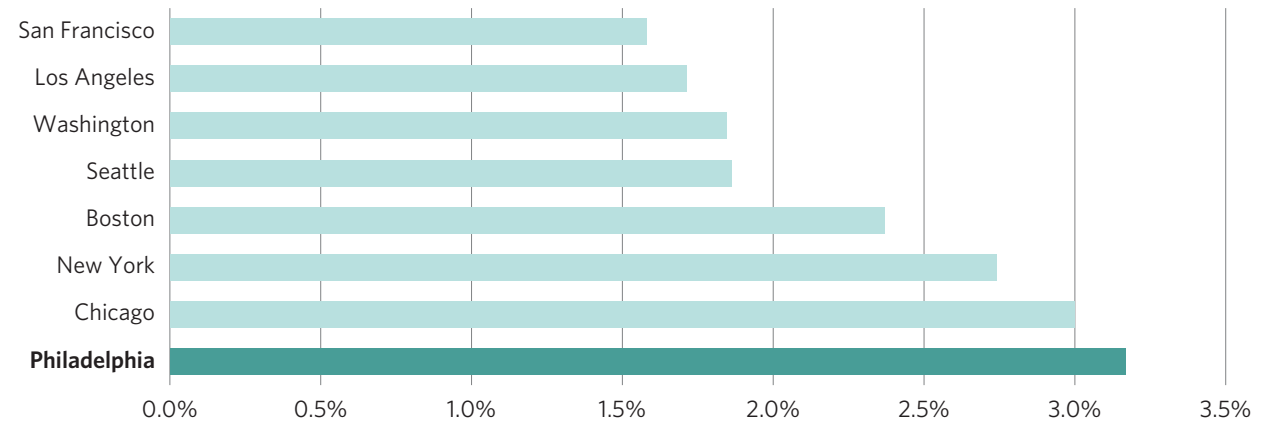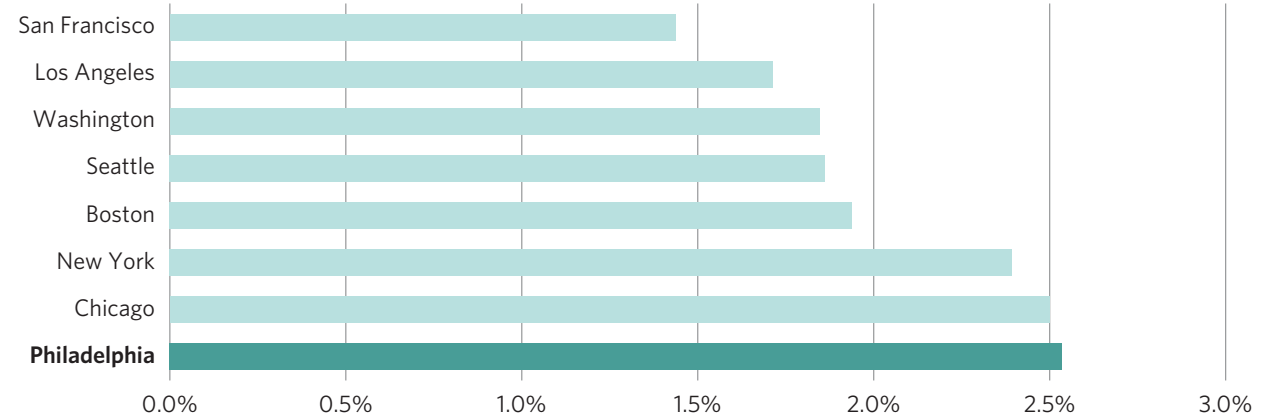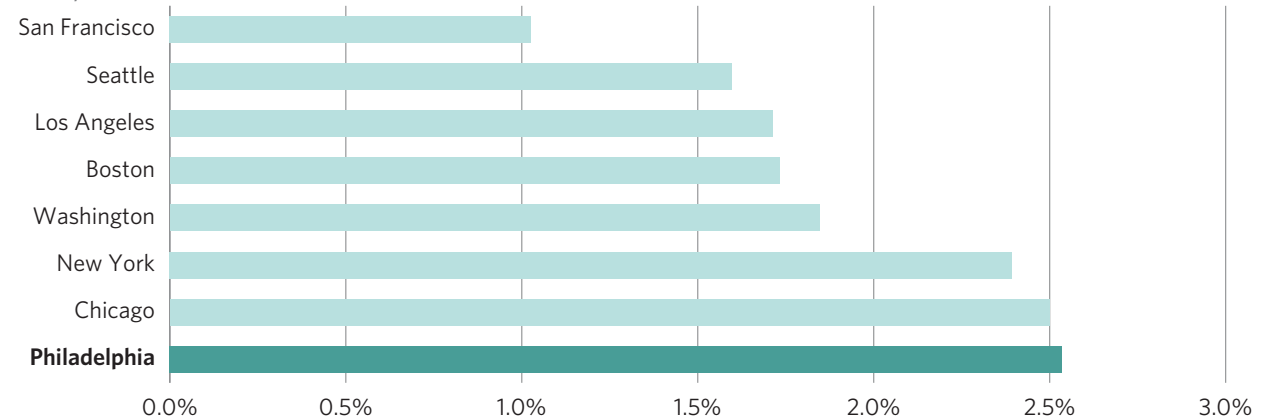
Source: Individual transit agency websites, accessed Aug. 31, 2018; U.S. Census Bureau American Community Survey, one-year estimates, 2016

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The total annual cost for a Philadelphian paying the base fare using the Travel Wallet (lowest single-trip fare) to commute to work 21 times a month amounts to 2.5 percent of median household income, about half a percentage point higher than in Boston and roughly 1 point above the figure in San Francisco, where incomes are much higher.[18] When a transfer is necessary, as was the case for 20 percent of City Transit riders who paid by Travel Wallet as of November 2018, Philadelphians paying the lowest single-trip fares spend 3.8 percent of median household income on fares, compared with 2.9 percent in the second most expensive city, Washington.[19]

Adjusted for inflation, SEPTA's fares are higher than they were a decade ago. As of October 2018, the base fare paid in cash was 11 percent higher than it was in 2008, and the same fare paid using the Travel Wallet was 23 percent higher than the corresponding fare 10 years ago, which was then paid with a token.

How much revenue transit agencies get from fares varies substantially among the cities—from 18 percent of operating funds expended for Los Angeles County's Metropolitan Transportation Authority to 50 percent for New York City Transit as of 2017.[20] (See Figure 5.) For SEPTA in 2017, fares accounted for approximately 34 percent of total operating funds expended, $447 million out of $1.3 billion. Transfer fees, which have existed since 1968, produce roughly $8 million per year.[21]

Figure 5

Fare Revenue as a Percentage of Total Operating Funds
For the eight cities with the largest number of transit commuters
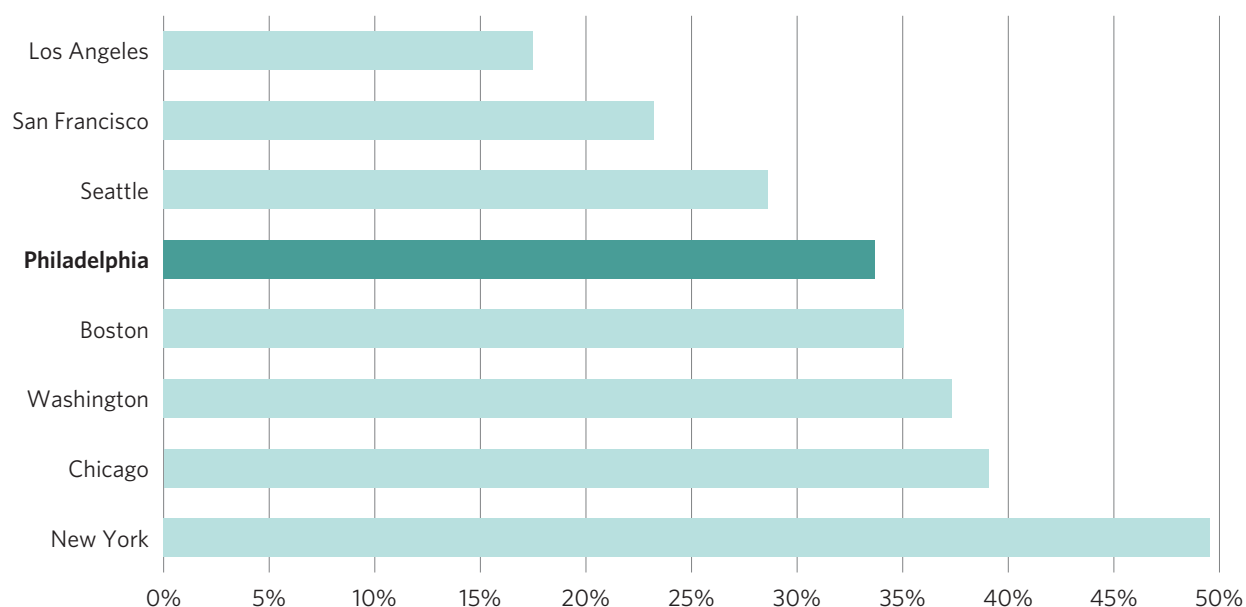
Source: Federal Transit Administration, National Transit Database, Transit Agency Profiles, 2017

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SEPTA's service, budget, and ridership

In fiscal year 2018, riders boarded SEPTA vehicles roughly 302.7 million times, with approximately 1.01 million boardings occurring on an average weekday. Of that total, 81 percent (roughly 819,000) were made on the City Transit Division, with the remaining 19 percent made on SEPTA's Suburban and Railroad divisions. Within the City Transit Division, 54 percent of boardings were on buses (including trackless trolleys), 37 percent on subway and elevated lines, and 9 percent on trolley routes.[*]

In SEPTA's customer surveys, 48 percent of riders describe themselves as African-American or black, 43 percent white, 7 percent Hispanic or Latino, 5 percent Asian or Pacific Islander, and 2 percent "other." Thirty-two percent of SEPTA riders report household incomes of less than $25,000, 31 percent earn between $25,000 and $50,000, and 36 percent earn more than $50,000 annually.[†]

Public transit ridership has been falling recently, particularly in the past few years, and especially on buses. The decline has been linked to several factors, including cheap gas, growth in car sales, and a dramatic increase in ride-hailing services.[‡] Among the comparison cities in this report, bus ridership declined by an average of 9 percent from 2013 to 2017 and rail ridership (excluding commuter rail) by 3 percent, yielding an average overall drop of 6 percent.[§] SEPTA's ridership losses over that time have been slightly larger, with bus use down by 11 percent, rail off by 7 percent, and overall ridership down by 9 percent.

SEPTA's services are concentrated in Pennsylvania's Philadelphia, Bucks, Chester, Delaware, and Montgomery counties, with some Regional Rail service extending to Mercer County, New Jersey, and New Castle County, Delaware. The agency is governed by a 15-member board, with two members appointed by each of the five Pennsylvania counties, one by the governor, and one each by the majority and minority leaders of the Pennsylvania House and Senate.

SEPTA's fiscal year 2019 operating budget projects total expenses of approximately $1.45 billion. Revenues, mostly from passenger fares, are expected to cover 36 percent of those expenses. The remainder of operating costs are covered by subsidies from the state (51 percent), federal sources (6 percent), and the five Pennsylvania counties (7 percent); Philadelphia pays 82 percent of the five-county subsidy.[||]

[*] SEPTA, "SEPTA Operating Facts, Fiscal Year 2018," https://septa.org/strategic-plan/reports/2018-opfacts.pdf.

[†] SEPTA, "2018 SEPTA Customer Satisfaction Survey Final Report" (December 2018), http://septa.org/strategic-plan/reports/2018-survey-results.pdf. Because multiple responses were allowed for the race/ethnicity question, the total exceeds 100 percent.

[‡] Federal Transit Administration, National Transit Database, Monthly Module Adjusted Data Release, https://www.transit.dot.gov/ntd/data-product/monthly-module-adjusted-data-release; SEPTA, "Revenue & Ridership Report: June & Fiscal Year-End 2018"; American Public Transit Association, "Understanding Recent Ridership Changes: Trends and Adaptations" (2018), https://www.apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/APTA-Understanding-Recent-Ridership-Changes.pdf; Schaller Consulting, "The New Automobility: Lyft, Uber and the Future of American Cities" (2018), http://www.schallerconsult.com/rideservices/automobility.pdf.

