

# Perceptions of Bicycle-Friendly Policy Impacts on Accessibility to Transit Services: The First and Last Mile Bridge



MTI Report 12-10



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REPORT 12-10

**PERCEPTIONS OF BICYCLE-FRIENDLY POLICY IMPACTS  
ON ACCESSIBILITY TO TRANSIT SERVICES:  
THE FIRST AND LAST MILE BRIDGE**

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## EXECUTIVE SUMMARY

The coordination of bicycle and transit modes has received close attention from public transit planners and researchers in recent years, as transit agencies worldwide have increasingly installed bicycle racks on transit vehicles, implemented bicycles-on-trains policies, and made other efforts to facilitate bicycle-transit integration in cities. These efforts help bridge the “first mile” and “last mile” gaps that often separate trip origins and destinations from established transit service, discouraging would-be transit users.

Precisely who benefits from these policies and investments, however, has not always been clear to transit planners, nor has the impact of cycle-transit coordination on access to public transit been well understood. This project, therefore, was designed to address two principal goals. First, was to develop a detailed profile of cycle-transit users (CTUs). Second, was to assess the relative distances travelled on bicycle by CTUs in order to access public transit. A mixed-methods approach was employed, using a literature review; a preliminary survey of bus operators in Philadelphia, Pennsylvania; an intercept survey of CTUs near transit terminals, stations and stops in Philadelphia and San Francisco, California; and a series of follow-up telephone interviews with a subset of CTU respondents.

The study provided valuable insights into the characteristics, travel behavior and preferences of survey respondents and permitted estimations of the distances traveled by bicycle when travelers combine bicycling and public transit. Subsequent analysis of the survey and interview data provided answers to the initial research questions, as well as to questions that arose in the course of data collection and analysis.

Key results include these findings: CTU respondents in both cities were predominantly male, white and well-educated, a profile that reflects the population of urban bicyclists identified in most studies in the U.S. They fall into two categories: those who use bicycles only as an access mode to transit; and those who access transit by bicycle *and* travel with their bicycles. Most survey respondents combined transit and bicycling for work commute trips, but about one-third of the Philadelphia respondents and just over one-quarter of the San Francisco respondents combined transit and bicycling for non-work trip purposes.

On average, Philadelphia respondents estimated that they traveled 2.8 miles by bicycle as part of their cycle-transit trips, while San Francisco respondents estimated that they traveled an average of 5.4 miles. The most common reasons for being a CTU were that it was faster than using either mode alone, trips were too long to do entirely by bicycle, it avoided the difficulty of riding in the dark or bad weather, and a bicycle was needed to reach the final destination. Bicycle parking was often a challenge for CTUs, with respondents expressing serious concerns about the security of parked bicycles. If CTU respondents could not easily combine bicycling and public transit, most would rely on transit alone, but about 15 percent said they would use another mode instead and most of these said they would drive themselves. In general, respondents were pleased with the freedom that effective bicycle-transit policies conveyed to them, but even experienced CTUs were anxious in some circumstances, suggesting the numbers of CTUs could rise significantly if bicycle-transit policies and conditions could be improved.

These study findings permit us to draw some important conclusions. First, bicycles and transit serve as access modes *for each other*, enabling travelers to access transit *and* use bicycles for transportation when they might not otherwise be able to. This means that catchment areas for CTUs are larger than for pedestrian-transit users, as transit-access trips by bicycle exceed the distance that transit riders would be willing to walk, by significant distances. But the very notion of a “CTU catchment area” is complex, as CTUs travel for many reasons and often do not take the shortest or most direct route to a transit stop or station.

While CTUs reflect the larger, fairly homogeneous population of U.S. bicycle commuters, they, nevertheless, exhibit a degree of diversity that can be built upon as we learn more about the barriers to becoming a CTU. And even as they highly value transit agency efforts to facilitate bicycle use on transit, they speak clearly about those barriers, particularly when it comes to bicycle parking at transit stops and station.