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Distribution of transit fares within Philadelphia

From here on, the focus of this report is on fares in Philadelphia, where how much a rider pays depends largely on whether a trip requires a transfer or Regional Rail—which depends, in turn, on the trip's origin and destination. This section describes how fares vary across the city as a consequence. It also discusses the relationship between fares and income levels by location.

In Philadelphia, as in most American cities, buses carry the greatest share of transit riders. But the high-frequency, high-speed service on the Broad Street and Market-Frankford lines, two heavy rail lines, serves as the backbone of the SEPTA system.

Overlaying that rail network, along with the trolley lines serving Center City, on a map of the poverty rate in Philadelphia reveals an often strong overlap between the two. (See Figure 6.) Further, unlike most other SEPTA city lines, transfers between the rail lines are free at the stations where they converge in central Philadelphia.[22] As a result, people who live in neighborhoods with good rail access and who are headed to destinations elsewhere on the rail network—in particular, central Philadelphia—tend to have convenient and low-cost trips.

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Figure 6

Poverty Rates in Philadelphia and Heavy and Light Rail Lines Serving Central Philadelphia

Legend:
- 0%-9%
- 10%-19%
- 20%-29%
- 30%-39%
- 40%-49%
- ≥ 50%
- Nonresidential
- SEPTA heavy rail and trolley lines serving Center City
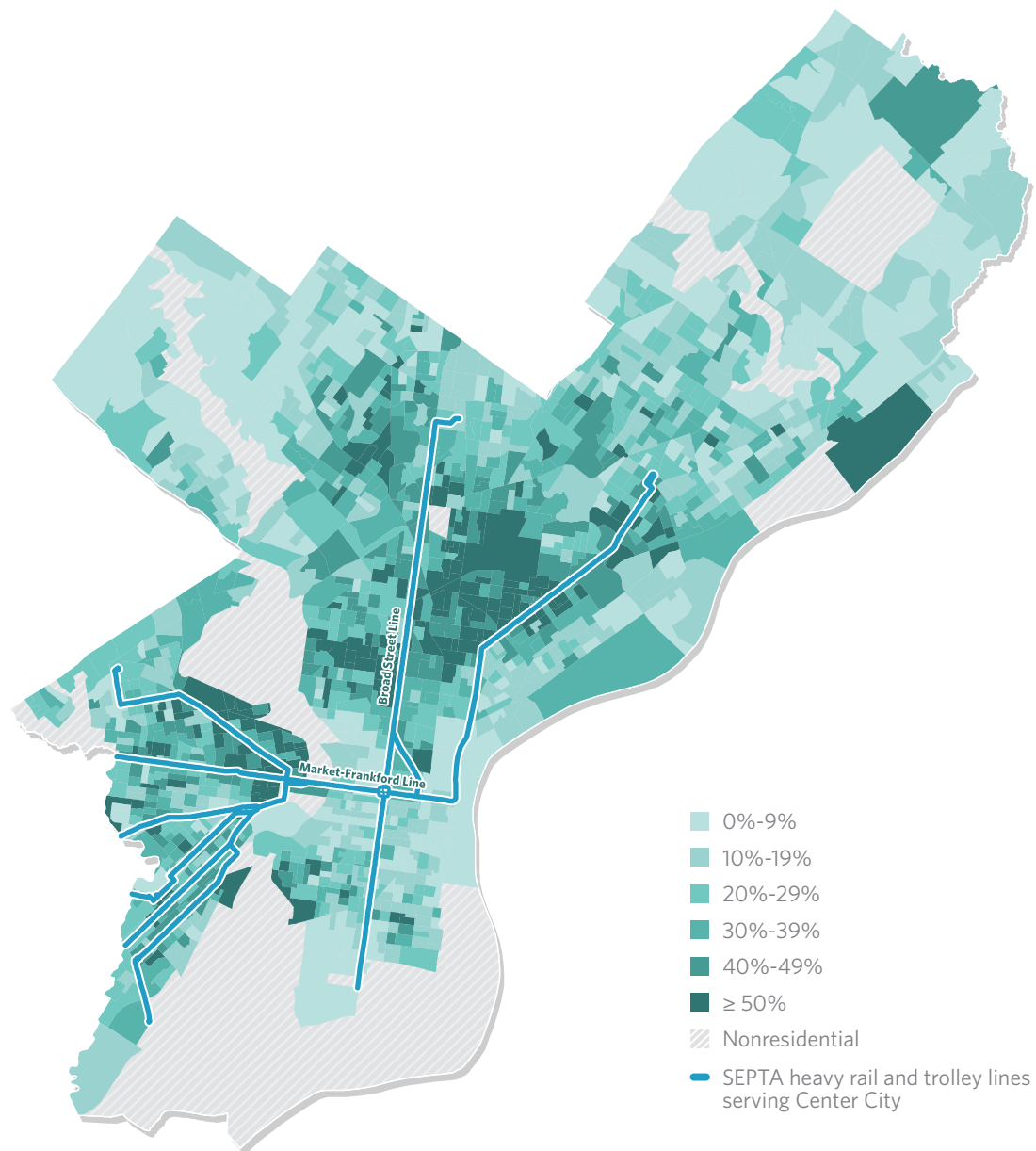
Source: U.S. Census Bureau American Community Survey, five-year estimates, 2012-16

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To precisely quantify how Philadelphia commuters' fares vary based on where they live, Pew used trip-planning software to identify the fastest trip to a common destination from the center of every census block group— one of the smallest geographic units for which the Census Bureau collects data, each containing an average of approximately 1,200 people.[23]

This analysis was repeated at three different departure times during the morning rush-hour period, and the fares for all trips between each origin-destination pair were averaged.[24] Although low-income Philadelphians are more likely to work nontraditional days and shifts, the majority of commuters leave home for work during the peak morning period, regardless of income.[25] The analysis allowed for rides on SEPTA heavy rail, trolley lines, and buses, and on Regional Rail—which primarily provides service between the suburbs and central Philadelphia but also has several outlying stops within the city, primarily in Northeast and Northwest Philadelphia.[26] It also allowed for trips with walks of up to 1 mile to reach the nearest transit stop and did not include park-and-ride trips.[27]

Traveling to Center City

First, Pew looked at trips to Philadelphia's City Hall, which is at the heart of both the transit network and the central business district. The following maps illustrate the variation in fares to City Hall. For all payment types, riders living close to the heavy rail and trolley network generally pay lower fares than those living farther away.

Figure 7 shows the average fares for riders paying cash.[28] If they can take a single transit vehicle to reach City Hall, they owe a fare of $2.50, shown in the light shade. If they need to take a bus to get to a subway or trolley line, or two buses, they pay $5, which is shown in the second-darkest shade. Residents paying cash fares of more than $5—many of them living in Northeast Philadelphia—would be either making more than one transfer or riding on one of the city's commuter rail lines, which charge higher fares than the city's bus, trolley, and subway lines.

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Figure 7
Average Cash Fare to Philadelphia City Hall
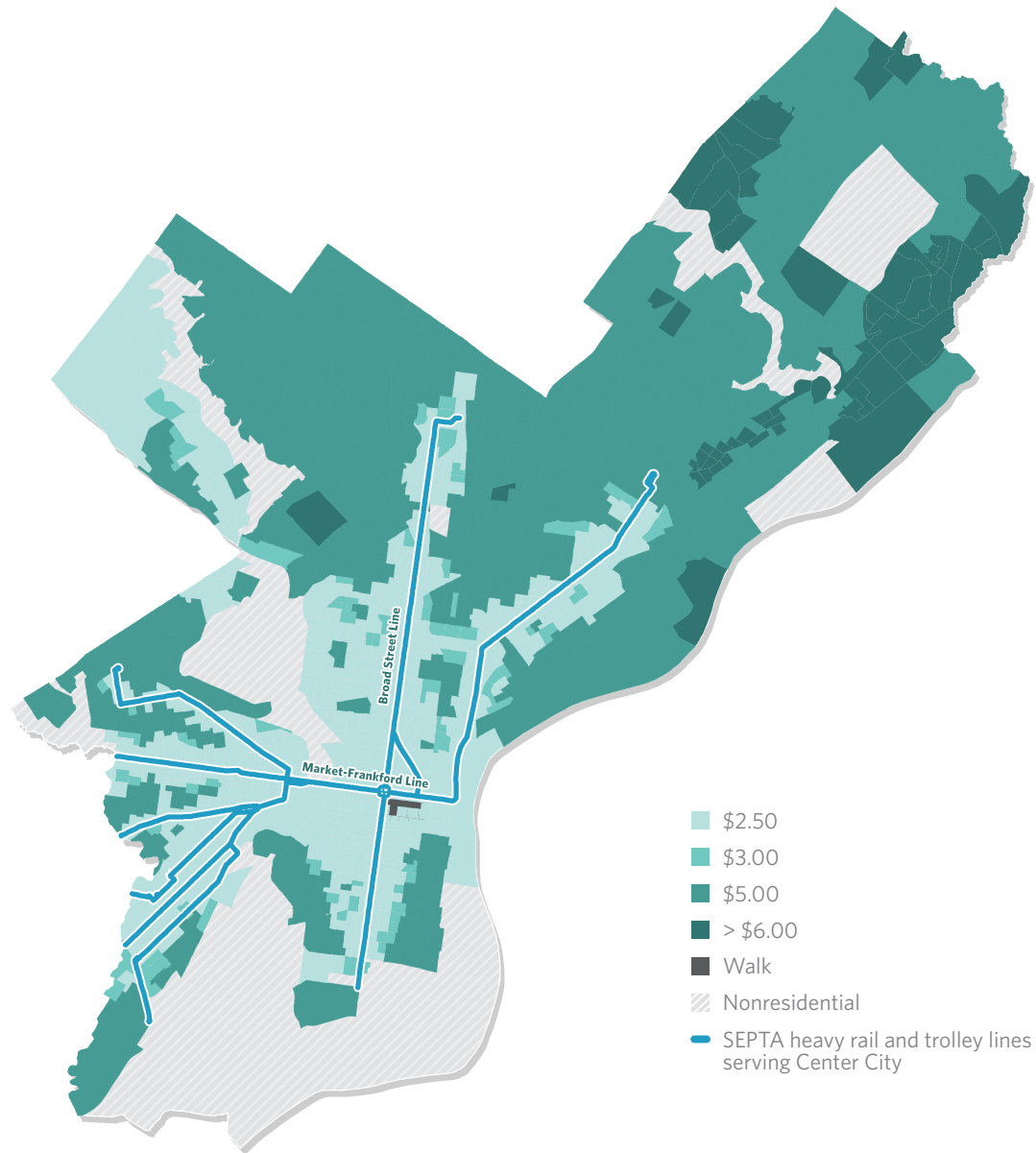
Note: Fares are symbolized by a common set of colors on all fare maps; not all fare classes are present on all maps. Areas labeled as "Walk" are those from which walking is always faster than any transit option.

Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018

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Low-income residents tend to be most concentrated in North and West Philadelphia, many of them in neighborhoods that are relatively close to SEPTA's heavy rail and trolley network. As a result, they tend to have cheaper fares to central Philadelphia.[29]

Figure 8 shows the lowest single-trip fare to City Hall. The fare is $2—via the Travel Wallet—for riders who do not need to transfer or who transfer between heavy rail and trolley lines; riders who make either one or two transfers between bus and rail or between buses pay $3. Again, riders paying $5 or more would generally be those riding a commuter rail train from an outlying location in Philadelphia.

Figure 8

Average Lowest Single-Trip Fare to Philadelphia City Hall

Note: Fares are symbolized by a common set of colors on all fare maps; not all fare classes are present on all maps. Areas labeled as "Walk" are those from which walking is always faster than any transit option.

Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018

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Figure 9 shows the cheapest fare to City Hall. For the vast majority of riders, it is either $2 for nontransfer riders using the Travel Wallet or $2.29 for riders making one or more transfers, assuming they buy monthly passes, make 42 rides per month, and do not use Regional Rail.[30]

Figure 9

Average Cheapest Fare to Philadelphia City Hall
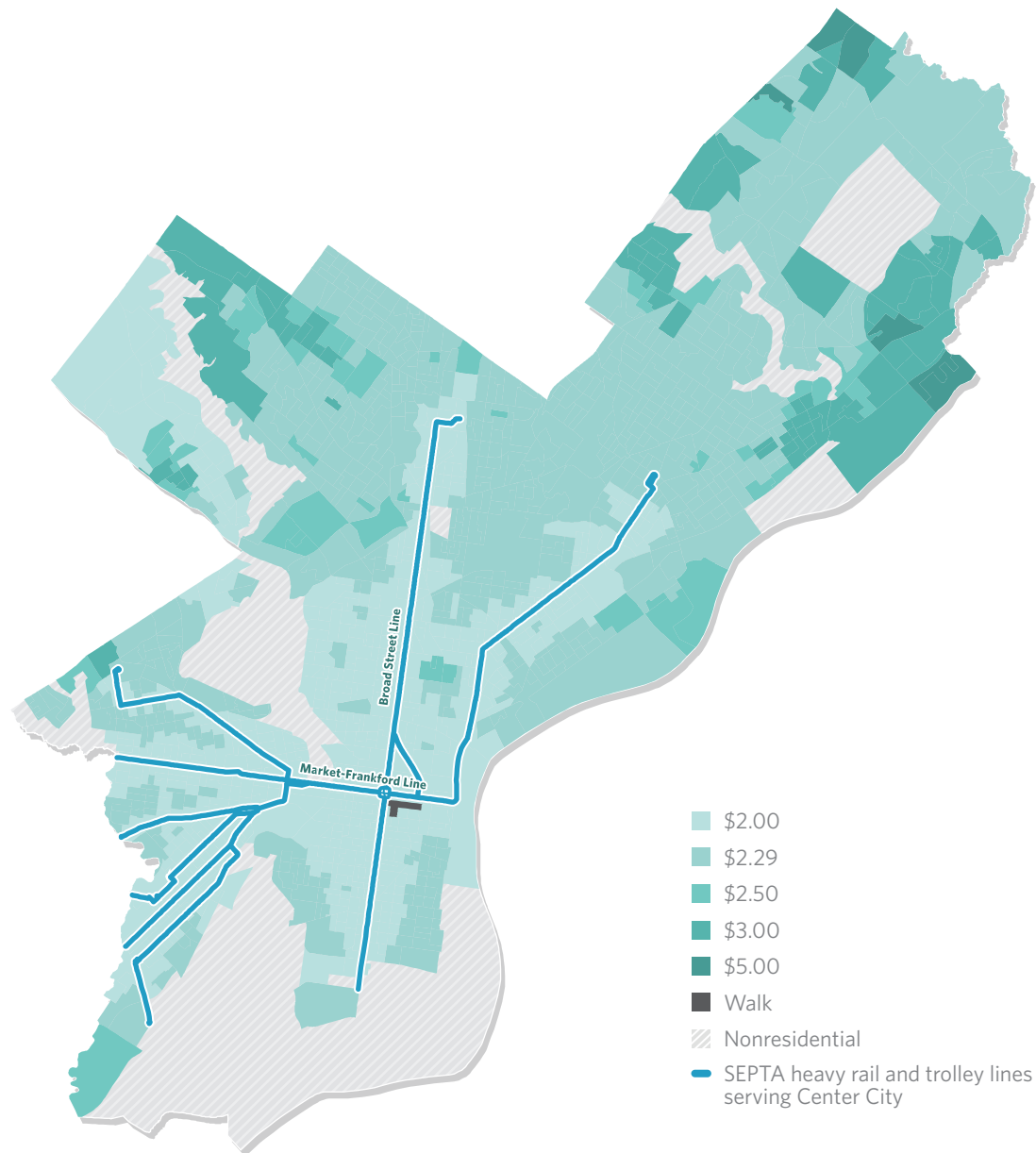
Legend:
- $2.00
- $2.29
- $2.50
- $3.00
- $5.00
- Walk
- Nonresidential
- SEPTA heavy rail and trolley lines serving Center City

Note: Fares are symbolized by a common set of colors on all fare maps; not all fare classes are present on all maps. Areas labeled as "Walk" are those from which walking is always faster than any transit option.

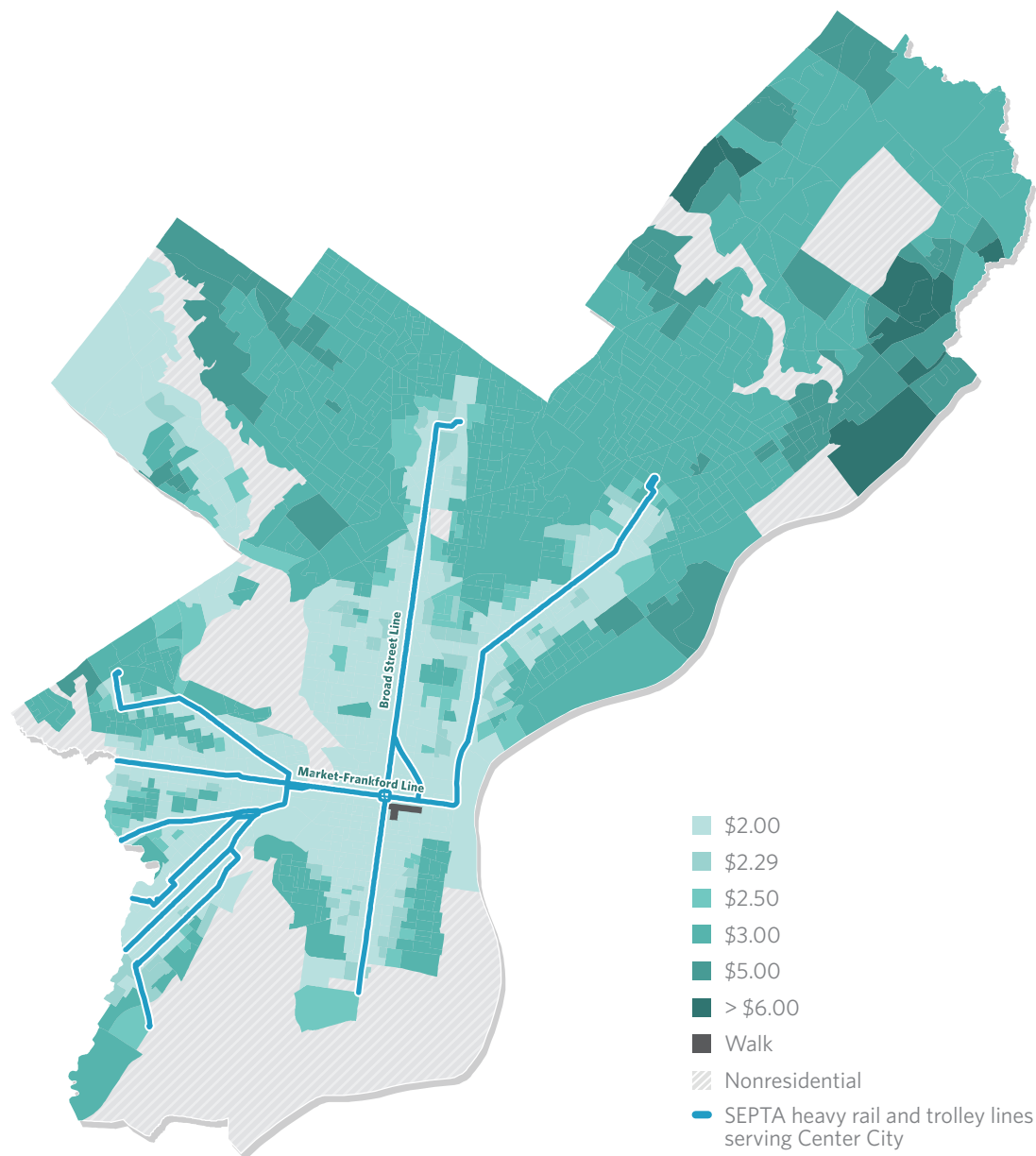Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018

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Traveling to the workplace

To get a fuller understanding of how fares affect Philadelphians' commutes, it is necessary to focus on where they work. Pew used the same trip-planning software to determine the fare that residents would pay to make the shortest trip from their home block groups to those where they work (whenever both block groups were served by SEPTA). The data on job location were drawn from a Census Bureau database that captures the number of workers traveling between every pair of census blocks in the U.S.[31] The median fare paid by the residents in a block group was then calculated, weighted by the number of residents making each trip.

Because many of these trips do not end in central Philadelphia, they are much more likely, on average, to require a transfer or a ride on Regional Rail than does a trip to City Hall, driving up the fares. For instance, in getting to City Hall, 45 percent of working Philadelphians paid a lowest single-trip fare of less than $3; in getting to their jobs, only 32 percent did so, with the rest paying more.

Figure 10 shows that the median cash fare for getting to work is $2.50 in relatively small parts of the city, mostly in Center City, South Philadelphia, and West Philadelphia. In much of the rest of the city, rides requiring transfers are necessary, and the median cash fare rises to $5. In other areas, residents face fares of more than $5 as a result of multiple transfers or rides on commuter rail.

Lexey Swall

Figure 10
Median Cash Fare to Residents' Workplaces in Philadelphia
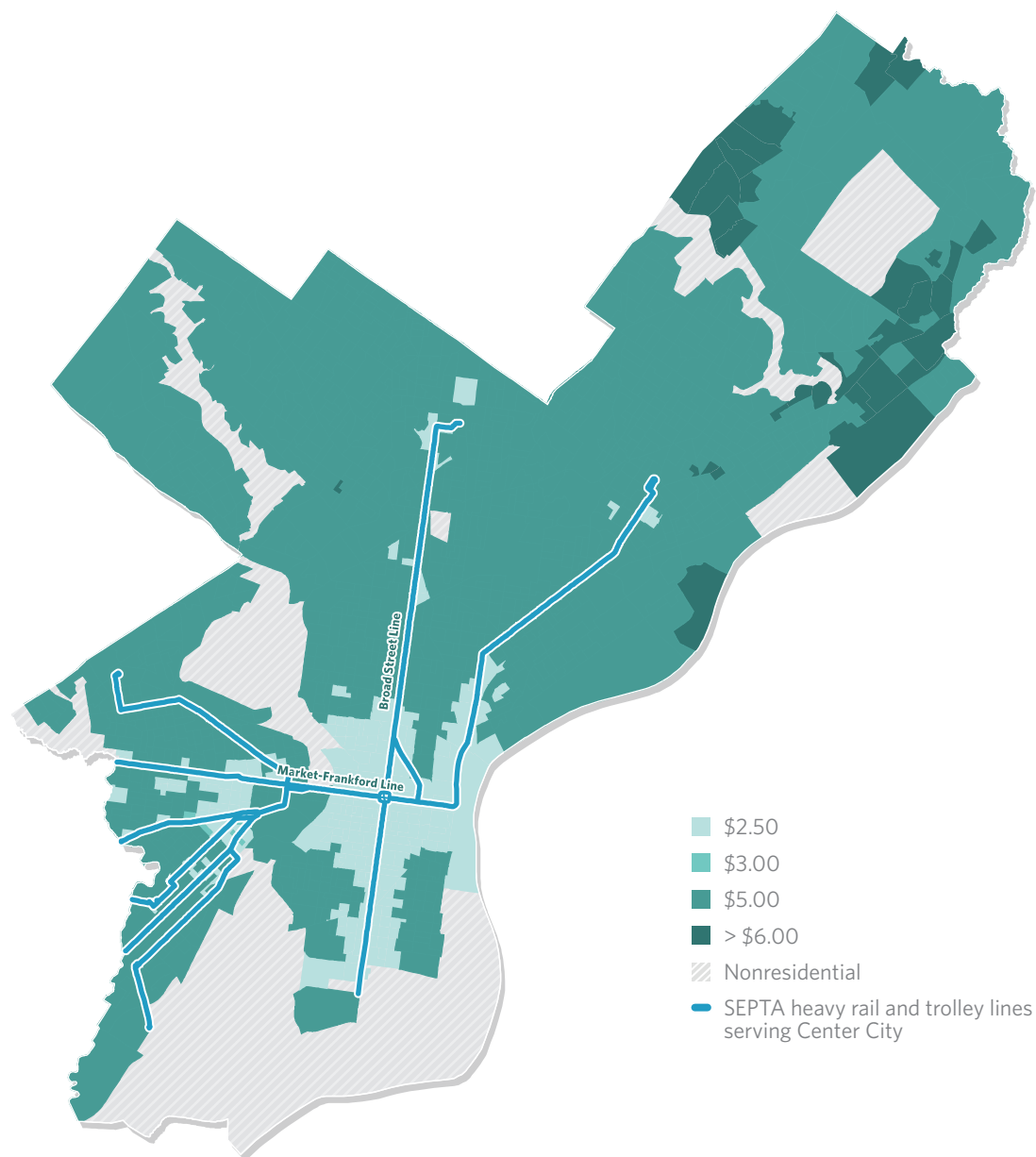
Legend:
- $2.50
- $3.00
- $5.00
- > $6.00
- Nonresidential
- SEPTA heavy rail and trolley lines serving Center City

Note: Fares are symbolized by a common set of colors on all fare maps; not all fare classes are present on all maps.

Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018, and U.S. Census Bureau LEHD Origin-Destination Employment Statistics 2015, accessed March 27, 2018

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The lowest single-trip and cheapest fares to get to work were also calculated. Figure 11 summarizes the results.[32] On average, the fares to work were higher than those to City Hall for all payment types, although the difference was smaller when methods other than cash were used. That was particularly true when riders were able to use passes, as they did for 39 percent of all trips on the City Transit Division.

Figure 11

Percentage of Employed Philadelphians Paying Each Fare, Based on Trip Destination and Payment Method
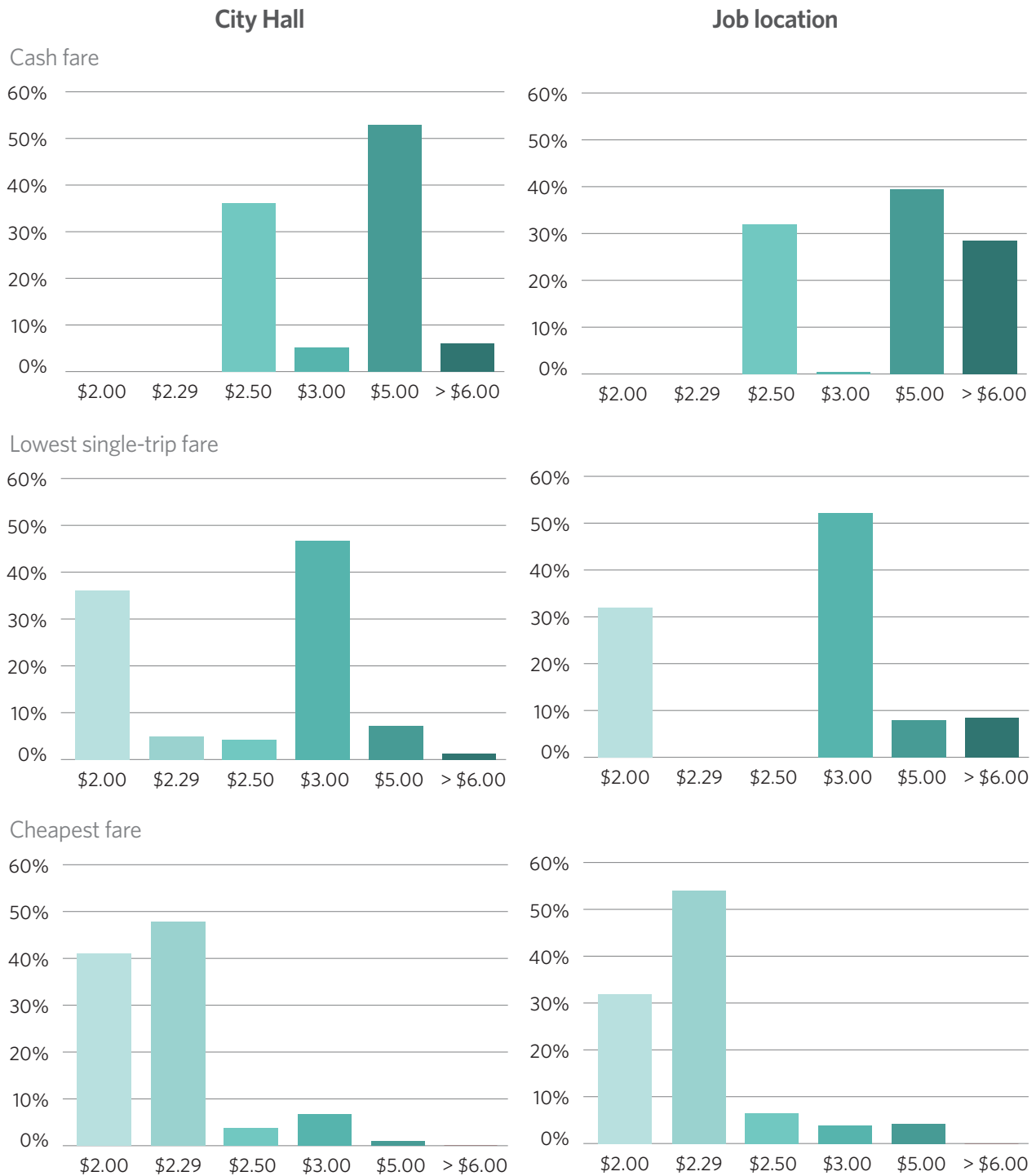
City Hall

Cash fare

Lowest single-trip fare

Cheapest fare

Job location

Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018, and U.S. Census Bureau LEHD Origin-Destination Employment Statistics 2002-15, accessed March 27, 2018

Census data show that the jobs held by higher-earning residents tend to be concentrated in Center City and University City, areas that are generally less expensive to access using public transit, while lower-salaried jobs are dispersed throughout the city and the region—and getting there can be more expensive.

As shown in Figure 12, nearly 40 percent of Philadelphians earning more than $40,000 per year work in Center City or University City, compared with only 20 percent of residents earning less than that amount.[33] On the other hand, 44 percent of lower-salaried Philadelphians have jobs elsewhere in Philadelphia, compared with only 29 percent of residents earning more than $40,000 per year. Philadelphians earning lower salaries are also slightly more likely to work outside the city than are residents who earn more.

Figure 12

Job Location by Salary for All Philadelphians Working in the Philadelphia Region

Legend: Under $40,000 — $40,000 and over
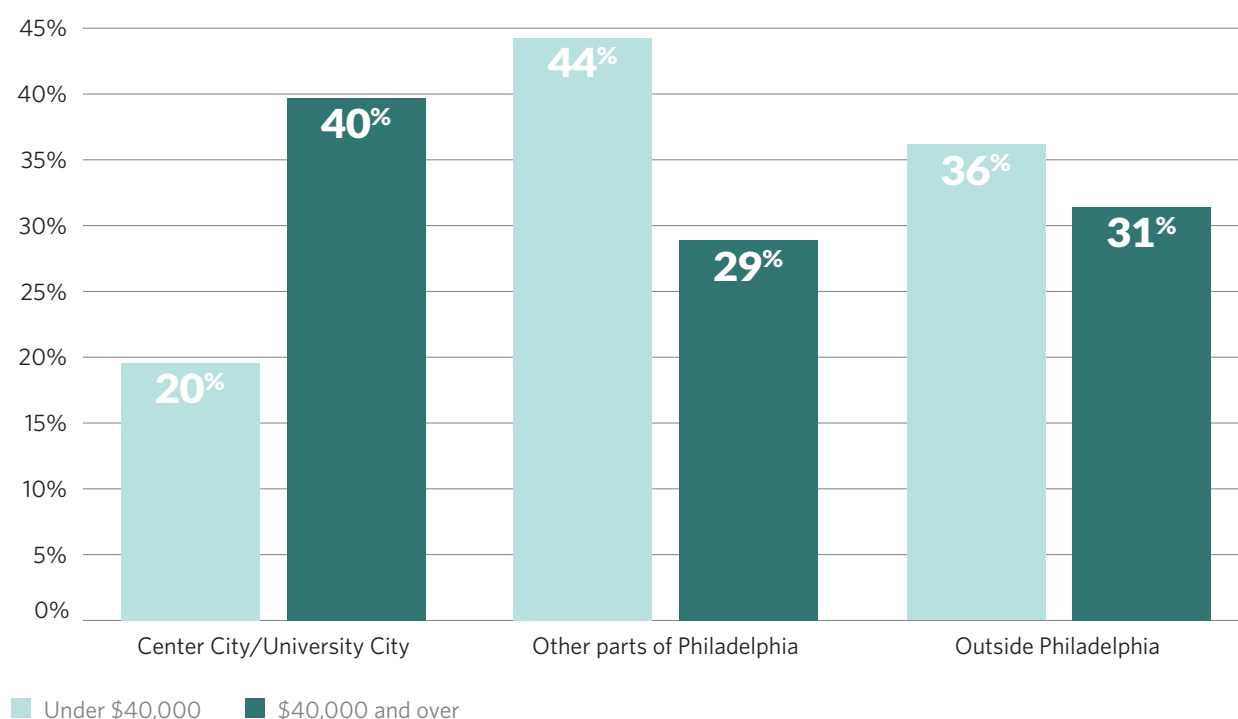
Source: U.S. Census Bureau LEHD Origin-Destination Employment Statistics 2002-15, accessed March 27, 2018

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A 2010-11 survey of transit riders by DVRPC also found that Philadelphians with low household incomes were less likely to travel to jobs in Center City than were high-income riders, as shown in Figures 13 and 14.[34] Because lower-salary jobs tend to be located outside central Philadelphia, the transfer fee has a greater impact on the residents who hold those jobs.

Figure 13

Work Locations for Philadelphia Transit Riders With Household Incomes Less Than $25,000
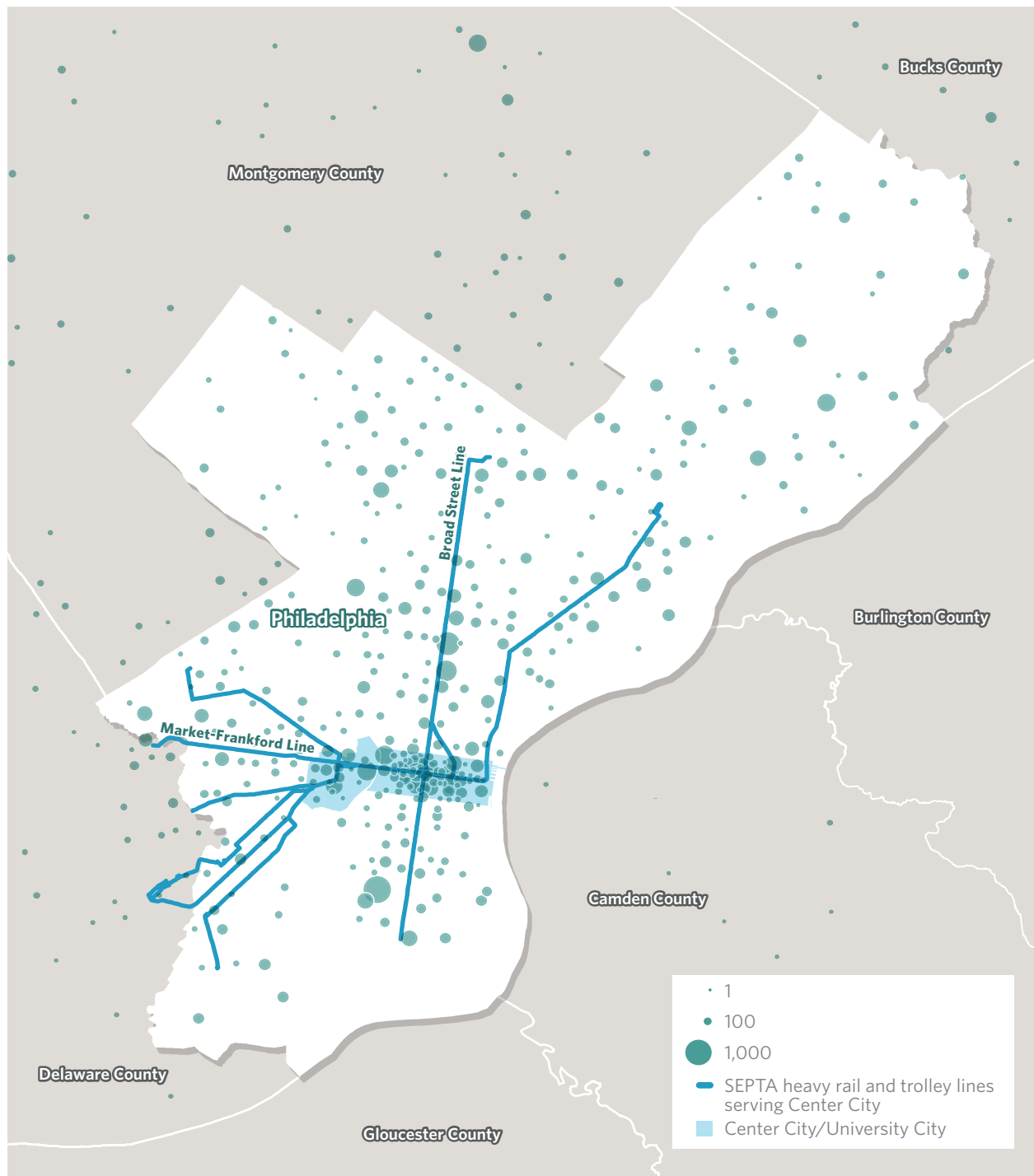
Source: Pew analysis of raw data from the Delaware Valley Regional Planning Commission's 2015 "Philadelphia Regional On-Board Transit Survey"