Based on these findings and conclusions, policy makers, transportation planners, and transit agency managers may wish to strengthen bicycle-transit integration through the implementation of a set of proactive measures: They ought to make bicycle-transit coordination a high and funded priority and plan for a future in which demand for cycle-transit use increases, providing more, and more secure, bicycle parking and higher-capacity bicycle facilities on transit vehicles. To do this, planners should develop joint transit agency/municipal bicycle parking facilities, support joint bicycle and transit planning and implementation at the local and regional level, improve transit agency data collection on the numbers and behaviors of CTUs, and develop better orientation materials (publications, web pages, and videos accessible online) through which to promote cycle-transit travel.

## I. INTRODUCTION

Passenger travel in the United States is overwhelmingly undertaken by private cars and light-duty trucks (vans, mini-vans, pickup trucks, and SUVs), the result, in part, of explicit transportation, housing and land use policies that have favored road and highway construction for decades. Nevertheless, alternatives to single occupancy vehicle travel – car- and van-pooling, public transit, walking and bicycling – remain important elements of our transportation systems and transportation planning processes.

Nationally, public transit makes up a small but still significant share of work commute trips (5.0 percent in the 2009 American Community Survey [ACS]), as do non-motorized modes of transportation: walking (2.8 percent) and bicycling (0.6 percent).<sup>1</sup> As a share of all travel for all purposes, according to the 2009 National Household Travel Survey, public transportation was used for 1.9 percent of trips, walking for 10.5 percent, and bicycling for 1.0 percent.<sup>2</sup>

In some large metropolitan regions – such as Chicago, Washington DC, Philadelphia, and San Francisco – mode splits are less heavily weighted to driving alone than they are for the country as a whole, yet the use of private vehicles still represents the largest single mode (see Table 1). In Philadelphia, for example, in the most recent five-year ACS, the commute mode split was 51 percent single-occupant vehicle (SOV), 9 percent rideshare, 26 percent transit, 9 percent walk, 3 percent “other,” and 3 percent work at home. In the city of San Francisco, the comparable figures were 38 percent SOV, 8 percent rideshare, 33 percent transit, 10 percent walk, 5 percent “other,” and 7 percent work at home.<sup>3</sup> Even in transit-friendly cities such as these, cars predominate and transportation options for some trips can be (or are perceived to be) restricted to driving.

**Table 1. Commute Mode Split, 2011**

| Commute Type            | Philadelphia | San Francisco |
|-------------------------|--------------|---------------|
| Single-Occupant Vehicle | 51           | 38            |
| Rideshare               | 9            | 8             |
| Transit                 | 26           | 33            |
| Walk                    | 9            | 10            |
| Other                   | 3            | 5             |
| Work at Home            | 3            | 7             |

Source: American Community Survey, 2011.

Planners working to develop and maintain efficient, equitable, and environmentally responsible transportation systems make strong efforts to coordinate travel modes so that people have multiple effective options for commuting and other travel purposes. Over the past several decades, many large transit agencies in the United States have facilitated multi-modal travel with new and upgraded infrastructure and facilities and with policy changes that encourage travelers to use shared and non-motorized transportation (NMT) options for all or parts of their trips.

One promising development has been the integration of bicycle transportation and transit. Over the past decade, an increasing number of transit agencies have not only provided bicycle parking in or adjacent to their stops and stations, but have also allowed for bicycles to be taken on transit vehicles. This trend has led toward a much greater accommodation of bicycles on transit and the modification or addition of station features that facilitate the regular use of bicycles at most or all times of the day.

This change in policy among many of the world's transit agencies has resulted in clear benefits to both bicyclists and transit users, above all in the ability to easily access transit from greater distances. The provision of parking lots, bicycle racks and lockers at rail stations, the construction of transit centers that accommodate users of all modes, policies that permit bicycles on streetcars, trolleys and trains (though in many cases, only in off-peak hours), and the equipping of buses and other transit vehicles with bicycle racks are the principal methods that have been used. In initiating and developing cycle-transit coordination policies such as these, a new type of traveler, a "cycle-transit user" (or CTU),<sup>4</sup> has emerged, a traveler who combines both shared and non-motorized modes of transportation.

Since shared and non-motorized forms of transportation generally use less energy and resources on a per-passenger basis,<sup>5</sup> and can help relieve traffic congestion by moving people in fewer vehicles, coordinating travel by bicycle and public transit can provide significant individual and societal benefits.