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Figure 14

Work Locations for Philadelphia Transit Riders With Household Incomes of $100,000-$149,999

Source: Pew analysis of raw data from the Delaware Valley Regional Planning Commission's 2015 "Philadelphia Regional On-Board Transit Survey"

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This pattern is quantified for all income classes in Figure 15. The likelihood of a Philadelphian commuting to central Philadelphia increases dramatically as household income rises. And conversely, people with lower incomes are more likely to have job destinations elsewhere in Philadelphia.[35]

Figure 15

Location of Commute Destination for Trips Originating in Philadelphia

By riders' household income

Legend:
- Under $35,000
- $35,000-$74,999
- $75,000 or over

Center City/University City: 35%, 61%, 72%
Other parts of Philadelphia: 54%, 31%, 19%
Outside Philadelphia: 11%, 8%, 9%

Source: Pew analysis of raw data from the Delaware Valley Regional Planning Commission's 2015 "Philadelphia Regional On-Board Transit Survey"

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In addition to the higher concentration of high-income jobs in Center City, this result likely reflects the range of travel options available to people with higher incomes. If higher-income residents view trips via transit as slow, inconvenient, and expensive, they are more likely to switch to driving or private ride-hailing services. Census data for Philadelphia support this conclusion.[36]

The overall result of these trends is that lower-income Philadelphians in the DVRPC rider survey made more commuting trips that were subject to the transfer fee or an additional base fare—and would have paid more if they used cash or tokens because they were unable to afford the upfront cost of a weekly or monthly pass or for some other reason. (See Figure 16.)

Figure 16

Percentage of Philadelphia Commuters Making Trips Subject to Transfer Fee or Requiring an Additional Base Fare
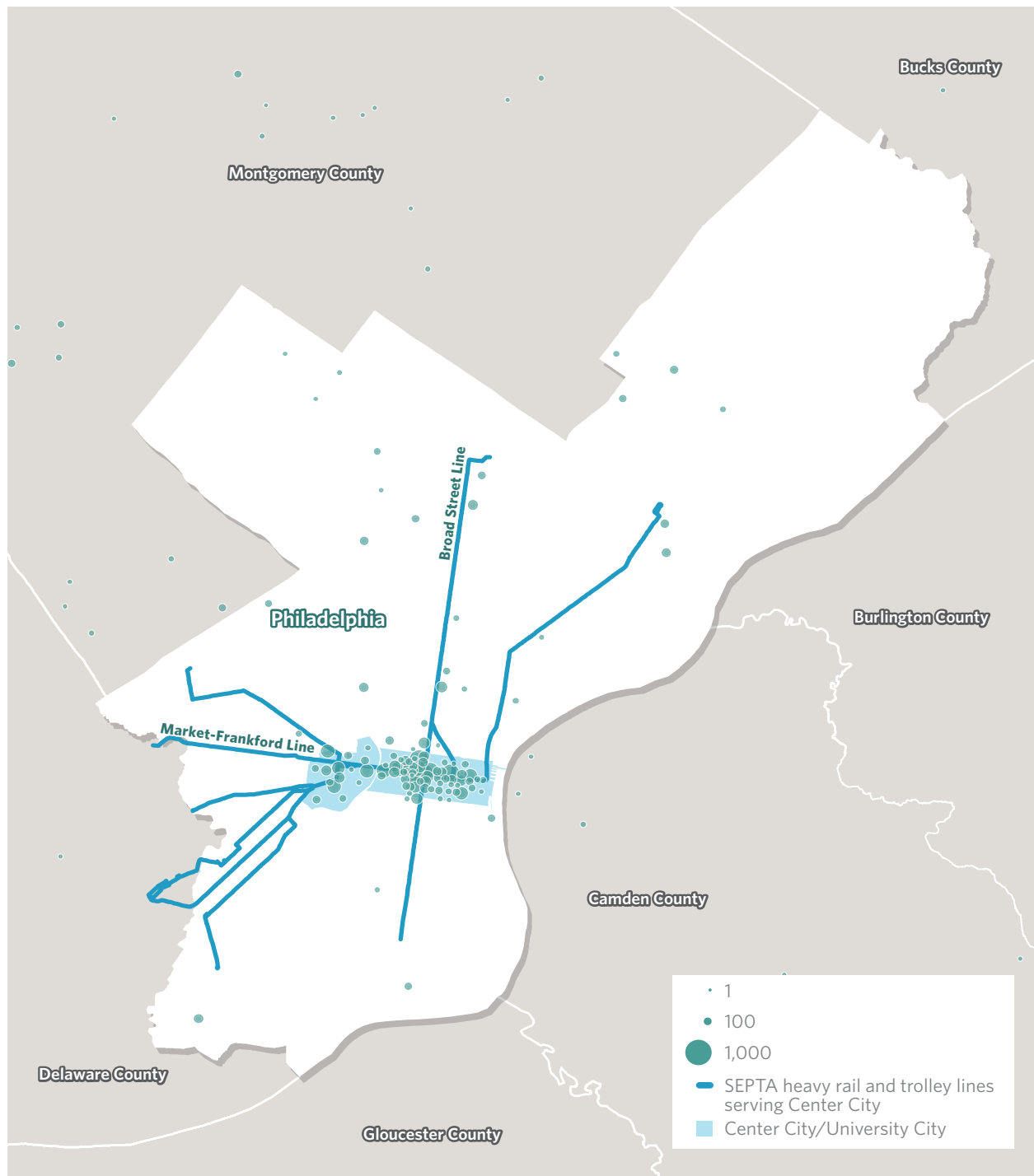
By income
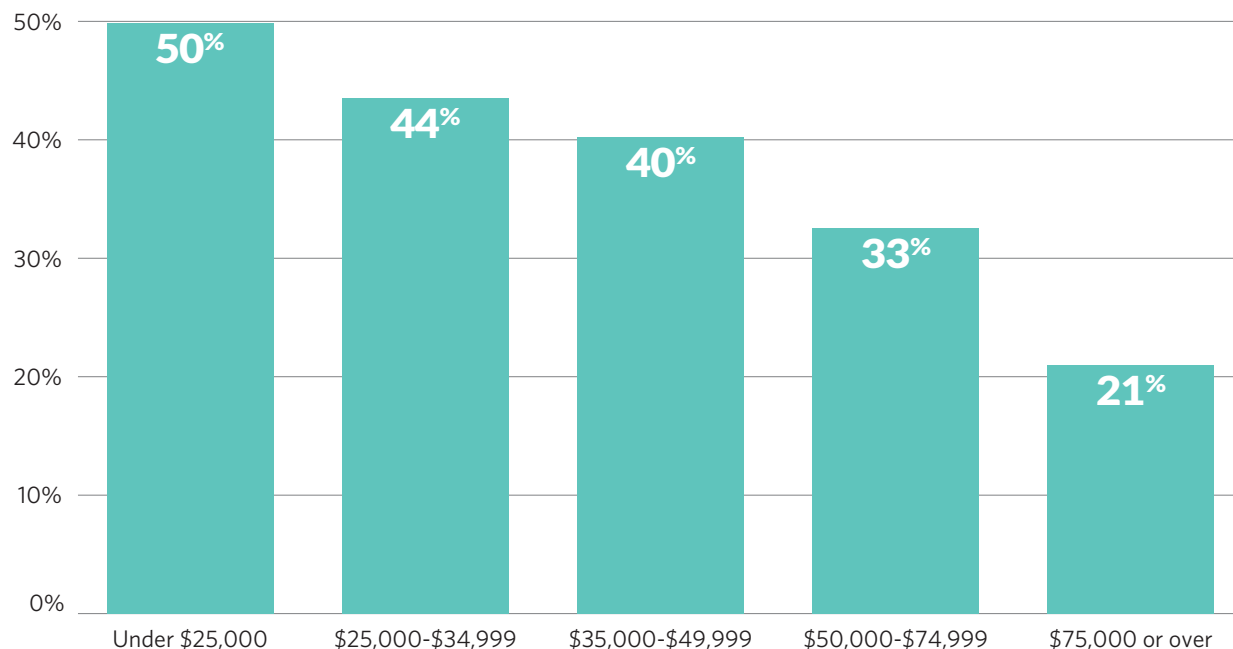
Source: Pew analysis of raw data from the Delaware Valley Regional Planning Commission's 2015 "Philadelphia Regional On-Board Transit Survey"

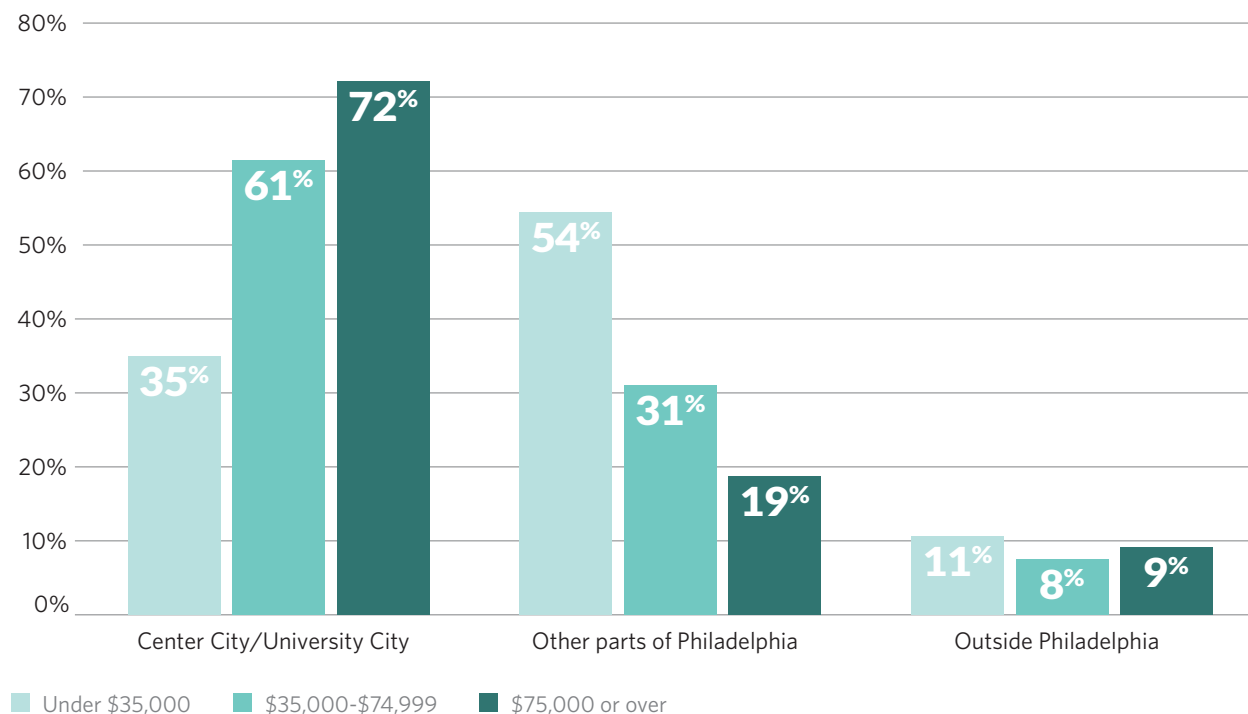© 2019 The Pew Charitable Trusts

SEPTA's current service review

SEPTA is conducting a multiyear reassessment of its existing bus network to determine whether a redesign could help reverse recent ridership declines.