These benefits, advocates and researchers argue, can include direct benefits to CTUs whose travel opportunities expand, thus conveying cost savings compared to owning and using a car, better health from a more active lifestyle, and higher quality of life, with time spent reading or relaxing, rather than driving. In addition, with more bicycles but fewer cars on the road, indirect benefits accrue to society through reductions in traffic congestion, improvements in air quality and other environmental and public health impacts.<sup>6</sup>

An important assumption these benefits are based upon is that by facilitating bicyclist access to public transit, the area of geographic access to transit (what is commonly called the "catchment area") is significantly enlarged. Consequently, the argument goes, potential ridership on transit increases. What is more, by permitting bicyclists to travel on transit *with* their bicycles, the geographic area accessible on the destination end is also enlarged. Both the "first mile" (the term planners use to describe the distance traveled before boarding transit) and the "last mile" on the destination end are made easier and less costly in terms of time spent traveling.

However, few profiles of the typical CTU have been developed, nor have geographic changes in the size of catchment areas resulting from better cycle-transit integration been effectively documented. Describing CTUs with precision, and testing the assumption that cycle-transit catchment areas are substantially larger than pedestrian-transit catchment areas, are key objectives of this research project. The results of our work describe what is already known on this topic, detail the research questions and methodology employed, and document our findings. We conclude the paper by discussing the implications of these results for transportation planners.

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## II. RESEARCH OBJECTIVES

The objective of this project is to answer the following questions:

- What are the characteristics of people who combine bicycling and public transit (cycle-transit users, or CTUs)?
- To what extent do cycle-transit coordination policies extend the range of access to transit on the origin end of transit trips *and* on the destination end?
- What benefits and challenges do CTUs perceive from cycle-transit coordination policies and investments?
- To what extent are current transit agency policies and practices effective in meeting CTU travel needs?

The answers to these questions allow a detailed description of the behaviors, challenges and opportunities that CTUs face, as well as a more detailed understanding of the first and last mile bridges to transit.

In order to explore these questions, we studied and compared CTUs in two large U.S. cities located on the east and west coasts – Philadelphia, Pennsylvania and San Francisco, California – where we believed the numbers and behaviors of CTUs to be significantly different. Each of these cities lies at the core of a major U.S. metropolitan area of more than five million inhabitants, but urban forms, ecological and climatic conditions, economies, and, importantly, the reputations, visibility and roles of bicyclists differ greatly.

Despite their regional and historical differences, however, they are both characterized by extensive transit systems that, by U.S. standards, provide service to large percentages of commuters and travelers with other trip purposes. Each system initially fueled its region's geographic expansion into neighboring counties; each system has evolved in significant ways in the past 50 years; and each system has helped in recent decades to revitalize neighborhoods in the urban core. In addition, each of these region's transit providers have sought to encourage the use of non-motorized transportation, including the bicycle, by prioritizing multi-modal access to transit stations and stops.

Of course, the cities are distinct, one from the other, and it is interesting to explore how each has approached the integration of bicycles and transit. The findings provide examples of current policies and implementation practices in each of these cities, suggesting possible reasons for specific CTU behaviors. They also propose appropriate policy changes needed to improve accessibility to and utilization of transit services by bicyclists. These changes can further facilitate the growth of bicycle-transit integration, relieving automobile traffic congestion in critical areas.

For the purposes of this study, a mixed-methods approach was employed, consisting of a review of relevant literature, a preliminary survey of bus operators of the Southeastern Pennsylvania Transportation Authority (SEPTA), an intercept survey of cycle-transit users at

transit stops and stations in both the Philadelphia and San Francisco metropolitan areas (the survey included both closed-ended and open-ended questions), and a series of subsequent interviews with a subset of the CTU survey respondents in each of these cities.

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### III. LITERATURE REVIEW

The integration of bicycle and transit use has gained increased attention in recent years. In the early 2000s, the Transit Cooperative Research Program of the National Academy of Science commissioned a comprehensive study entitled *Integration of Bicycle and Transit*, which detailed the objectives, activities, policies and investments that transit agencies in the United States have made to coordinate bicycle and transit transportation.<sup>7</sup> Hagelin, in assessing the benefits and costs of such investments, focused on what he called “BOB” (bikes-on-bus) programs and found that the benefits to transit agencies in increased ridership outweighed the costs of purchase and installation of bicycle racks and other bicycle-friendly amenities.<sup>8</sup> Krizek, in collaboration with two other researchers, designated travelers who combine bicycles and transit “CTUs” (cycle-transit users), and documented user preferences for facilitating bicycle-transit integration.<sup>9</sup> Wang and Liu analyzed data from the 2001 and 2009 National Household Travel Surveys to describe the demographic and socio-economic characteristics of CTUs, finding age, race, economic, and geographic disparities from the typical public transit user.<sup>10</sup>

These studies document the evolution of cycle-transit coordination in the United States from an uncommon and limited practice to one widely adopted by U.S. public transit agencies. Pucher, et al., in documenting the wide variety of cycle-transit coordination policies and investments, reported that 72 percent of U.S. buses are equipped with bicycle racks.<sup>11</sup> The 2012 edition of the American Public Transit Association’s (APTA) Public Transportation Factbook indicates that percentage has risen slightly to 74 percent.<sup>12</sup>

In Europe, the use of bicycles to get to transit has a long history and in some places is the single most important mode of access to transit. A recent study in the Netherlands, for example, found that 38 percent of respondents to a 2005 survey used a bicycle to access transit on the home end (a different transit vehicle was the access mode for 27 percent of respondents, while 20 percent walked).<sup>13</sup> In some cities, bicycle use is so popular that even extensive bicycle parking facilities are insufficient to meet demand (see, for example, a recent *New York Times* article<sup>14</sup> and Pucher and Buehler,<sup>15</sup> who discussed bicycle parking in detail).

Martens, in a study of three European countries,<sup>16</sup> described bicycles as a *feeder* mode, one travel mode that provides access to another (we use the term access mode in this report). He noted that, although bicycles can sometimes be brought on commuter trains in Europe, few European transit buses at the time of his study were equipped with bicycle racks. The previously cited Givoni and Rietveld study supports this point; only 9.5 percent of the transit users they studied traveled by bicycle for the “last mile” link to a final destination, and some of those would have used a bicycle share service to do so, rather than traveling with their bicycles.<sup>17</sup>

While coordinating bicycle travel with transit provides the potential to expand transit catchment areas (that is, the geographic range of access to transit services), relatively few empirical research projects have delved into this issue. Hagelin<sup>18</sup> determined that most CTUs rode a mile or more to access transit, while Adjei<sup>19</sup> used a generalized distance of three kilometers (slightly less than two miles) when modeling bicycle access to transit.

While these studies establish estimated distances ridden by CTUs, the question remains: How far do CTUs travel by bicycle in order to access public transit?

It is, therefore, an open question the extent to which cycle-transit coordination policies and investments affect transit use. The unstated assumption is that cycle-transit coordination efforts will increase transit use by making it easier for more people to get to transit stops and stations. Similarly, there is very little empirical confirmation of the extent to which bicycle-friendly transit agency policies affect bicycle travel. For those individuals who normally travel by bicycle – the primary mode of transportation for many people in some communities, particularly college and university towns – what effect do these cycle-transit coordination policies have on the frequency and distances traveled by bicycle?

Intuitively, it makes sense that connecting bicycle travel to transit could help expand catchment areas by permitting areas more distant from transit stops and stations to be accessible via a faster-than-walking, non-motorized mode. But, as we have seen, empirical studies of the extent to which transit service areas are extended by bicycle-friendly policies are few in number. Researchers such as Guerra et al. have summarized findings concerning walk-to-transit catchment areas – documenting 29 studies that suggest 0.5-mile catchment areas in residential locations and 0.25-mile catchment areas for access to work sites<sup>20</sup> – but comparably detailed findings are not available for bicycle-to-transit catchment areas. This study, therefore, is meant to fill in this knowledge gap and to shed light on the full range of cycle-transit coordination impacts on both transit and bicycle use.

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## IV. STUDY METHODOLOGY

The research design employed in this study featured four principal elements that permitted the stated research objectives to be met:

1. A bus operators' survey in Philadelphia,
2. Transit station-based surveys of cycle-transit users (CTUs) in Philadelphia and San Francisco,
3. Descriptive statistical analysis of respondents' questionnaire answers, and
4. Telephone follow-up interviews of a subset of the survey respondents in both metropolitan regions.