The initial phase of that assessment, done by Jarrett Walker and Associates, produced the "Philadelphia Bus Network Choices Report."* The report described strategies for improving service, including increasing travel speeds, reducing the amount of duplicative service in the SEPTA system, adding space between stops, trimming some peak-hour service, making targeted increases in vehicle frequency, and eliminating the transfer fee. And in its recent strategic transportation plan, Philadelphia voiced its commitment to help SEPTA implement many of those ideas.†

Eliminating the transfer fee is central, the report said, because the system can operate more efficiently if riders make more connections between high-frequency routes; a network that encourages easy transfers along a grid pattern is less expensive to operate than one that includes long, complicated, and duplicative routes. To compensate for the loss of revenue that would result from eliminating the transfer fee, the

Continued on the next page

report raises the possibility of a higher base fare, a move employed by other transit agencies in this situation.‡

* SEPTA, "Philadelphia Bus Network Choices Report" (2018), http://www.septa.org/service/bus/network/report. html.

† City of Philadelphia, "CONNECT: Philadelphia's Strategic Transportation Plan" (2018), http://www.phillyotis.com/wp-content/uploads/2018/11/Connect_9.8_11-09-18_sm.pdf.

‡ Delaware Valley Regional Planning Commission, "SEPTA Transfer Pricing Analysis" (2012), https://www.dvrpc.org/reports/12016.pdf.

Many low-income riders purchase weekly or monthly passes and thereby avoid paying to transfer. In the DVRPC survey, taken before SEPTA Key was introduced or the paper transfer was eliminated, more than 50 percent of respondents who lived in Philadelphia and reported incomes of $25,000 or less said they used passes to pay for their commutes—about the same as the percentage for residents in all income categories.[37] Such passes are often, but not always, the path to the cheapest fare.

Although riders with passes are more likely to transfer, many riders end up making transfers without the benefit of a pass. In November 2018, according to SEPTA data, 20 percent of City Transit riders who used the Travel Wallet made a paid transfer—approximately 588,000 rides per month—and these trips were far more likely to have originated on buses than on rail.[38] According to 2015 SEPTA data, low-income riders were much more likely than their higher-income counterparts to buy transfers.[39]

The DVRPC survey found that low-income riders were much more likely to pay with cash, although no comparable data are available since the introduction of SEPTA Key. Then as now, cash fares were higher than the alternative, the token. The survey found that about 17 percent of respondents with incomes under $25,000 paid cash for their trips to work, roughly twice as many as among higher-income riders.[40] This is consistent with the results of a survey in New York City that found that riders with low incomes and low savings were twice as likely as moderate- and higher-income riders to purchase a single-fare MetroCard—the equivalent of paying cash—rather than a weekly or monthly pass.[41] This finding may be due to the high upfront cost of a monthly pass, job instability among lower-income riders, or other factors.[42]

Where the transfer fee hits the hardest

To identify the neighborhoods where transfer fees have the greatest impact on riders who do not purchase weekly or monthly passes, Pew looked for block groups where the shortest trip to work would subject more than half of residents to the fee; where more than half did not have access to personal vehicles; and where the poverty rate exceeded the citywide average of 26 percent.[43]

Those neighborhoods, as shown in Figure 17, tend to be in West and North Philadelphia and along the Kensington Avenue corridor. Of course, there are individuals throughout the city who, depending on the location of their jobs, are similarly affected.

Figure 17

Areas of Philadelphia Widely Affected by the Transfer Fee With Poor Vehicle Access and High Poverty
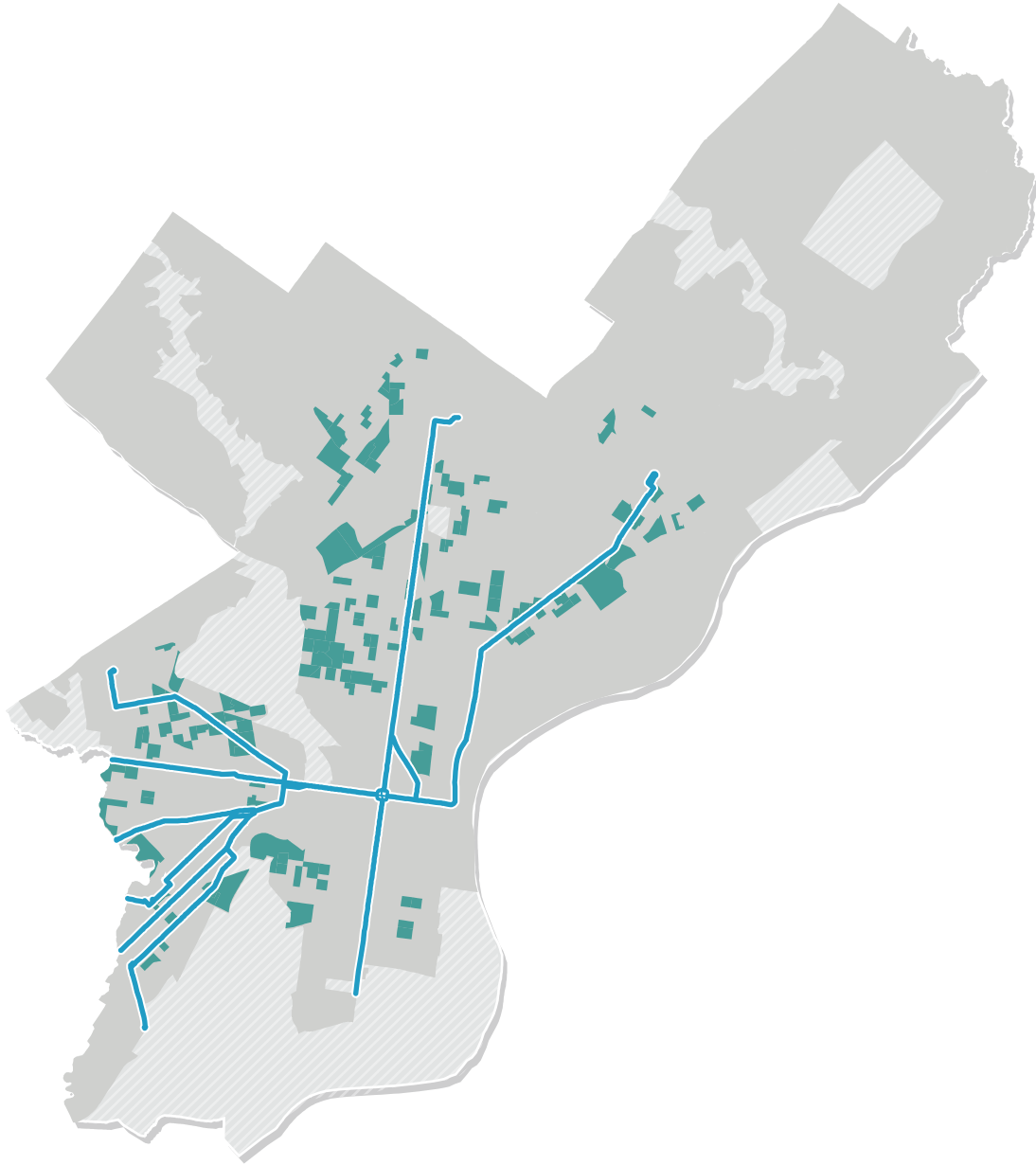
Source: Pew analysis, based on SEPTA fares accessed Aug. 31, 2018, and U.S. Census Bureau LEHD Origin-Destination Employment Statistics 2002-15, accessed March 27, 2018; U.S. Census Bureau American Community Survey, five-year estimates, 2012-16

Conclusion

The base fare for SEPTA's City Transit Division is low compared with those in the other major cities in this report. But combined with the fee that the transit agency charges for transfers, which is high compared with those of the other cities, Philadelphians who make longer trips with multiple legs—and, particularly, riders who do not have weekly or monthly passes—may face relatively expensive fares.

Due to the transfer fee and the higher fares charged on Regional Rail, the cost to reach any destination from various parts of the city is far from uniform. As a result, the fare structure's impact is felt unevenly depending on where people live and where they are going.

In general, low-income Philadelphians are relatively well-served by SEPTA's urban rail network, which runs close to where many of them live, and by the fare structure, as long as the goal is to reach central Philadelphia. But Philadelphia's jobs are dispersed throughout the city and the region, particularly at the low end of the salary scale. As a result, low-income residents traveling to work are disproportionately exposed to higher fares. Not having access to a car can exacerbate this vulnerability, particularly in certain low-income neighborhoods.

As declining ridership spurs transit agencies to re-examine their service, SEPTA, for its part, is reconsidering the design of its bus network while also completing the transition to its new smart card payment technology. In this evolving context, the fare structure is and will continue to be an important consideration in how riders use the system.

Appendix A

Methodology of intercity comparisons
Selection of comparison cities

To put Philadelphia's fare structure in the appropriate perspective, this analysis examined fares in cities, like Philadelphia, in which many commuters travel via public transit. With the fifth-highest number of transit commuters in the country, Philadelphia is one of the eight cities in the top tier of ridership: New York, Chicago, Los Angeles, San Francisco, Philadelphia, Washington, Boston, and Seattle. A large interval separates the city with the eighth-highest ridership (Seattle) from the next one that is also the principal city in its metropolitan statistical area (Baltimore), creating a natural breakpoint for the selection of cities.

Fare data

Comparisons were made among the fares charged by the primary transit service provider within each city. Those agencies are MTA New York City Transit, Chicago Transit Authority, Los Angeles County Metropolitan Transportation Authority, San Francisco Municipal Transportation Agency, Southeastern Pennsylvania Transportation Authority (Philadelphia), Washington Metropolitan Area Transit Authority, Massachusetts Bay Transportation Authority (Boston), and King County Department of Transportation (Seattle). Fare data were captured from the agency websites on Aug. 31, 2018; the comparisons in this report reflect the fares in effect at that time.

The decision on which services to include in the fare comparisons for each city was based on service maps and the fare and service information on each agency's website. GIS shapefiles defining the boundaries of each city were downloaded from the U.S. Census Bureau (either TIGER/Line or Census Cartographic Boundary files). For some cities, these were complemented by city land area shapefiles downloaded from the corresponding city,

county, or state open-data websites. GIS shapefiles comprising all routes operated by each of the transit service providers were downloaded from the agency or corresponding city, county, or state open-data websites June 5-6, 2018. All transit routes were mapped and overlaid on the city limits.

The following services were included in the comparisons:

1. Buses and trolleybuses: All buses and trolleybuses, except for express bus service to outlying areas. Those express routes were excluded because they typically charge higher fares than city routes and often use limited-access highways for a portion of their routes, making few, if any, stops within the city outside the central business district. They represent a small share of overall bus service.

2. Heavy rail: All heavy rail (subway/elevated). Excluded were BART trains in San Francisco, which are operated by Bay Area Rapid Transit and primarily provide service outside San Francisco city limits.

3. Light rail: All light rail operating within or mostly within city limits. The Seattle Streetcar and Link light rail, which is operated by Sound Transit, were excluded; the Seattle Streetcar provides limited service on two routes, and Link provides service primarily outside the city. In Los Angeles, the analysis includes several lines that provide service that goes substantially outside the city limits. But because all light-rail fares are the same there, doing so did not affect the results.

   In a small number of cases, special fares are charged to or from a small number of stations. In Chicago, this includes O'Hare airport and the Route 128 express, which were excluded from the analysis.

   All commuter rail service was excluded.

Washington presented a special case, as heavy rail fares on the Metro system are distance-based, alone among the comparison cities. To generate a comparable fare, Pew created a matrix of peak fares between all pairs of stations located within city limits, and the average fare, $2.67, was calculated.

In a limited number of cases, the fare differed depending on the transit mode. These included Chicago, Boston, New York, and Washington. In those cases, the fare of the higher-cost mode (rail) was used. By focusing on the higher-cost mode, the analysis captures the worst-case fares for riders. (Data for all modes are included in Appendix B.) In Seattle, only bus fares were used. Where the comparison involved the base fare plus transfer, the trip was assumed to be mixed-mode (except for Seattle, where the trip was bus-only), thereby involving travel on both the higher- and lower-cost services. This was done to capture the variation in fares across all modes. In cases where the order of the modes affected the total trip cost, the costs of both mode orders were averaged.