The project goals necessitated close collaboration with the major public transit agencies in Philadelphia, Pennsylvania and San Francisco, California. In Philadelphia, the largest public transit agency is the Southeastern Pennsylvania Transportation Authority (SEPTA), with additional service provided by New Jersey Transit, PATCO (the [Delaware River] Port Authority Transit Corporation), and Amtrak. In San Francisco, the San Francisco Municipal Transportation Authority (SFMTA) is the largest transit agency in the region, operating "Muni" buses, trolleys, cable cars and light rail within the city. In addition, Bay Area Rapid Transit (BART), Alameda-Contra Costa (AC) Transit, Caltrain, SamTrans and Golden Gate Transit provide bus, rail, and ferry transit services between San Francisco and other communities of the Bay Area.

### **BUS OPERATORS' QUESTIONNAIRE**

In order to identify routes and areas where survey-takers in the Philadelphia metropolitan area would have the best chances of encountering CTUs, we worked with SEPTA planning staff to develop a simple, one-page survey of the agency's bus operators. Copies of the survey (see Appendix A) were distributed in June 2012 in eight of nine SEPTA bus depots (all but the Elmwood depot) to 2,612 bus operators. A total of 632 completed surveys were submitted, for a response rate of 24 percent.

Ultimately, the purpose of the bus operators' questionnaire – identifying the best routes and locations to send survey takers – was not successfully achieved. Few bus routes stood out as having significantly more CTUs, and the specific locations at which CTUs boarded and alighted could not be identified. For this reason, and in consultation with SEPTA staff, we opted instead to place survey takers at 11 of SEPTA's major transit centers where multiple bus routes, subway and trolley lines, and regional rail trains come together. Nevertheless, the effort to communicate with bus operators through the questionnaire provided us with additional information that proved useful.

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## IN-TRANSIT-STATION QUESTIONNAIRES

In Philadelphia, current CTUs were intercepted at transit stops and stations by survey-takers during the week of December 3 through 9 of 2012. They were asked to fill out a questionnaire concerning:

1. Their use of bicycles and transit;
2. Their attitudes towards bicycle-transit coordination; and
3. The extent to which bicycle-transit policies extend their range of access to transit.

The questionnaire was designed to be completed in about ten minutes (a limited pre-test with volunteer survey-takers confirmed this estimate). The cover page included the title, an image of a bus with a bicycle mounted on the front bicycle rack, a hand-written code indicating the location the survey was distributed, and a text box including a statement concerning confidentiality and informed consent. The inner two pages included 28 closed-ended questions (some with multiple question elements). The back page provided room for responses to two open-ended questions, one encouraging respondents to supply any additional comments or details they felt important and the other encouraging them to draw a map of the trip that was the subject of earlier, closed-ended questions. See Appendix B for copies of the entire surveys, as distributed in Philadelphia and in San Francisco.

Training materials were developed to introduce survey-takers to the purpose of the study and the logistics and methods of distributing the questionnaire (see Appendix C). In Philadelphia, eight survey-takers spent a total of 137 hours in 51 shifts at 11 transit centers. Three transit centers were in Center City Philadelphia and six in other locations in the city of Philadelphia. Two transit centers were outside of Philadelphia, one in King of Prussia, a commercial and office center located about 20 miles from Center City Philadelphia, and the other in Norristown, the county seat of Montgomery County, Pennsylvania.

In Philadelphia, weather conditions during the period of distribution of surveys were not ideal for bicycling, nor were they so uncomfortable as to completely discourage bicycling. The high temperatures were in the 60s (degrees Fahrenheit) for two days, in the 50s for three days, and in the 40s for two days. Five days were clear with no precipitation, while two days had light rains, with 0.40" and 0.08" falling. For occasional bicyclists, the cooler and wetter days might have reduced their numbers on the region's roads and, thus, on SEPTA vehicles, but experienced riders likely would have ridden and combined their bicycling with transit in near-usual numbers.<sup>21</sup>

CTUs who had time to fill out the survey were asked to do so in the presence of the survey-taker. Those who could not do so were given a survey (along with a stamped and addressed envelope) and asked to return it via U.S. mail. In still other cases, copies of the survey were left on bicycles parked at transit stations under the assumption that their owners had continued their journeys on a transit vehicle (an assumption sometimes, but not always, confirmed by respondent answers to survey questions).