Appendix B
Table of fares for comparison group cities

		Philadelphia	Boston	New York City
	Agency	Southeastern Pennsylvania Transportation Authority (SEPTA)	Massachusetts Bay Transportation Authority (MBTA)	MTA New York City Transit (NYCT)
Cash fare	Base fare—rail	$2.50	$2.75	$3.00
	Base fare—bus	$2.50	$2.00	$2.75
	Transfer cost—rail to bus	$2.50	$2.00	$2.75
	Transfer cost—bus to rail	$2.50	$2.75	$3.00
	Transfer cost—bus to bus	$2.50	$2.00	$0.00
	Base fare + transfer (mixed-mode trip)	$5.00	$4.75	$5.75
	Base fare + transfer (bus-only trip)	$5.00	$4.00	$2.75
	Notes on base fare			Higher cost for rail includes $0.25 cost for single-trip ticket.
	Notes on transfer cost	Full fare for transfer.	Full fare for transfer with cash.	Full fare for transfer between bus and rail; free transfers between buses.
	Notes on base fare + transfer			

Chicago	Los Angeles	Washington	San Francisco	Seattle
Chicago Transit Authority (CTA)	**Los Angeles County Metropolitan Transportation Authority (LACMTA)**	**Washington Metropolitan Area Transit Authority (WMATA)**	**San Francisco Municipal Railway (MUNI)**	**King County Department of Transportation**
$3.00	$1.75	$2.67	$2.75	NA
$2.50	$1.75	$2.00	$2.75	$2.75
$0.00	$1.75	$1.50	$0.00	NA
$3.00	$1.75	$2.67	$0.00	NA
$2.50	$1.75	$2.00	$0.00	$0.00
$4.25	$3.50	$4.42	$2.75	NA
$5.00	$3.50	$4.00	$2.75	$2.75
Higher cost for rail includes $0.50 cost for ticket. Fare from O'Hare only is $5.		Base peak fare for rail is $2.25 (i.e., lowest fare between any pair of stations). $2.67 rail fare is the average peak fare between all destinations within Washington. Boarding rail requires purchase of a SmarTrip card, but the cost of the card ($2) is not included in the fare.	Fares exclude cable car.	
Two free transfers are included with rail ticket, none with bus fare.	Full fare for transfer.	Full fare for transfer from bus to rail or bus to bus. Transfer from rail to bus qualifies for $0.50 SmarTrip card discount on bus fare because purchase of a card was required for rail boarding.	Transfers are free within 90 minutes.	
Mixed-mode fare is average of total cost for trips beginning on bus or rail.		Mixed-mode fare is average of bus-to-rail and rail-to-bus transfer, where going from rail to bus is $0.50 cheaper because purchase of a SmarTrip card was required to board rail first, but not vice versa.		

		Philadelphia	Boston	New York City
Lowest single-trip fare	Base fare—rail	$2.00	$2.25	$2.62
	Base fare—bus	$2.00	$1.70	$2.62
	Transfer cost—rail to bus	$1.00	$0.00	$0.00
	Transfer cost—bus to rail	$1.00	$0.55	$0.00
	Transfer cost—bus to bus	$1.00	$0.00	$0.00
	Base fare + transfer (mixed-mode trip)	$3.00	$2.25	$2.62
	Base fare + transfer (bus-only trip)	$3.00	$1.70	$2.62
	Notes on base fare	Requires token (no longer sold) or SEPTA Key card (smart card). Card cost is $4.95; fee is waived if card is registered. Cost of card is not included in fare calculations.	Requires discount-ride CharlieCard (smart card). Card is free.	Using a MetroCard, the $2.75 base is discounted by 5 percent if $5.50 or more is added to the card, so the base fare is effectively $2.62. There is a $1 cost for a MetroCard. Cost of card is not included in fare calculations.
	Notes on base fare + transfer	Fare is achieved via smart card. Includes two transfers within 90 minutes of original ride.	Fare is achieved via smart card. Cost of mixed-mode trip is $2.25 regardless of mode order. Includes one transfer within two hours of original ride.	Fare is achieved via discounted fare with pay-per-ride MetroCard. Includes free transfers within two hours of original ride.
Cheapest fare	Base fare—rail	$2.00	$2.01	$2.62
	Base fare—bus	$2.00	$1.31	$2.62
	Base fare + transfer (mixed-mode trip)	$2.29	$2.01	$2.62
	Base fare + transfer (bus-only trip)	$2.29	$1.31	$2.62
	Notes on base fare	Fare is achieved via smart card Travel Wallet.	Fare is achieved via monthly pass.	Fare is achieved via discounted fare on pay-per-ride MetroCard.
	Notes on base fare + transfer	Fare is achieved via monthly pass.	Mixed-mode fare is achieved via monthly pass. Bus fare is achieved via monthly bus pass.	Fare is achieved via discounted fare on pay-per-ride MetroCard.

Chicago	Los Angeles	Washington	San Francisco	Seattle
$2.50	$1.75	$2.67	$2.50	NA
$2.25	$1.75	$2.00	$2.50	$2.75
$0.25	$0.00	$1.50	$0.00	NA
$0.25	$0.00	$2.17	$0.00	NA
$0.25	$0.00	$0.00	$0.00	$0.00
$2.63	$1.75	$4.17	$2.50	NA
$2.50	$1.75	$2.00	$2.50	$2.75
Requires Ventra card (smart card), which costs $5. Cost of card is not included in fare calculations.	No additional discount applies to base fare; transfers are free. Discount-ride TAP smart card costs $2. Cost of card is not included in fare calculations.	No additional discount applies to base fare. SmarTrip card (smart card) costs $2 and is required to ride rail. Cost of card is not included in fare calculations.	Requires Clipper Card (smart card), which costs $3; fee is waived if autoload is set up. Excludes cable car. Cost of card is not included in fare calculations.	No discount with ORCA card (smart card), which costs $5. Cost of card is not included in fare calculations.
Fare is achieved via smart card. $0.25 fee provides up to two additional rides within two hours. Cost of mixed-mode trip is average of trip starting on rail ($2.75) and starting on bus ($2.50).	Fare is achieved via smart card. Card allows transfers to other Metro lines for up to two hours.	Bus-to-bus transfers are free for two hours with SmarTrip card; other transfers are $0.50 less than the base fare. Cost of mixed-mode trip is $4.17 regardless of mode order.	Fare is achieved via smart card. All transfers are free within 90 minutes.	Free transfers for two hours with ORCA card. Fare is for bus-only trip.
$2.50	$1.75	$2.67	$1.79	NA
$2.25	$1.75	$1.67	$1.79	$2.36
$2.50	$1.75	$3.63*	$1.79	NA
$2.50	$1.75	$1.67	$1.79	$2.36
Rail fare is the same with monthly pass or smart card; bus fare is achieved via smart card.	Fare is achieved via smart card.	Rail fare is achieved via smart card; bus fare is achieved via monthly pass.	Fare is achieved via monthly pass.	Fare is achieved via monthly pass.
Mixed-mode fare is achieved via monthly pass. Bus fare is achieved via monthly pass or smart card.	Fare is achieved via smart card.	Mixed-mode fare is achieved via smart card. Bus fare is achieved via monthly (four-week) pass.	Fare is achieved via monthly pass.	Fare is achieved via monthly pass. Fare is for bus-only trip.

		Philadelphia	Boston	New York City
Passes	**Monthly pass (excluding bus only)**	$96.00	$84.50	$121.00
	Monthly pass (bus only)		$55.00	
	Notes on monthly pass		$84.50 for local bus, subway; same price for CharlieCard or CharlieTicket; CharlieTicket is also valid for travel on Commuter Rail Zone 1A and Charlestown Ferry; $55 for bus.	

Chicago	Los Angeles	Washington	San Francisco	Seattle
$105.00	$100.00	$152.64	$74.00	NA
		$75.25		$99.00
		*	$94 for pass that is also valid on BART within San Francisco.	

* The cheapest fare for Washington was calculated as follows: Passes that allow travel on rail and bus are available only for trips with two different rail base fares: $189 (for a $3.75 base fare) and $135 (for a $2.25 base fare). For a rider paying the average rail fare of $2.67 and transferring to or from a bus, the lowest-cost option would be to purchase a $135 rail and bus monthly pass. The rider would be required to pay a surcharge of $0.42 per rail trip ($2.67-$2.25), yielding a monthly cost of $152.64 ($135 plus $0.42 per trip times 42 trips per month) and a per-trip cost of $3.63 at 42 trips per month.

Because no monthly bus pass exists, the $75.25 monthly bus pass cost is based on the purchase of an average of 4.3 weekly passes per month at $17.50 each.

Appendix C

Methodology of Philadelphia fare estimates
Definition of SEPTA service area

The SEPTA service area was derived from the spring 2018 rail and bus general transit feed specification (GTFS) stop files downloaded from the SEPTA website (http://www3.septa.org/developer). These were mapped and used to select all census block groups within 1 mile of a SEPTA stop in counties the transit agency serves: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; New Castle in Delaware; and Mercer in New Jersey. This yielded 2,838 block groups, excluding one that covers portions of the Delaware Bay and no land area.

Quantification of block group-level commute trips

Trip origin-destination data were downloaded from the U.S. Census Bureau's Longitudinal Employer-Household Dynamics Origin Destination Employment Statistics (LODES), Version 7, 2015 (https://lehd.ces.census.gov/data) for Pennsylvania, New Jersey, and Delaware. Those files were merged to yield a list of all trips among the three states served by SEPTA.

Custom scripts written in the R programming language and executed in RStudio were used to extract a count of trips, by job salary level, originating from every block within the 2,838 block groups within the study area, and traveling to a block within any of those same block groups. Those trip counts were then aggregated to the block group level, yielding a count of trips, by salary level, between every block group pair.

Trip modeling

OpenTripPlanner (OTP) is open-source multimodal trip-planning software developed in partnership with the transit agency serving Portland, Oregon (TriMet), and is used for trip planning by a number of transit agencies worldwide, as well as by transportation researchers.[44] The software (version 1.2.0) was downloaded (https://repo1.maven.org/maven2/org/opentripplanner/otp) and used to determine the shortest trip (by time) from every census block group in Philadelphia to every block group within the SEPTA service area as identified above (with at least one commute trip).

OTP functions similarly to the trip planner that Google Maps uses to generate directions on that website. It was used rather than Google's trip planner, as Google's software does not output sufficiently detailed trip information to calculate fares and because its model's assumptions are opaque to the user and cannot be adjusted.

The OTP software makes use of two data inputs: a set of transit agency route, schedule, and fare data known as the GTFS feed and available directly from SEPTA (http://www3.septa.org); and a representation of the street network, which is based on OpenStreetMap and was downloaded via the Overpass API (https://www.openstreetmap.org/export). This permits extraction of only the streets within the SEPTA service area.

OTP allows the user to modify several parameters that it uses to find the shortest trip between the origin and destination. In general, these settings were left at or close to their default values. This choice was based in part on conversations with planners at TriMet. The only changes made to the default settings were as follows: maxWalkDistance (1,609.34 meters); walkSpeed (1.341 meters per second); walkBoardCost (750); minTransferTime (60).

The software settings were fine-tuned and validated by comparison with rider route choice as recorded in the 2010-11 DVRPC survey.

The shortest trip between each pair of block groups was calculated at three times: 7:15, 7:45, and 8:15 a.m. (See endnote 24.) Custom scripts written in R calculated fares based on the detailed trip data output by OTP and rules governing the base fare and transfer fees derived from the current SEPTA fare tariffs (http://septa.org/fares/pass/tariffs.html). The fares for each trip at all three departure times were then averaged. For the analysis of trip fares based on job location, the median weighted fare for each block group was calculated based on the number of job trips between each block group pair.

Appendix D
Analysis of DVRPC survey data

The raw data from the Delaware Valley Regional Planning Commission's "Philadelphia Regional On-Board Transit Survey" were downloaded from https://www.dvrpc.org/transportation/Modeling/Data/zip/DVRPC_OnBoard_Transit_Survey_2012_PublicVersion-2018.zip. Among other things, the survey responses included information on the transit routes used to complete a trip, the method of payment, rider income, the approximate origin and destination (at the level of the Traffic Analysis Zone), and the origin and destination type (e.g., home, work, etc.). The survey focused preferentially on the peak morning travel period. The margin of error was less than 10 percentage points for all the rail lines and most of the bus lines, but there were several individual bus lines where that threshold was exceeded. All lines were collapsed in the Pew analysis.

Pew first processed the raw data to extract only the responses of Philadelphians traveling from home to work (to be comparable to the data analyzed elsewhere in the report), and 5,660 responses met those criteria. From those responses, Pew calculated the proportion of riders using different payment methods. In that and all other analyses of the survey data, Pew used the linked expansion factors provided by DVRPC for response weights, as the analyses were at the system rather than the line level.