A total of 297 surveys were distributed: 10 were responded to in the presence of a survey-taker, 130 were handed out to intercept CTUs, and 157 were left on parked bicycles. A total of 74 usable surveys were completed (see Table 2 for response rates by method of distribution and city).

In San Francisco, a similar approach was taken to intercepting CTUs at transit centers. CTUs were contacted by survey-takers at major points of bicycle-transit interchange, providing data for CTUs who combined bicycling with a variety of transit modes, including commuter rail, bus, and ferry.

Bicycle-bus users proved to be a small share of the CTUs intercepted in the San Francisco survey, in part because few Muni buses have direct access to transit centers, particularly in downtown San Francisco. In addition, bicycle planners at the SFMTA point out that a higher proportion of bicycle riders in San Francisco depend solely on a bicycle for intra-city trips, as a majority of these trips are less than three miles long. The authors have observed that despite improvements in real-time bus information throughout the city, bus speeds are relatively low and many CTUs still see few benefits in transferring to a Muni bus. In addition, since buses only accommodate two or three bicycles, CTUs perceive that they lose time waiting for a bus, and often ride their bicycles for the entire trip.

CTUs were intercepted by six survey-takers at nine different locations in the city of San Francisco during the week of April 21 through 27, 2013 and were asked to complete a survey identical in most respects to the survey used in Philadelphia. Local weather conditions during the week were mild, with highs ranging from 61 to 78 degrees Fahrenheit and no recorded precipitation, optimal weather for bicycling. In most cases, CTUs either filled out the survey in the presence of a survey-taker or were given copies to mail back. At four stations where bicycle parking facilities were available to the public, surveys were attached to parked bicycles.

In all, 174 surveys were distributed: 20 were administered in person, 134 were handed out to intercept CTUs, and 20 were left on parked bicycles. Coincidentally, the same number of usable surveys (74) was returned in San Francisco as in Philadelphia (see Table 2 for distribution numbers and response rates).

**Table 2. Questionnaires Distributed and Completed**

| Questionnaire Method | Philadelphia |           |               | San Francisco |           |               |
|----------------------|--------------|-----------|---------------|---------------|-----------|---------------|
|                      | Distributed  | Returned  | Response Rate | Distributed   | Returned  | Response Rate |
| In-Person            | 10           | 10        | 100%          | 20            | 17        | 85%           |
| Take Home            | 130          | 51        | 39%           | 134           | 53        | 40%           |
| Left on Bicycle      | 157          | 13        | 8%            | 20            | 4         | 20%           |
| <i>Total</i>         | <i>297</i>   | <i>74</i> |               | <i>174</i>    | <i>74</i> |               |

Note: Given the large differences in distribution methods, reporting an overall response rate is inappropriate.

Survey respondent confidentiality was assured following standard best research practices. A \$10 gift certificate was provided via U.S. mail as an incentive to respondents who

completed the survey. The gift certificate in Philadelphia was to a local convenience store (Wawa) and in the San Francisco Bay Area to a local coffee shop chain (Peet's). Names and mailing addresses of respondents were recorded separately from survey responses and were not linked in any way to individual responses.

In neither case city was the distribution of the survey based upon a random sample, and for this reason, the results of our surveys, interviews and analysis do not provide a statistically valid representation of all CTUs. The principal reason for this is that the numbers and characteristics of the universe of CTUs are unknown. Only a very few transit agencies keep detailed records of CTUs. The Greater Cleveland RTA is one of the few exceptions to this rule (see a recent study of the agency for an example of analysis using such data),<sup>22</sup> but transit agencies in Philadelphia and San Francisco are not members of this small group. Our findings are, nonetheless, indicative of CTU behaviors and attitudes and suggestive of the broader population of CTUs.

## **DATA ANALYSIS**

In both case cities, data entry and analysis were completed using Microsoft Excel spreadsheet software. To assess respondent perspectives on, and behaviors related to, bicycle-transit coordination, standard descriptive analytical techniques were used. Because data compiled from the surveys distributed in the two cities combined quantitative and qualitative data, comments and illustrations obtained from open-ended questions are combined in the findings section of this report.

## **INTERVIEWS**

Follow-up interviews with willing CTU survey respondents were conducted in both case cities to gather additional details on usage and attitudes towards bicycle-transit coordination and to further support and clarify results of the statistical analysis. These interviews provided an opportunity to not only gather additional data on the respondent's travel on the day he or she completed the survey, but to gain further insights into some of the major factors affecting CTU travel behavior.

The research associates conducted the interviews by telephone during the spring and summer of 2013 (see Appendix D for the questions and prompts used in conducting these telephone surveys). A total of 16 telephone interviews were completed, seven with Philadelphia region respondents and nine with San Francisco region respondents. These follow-up interviews were designed to capture additional details of CTU characteristics, behaviors and preferences and to obtain insights beyond the responses to the original survey's closed-ended questions.

The benefits gained from further exploring CTU travel behavior with respondents were useful in our analysis, though we note that the interview respondents were self-selected from what was an unrepresentative survey sample. Their responses are not necessarily representative of the sample of 148 respondents to the written questionnaire nor of the larger population of CTUs in the two cities. Nevertheless, the interviews shed light on some of the reasons that CTUs make use of the opportunities afforded them by effective bicycle-transit coordination policies.

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## V. FINDINGS

As the methodology for this study uses both quantitative and qualitative analyses, the findings combine evidence in the form of tables and graphs based upon descriptive statistical analysis and quotations and graphics from responses to open-ended questions in the surveys and interviews. Respondents' comments and drawings are not intended to represent the perspectives of all cycle-transit users, nor even all respondents in our dataset. Nevertheless, they illustrate opinions and experiences that were shared by other respondent CTUs, sometimes many of them. Without being presented as typical of our respondents or CTUs, they nevertheless inform our understanding of the profiles, behaviors, and desires of travelers who combine bicycling and public transit, enriching our findings and conclusions.

### PROFILES OF CYCLE-TRANSIT USERS

Responses to the questions in the survey distributed to CTUs in Philadelphia and San Francisco allow us to describe this set of 148 CTUs in detail. We are able to do this both in terms of the demographic and socio-economic characteristics of the respondents and the ways, frequencies, and purposes for which they combine bicycling and public transit.

#### Who are the respondent cycle-transit users?

Respondents to surveys in Philadelphia and San Francisco were predominantly men (over 75 percent of all respondents) who self-identified as White (just under 75 percent) and well-educated (in both cities, 74 percent held a bachelor's or graduate degree). However, in both cities roughly 20 percent of respondents were female and almost 25 percent were not White, so many of the perspectives expressed in survey responses were those of women, non-Whites, and people of varying levels of income and education (see Table 3).

The diversity in household incomes was quite high, with a fairly even distribution across the income categories in Philadelphia. In San Francisco, respondents were more likely to fall within the highest income category of more than \$100,000 (45 percent did, compared to just 20 percent in Philadelphia), but every income category was represented, including the category of less than \$20,000. The differences in respondent household incomes accurately reflect differences in median household incomes in the two metropolitan regions.<sup>23</sup> The average age of respondents was 38 years in Philadelphia and 42 years in San Francisco. Ages ranged from 19 to 65 years in the former region, and 22 to 68 years in the latter. In both cities, respondents came from fairly typical American households in terms of size, with an average of 2.6 persons per household.

Comparing our CTU respondents to general transit ridership demographics, we find significant differences in most demographic and socio-economic characteristics. In Philadelphia, SEPTA's ridership, for example, is 64 percent female, 51 percent African American (Black), 41 percent White, and 8 percent Hispanic, Asian, and "Other." System-wide, 44 percent of riders have incomes of less than \$35,000 (Regional Rail riders, however, are wealthier, with only 21 percent having incomes less than \$35,000). The average age

of SEPTA's ridership is not reported, but the median age is in the early 40s, as was the median age of our respondents.<sup>24</sup>

In San Francisco, demographic characteristics of transit riders also contrasted with those of the CTU survey respondents. In its *2008 Station Profile Report*,<sup>25</sup> BART reported more diversity in its riding public than our survey of CTUs did: 48 percent of its riders were White, 24 percent Asian or Pacific Islander, 14 percent Hispanic and 10 percent Black. A majority of BART riders were female (57 percent), a figure three times greater than in the CTU survey (19 percent). Annual incomes among BART riders were not significantly different from our sample: 37 percent of its weekday riders had annual incomes of more than \$100,000 compared to 45 percent of the CTU survey respondents. The average age of BART riders (41) was similar to the average for the CTU survey respondents. Similarly, the average household size for BART riders was similar to that of the CTU survey respondents, with an average of 2.7 persons per household.