From the list of transit routes used to complete a respondent's trip, Pew determined whether the trip was subject to payment of the transfer fee or an additional base fare based on the fare rules in effect at the time of the survey. Such trips were those that involved travel on two or more SEPTA bus, trolley, or heavy rail routes unless those routes were all connected at free interchange points in central Philadelphia. To determine the routes subject to those additional costs, a list of the SEPTA routes active at the time of the survey was derived from SEPTA's fiscal year 2012 and 2013 Annual Service Plans. From the survey responses, it was not possible to distinguish between transfers that occurred between SEPTA's two heavy rail lines at the City Hall/15th Street Station Complex (where transfers are free) and at 8th Street Station (where they are not); thus, the results here are likely to slightly underestimate the fraction of rides subject to the transfer fee.

Endnotes

1   U.S. Census Bureau American Community Survey, one-year estimates, 2016 (percentage of residents using public transit to get to work); U.S. Census Bureau American Community Survey, five-year estimates, 2012-16 (percentage of public transit riders earning less than $25,000 per year).

2   U.S. Census Bureau American Community Survey, one-year estimates, 2016. See detailed description of city selection in Appendix A.

3   The base fare definition used here is that of the American Public Transportation Association and refers to "the minimum cash fare paid by an adult for one transit ride; excludes transfer charges, zone or distance charges, express service charges, peak period surcharges, and reduced fares."

4   A very small number of Philadelphians use a day pass, which costs $9 and can be used for up to eight rides on any part of the SEPTA system other than Regional Rail.

5   Excluding commuter rail. SEPTA, "Revenue & Ridership Report: November 2018."

6   A 2010-11 rider survey by the Delaware Valley Regional Planning Commission found that 61 percent of unlinked trips on SEPTA buses, trolleys, and subways (as well as the Port Authority Transit Corp., or PATCO) involve a trip to or from work: Delaware Valley Regional Planning Commission, "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf. SEPTA's most recent rider survey found that 82 percent of trips were work-related: SEPTA, "2018 SEPTA Customer Satisfaction Survey Final Report" (December 2018), http://septa.org/strategic-plan/reports/2018-survey-results.pdf.

7   All the transit systems in this report offer payment via a fare card, in addition to cash. In most cities, that is via a contactless smart card that handles discount fares and passes. Only New York City Transit employs the older magnetic stripe technology in its MetroCard.

8   If the pass is used for non-commute trips, then the cheapest fare may be lower than the values calculated in this report, depending on the number of additional trips taken. That is, as more trips are taken, the cost per trip may fall below the lowest single-trip fare.

9   Washington is the only city in this group where the fare is higher during peak hours, and that is the fare that is used in the comparisons in this report.

10 Washington presented a special case, as heavy rail fares are distance-based, unlike all other cities in the comparison group. To estimate a comparable fare, a matrix was created of peak hour fares between all pairs of stations located within city limits, and the average fare, $2.67, was calculated. In the case of Seattle, the comparison is between bus fares. See Appendix A for details.

11 In both New York and Chicago, the rail fares include an extra fee (25 cents and 50 cents, respectively) for the cost of the rail ticket itself, resulting in higher fares for rail rides purchased with cash. In Washington, a rail trip is possible only with a smart card, for which a rider must pay $2 before putting any money on it. The cost of the card itself is not included in the cash fare compared in this report.

12 The cheapest base fare for a Philadelphia rider making fewer than 49 trips per month is $2. Riders making more rides would obtain the cheapest fare via a monthly pass, and that fare would decline with each additional trip.

13 In some cities, transfers are priced differently depending on the type of transit mode (i.e., bus or rail) transferred to or from. In this report, comparisons between the base fare plus transfer assume that the trip involves a transfer between modes (except in the case of Seattle, where only bus fares are included in this report). In two cases (Chicago and Washington), the order of the modes affects the total trip cost for fares paid in cash. For those cities, both mode orders are averaged in the calculations. In all cases, transfers between rail lines are considered to be free. This is true with very limited exceptions in all cities, as free interchange between intersecting rail lines is virtually universal policy for non-distance-based fare structures.

14 Pew analysis of data from Delaware Valley Regional Planning Commission, "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf.

15 Because of its distance-based fares, Washington again presents a special case. Its lowest single-trip fare for a trip involving a transfer ($4.17) is the sum of its average rail fare of $2.67 (as explained in endnote 10) and a bus fare of $2, minus a 50-cent transfer discount. The cash fare ($4.42) is calculated in the same way, except because a rider beginning her trip on a bus would not yet have a SmarTrip card, she would not receive the 50-cent transfer discount. The fare is calculated as the average for trips beginning on each mode (as explained in endnote 13), so the fare for a mixed-mode trip paid in cash is 25 cents higher than the lowest single-trip fare.

16 The price is lower for SEPTA riders making more than 42 trips per month, as the cost of the pass would be distributed across more rides. In all cases, the trends described for rail fares are very similar to the results of an analogous analysis of bus fares (both for the bus base fare and the base fare + transfer for bus-to-bus transfers). The primary difference is that SEPTA's bus-only fares tend to be slightly higher relative to the other cities. All fare details are provided in Appendix B.

17 U.S. Census Bureau American Community Survey, one-year estimates, 2016.

18 For a Philadelphian, the annual fare would be $1,008—$2 per ride times two rides per day times 21 days per month times 12 months per year. Median household income in Philadelphia is $39,770 based on the U.S. Census Bureau American Community Survey, five-year estimates, 2012-16.

19 SEPTA is the source for transfer rate.

20 Federal Transit Administration, National Transit Database, "Transit Profiles: 2017 Full Reporters" (2018), https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/ntd/transit-agency-profiles/130051/2017-transit-profiles-full-reporter-summary_1.pdf.

21 Should the transfer fee be eliminated, the impact on SEPTA's revenues would likely exceed $8 million, however, as weekly and monthly passes would lose much of their cost advantage if they remained at their current prices, leading to a decrease in pass sales, unless other fare changes were implemented.

22 These free transfer points occur at the City Hall/15th Street Station Complex, the Juniper Street/13th Street Station Complex, and the 30th Street Station Transit Complex. The exception is the intersection of the Broad Street Line's Ridge Avenue spur and the Market-Frankford Line.

23 The software used was OpenTripPlanner, version 1.2.0 (https://repo1.maven.org/maven2/org/opentripplanner/otp).

24 Data from the U.S. Census Bureau American Community Survey, five-year estimates, 2012-16, were used to identify the three half-hour intervals during which the most Philadelphians leave home for work. The midpoints of those three intervals—7:15, 7:45, and 8:15 a.m.—were chosen as the three departure times for the analysis. Because the trip-planning software aims to minimize travel times, a given trip may involve a different set of routes at different times, depending on the route schedules.

25 U.S. Census Bureau, Public Use Microdata Sample, American Community Survey, five-year estimates, 2012-16, accessed using IPUMS-USA, University of Minnesota, https://www.ipums.org.

26 Although SEPTA is by far the largest provider of public transit in Philadelphia, New Jersey Transit and PATCO also provide service to New Jersey, and were not included in the analysis.

27 Note that different riders will make different decisions regarding how far they are willing to walk to a transit station or whether to transfer to a second bus to shorten their total trip time, etc. OTP's settings can be adjusted to reflect these differences, and Pew fine-tuned those so as to most accurately match Philadelphia commuters' variation in travel behavior, as recorded in the Delaware Valley Regional Planning Commission's "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf.

28 To make their interpretation easier, the maps depicting the distribution of fares throughout Philadelphia (Figures 7-10) contain legend labels that identify the predominant fare represented by each color. The fares on these maps are averages, but they cluster tightly around the set of values on the legend labels, which result from the most common combinations of payment and trip type. Those fares are $2 (base fare paid with Travel Wallet); $2.29 (any trip paid with a monthly pass); $2.50 (base fare paid in cash); $3 (base fare + transfer paid with Travel Wallet); and $5 (base fare + transfer paid in cash). The legend labels represent bins of fares that were constructed by inserting breaks at the midpoints between each of those common fares, as follows:

Legend label/predominant fare	Fares contained in interval
$2.00	$0-$2.15
$2.29	$2.15-$2.40
$2.50	$2.40-$2.75
$3.00	$2.75-$4.00
$5.00	$4.00-$6.00
> $6.00	> $6.00

The same bin definitions apply to the charts in Figure 11.

29 For instance, the average cash fare to City Hall from block groups with a poverty rate of less than 20 percent is $4.40, compared with a fare of $3.57 from block groups with a poverty rate of greater than 40 percent.

30 If riders make more than 42 trips per month, that would have the effect of further equalizing the cheapest fare throughout the city.

31 U.S. Census Bureau, LEHD Origin-Destination Employment Statistics, 2015, https://lehd.ces.census.gov/data/#lodes. These data do not include military personnel, self-employed workers, informally employed people, and several other specific classes of workers, including some federal employees.

32 See endnote 28 for a description of the bin labels and intervals.

33 U.S. Census Bureau, LEHD Origin-Destination Employment Statistics, 2015, https://lehd.ces.census.gov/data/#lodes. For the purpose of this analysis, the Philadelphia region is defined as the Philadelphia Metropolitan Statistical Area (except for Cecil County, Maryland) and Mercer County, New Jersey.

34 Pew analysis of raw data from Delaware Valley Regional Planning Commission, "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf.

35 Destinations outside Philadelphia and captured in the survey included those in the following counties: Berks, Bucks, Chester, Delaware, Lancaster, Lehigh, Montgomery, and Northampton (Pennsylvania); Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester,

Hunterdon, Mercer, Middlesex, Monmouth, Ocean, Salem, Somerset, and Warren (New Jersey); New Castle (Delaware); and Cecil (Maryland).

36 U.S. Census Bureau, Public Use Microdata Sample, American Community Survey, one-year estimates, 2016, accessed using IPUMS-USA, University of Minnesota, https://www.ipums.org. The data show that Philadelphians earning less than $30,000 per year are slightly more likely than those earning more to commute by transit to jobs in the city (31 percent versus 25 percent) but are much more likely to use transit to reach jobs outside Philadelphia, which are generally less conveniently reached by transit (22 percent versus 7 percent).

37 Pew analysis of raw data from Delaware Valley Regional Planning Commission, "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf.

38 As of November 2018, transfer rates were 40 and 36 percent, respectively, among weekly and monthly pass holders. Interestingly, paid transfers are even more common on SEPTA's Suburban Transit Division. Many of those routes terminate at heavy rail stations providing service to central Philadelphia via a transfer.

39 SEPTA, "Title VI Fare Equity Analysis: Proposed Adjustment to Passenger Fares" (March 2017), https://www.septa.org/notice/pdf/2017-fare-equity-analysis-titlevi.pdf.

40 Pew analysis of raw data from Delaware Valley Regional Planning Commission, "Philadelphia Regional On-Board Transit Survey" (2015), https://www.dvrpc.org/Reports/14040.pdf.

41 Community Service Society, "The Transit Affordability Crisis: How Reduced MTA Fares Can Help Low-Income New Yorkers Move Ahead" (April 2016), http://lghttp.58547.nexcesscdn.net/803F44A/images/nycss/images/uploads/pubs/The%20Transit%20Affordability%20Crisis%20updates%204%2018%2016%20-%20UPDATED%204.pdf.

42 David Verbich and Ahmed El-Geneidy, "Public Transit Fare Structure and Social Vulnerability in Montreal, Canada," Transportation Research Part A 96 (2017): 43-53, https://doi.org/10.1016/j.tra.2016.12.003. A study of riders in Montreal found data to support the hypothesis that financially vulnerable riders were more likely to purchase weekly rather than monthly fare passes, and to do so in a recurring way, rather than pay for a single monthly pass, possibly due to the higher upfront cost (but lower total cost) of a monthly pass. The authors also cite job insecurity and relatively less travel as potential factors in the decision to purchase weekly rather than monthly passes.

43 U.S. Census Bureau American Community Survey, five-year estimates, 2012-16.

44 For example, Andrew Owen and Brendan Murphy, "Access Across America: Transit 2017," Center for Transportation Studies, University of Minnesota (June 2018), http://cts.umn.edu/Publications/ResearchReports/pdfdownload.pl?id=2918.
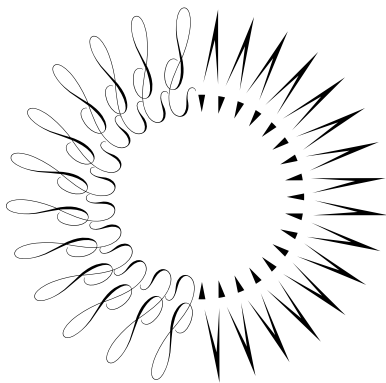
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