Table 3. Demographic and Socio-Economic Characteristics of Survey Respondents

|   | Philadelphia |          | San Francisco |          |
|---|--------------|----------|---------------|----------|
|   |              |          |               |          |
| <b>Gender</b>                           |              |          |               |          |
| Male                                    | 58 (78%)     | 60 (81%) |               |          |
| Female                                  | 14 (19%)     | 14 (19%) |               |          |
| No Response                             | 2 (3%)       | 0 (0%)   |               |          |
| <b>Marital Status</b>                   |              |          |               |          |
| Married (or Domestic Partner)           | 28 (38%)     | 36 (48%) |               |          |
| Single                                  | 36 (49%)     | 30 (41%) |               |          |
| Divorced or Separated                   | 3 (4%)       | 7 (9%)   |               |          |
| Widowed                                 | 1 (1%)       | 0 (0%)   |               |          |
| No Response                             | 6 (8%)       | 1 (1%)   |               |          |
| <b>Age</b>                              |              |          |               |          |
| Maximum                                 | 65           | 68       |               |          |
| Minimum                                 | 19           | 22       |               |          |
| No Response                             | 1            | 2        |               |          |
| Average                                 | 38           | 42       |               |          |
| <b>Highest Educational Attainment</b>   |              |          |               |          |
| Less than High School                   | 3 (4%)       | 1 (1%)   |               |          |
| High School/GED                         | 6 (8%)       | 5 (7%)   |               |          |
| Assoc. degree                           | 7 (9%)       | 11 (15%) |               |          |
| Bachelor's                              | 28 (38%)     | 28 (38%) |               |          |
| Graduate                                | 27 (36%)     | 27 (36%) |               |          |
| No Response                             | 3 (4%)       | 2 (3%)   |               |          |
| <b>Race/Ethnicity</b>                   |              |          |               |          |
| White                                   | 55 (74%)     | 54 (73%) |               |          |
| African American or Black               | 7 (9%)       | 4 (5%)   |               |          |
| Asian                                   | 3 (4%)       | 10 (14%) |               |          |
| Hispanic or Latino                      | 2 (3%)       | 4 (5%)   |               |          |
| Two or More Races                       | 3 (4%)       | 1 (1%)   |               |          |
| No Response                             | 4 (5%)       | 1 (1%)   |               |          |
| <b>Household Size</b>                   |              |          |               |          |
| Maximum                                 | 9            | 6        |               |          |
| Minimum                                 | 1            | 1        |               |          |
| Average                                 | 2.6          | 2.6      |               |          |
| <b>Access to Car / License to Drive</b> |              |          |               |          |
|   | Access       | License  | Access        | License  |
| Yes                                     | 45 (61%)     | 57 (77%) | 64 (86%)      | 67 (91%) |
| No                                      | 27 (36%)     | 13 (18%) | 9 (12%)       | 6 (8%)   |
| No Response                             | 2 (3%)       | 4 (5%)   | 1 (1%)        | 1 (1%)   |
| <b>Income</b>                           |              |          |               |          |
| <\$20,000                               | 10 (14%)     | 9 (12%)  |               |          |
| \$20,001-\$40,000                       | 14 (19%)     | 4 (5%)   |               |          |
| \$40,001-\$60,000                       | 10 (14%)     | 8 (11%)  |               |          |
| \$60,001-\$80,000                       | 14 (19%)     | 3 (4%)   |               |          |
| \$80,001-\$100,000                      | 3 (4%)       | 10 (14%) |               |          |
| >\$100,000                              | 15 (20%)     | 33 (45%) |               |          |
| No Response                             | 8 (11%)      | 7 (9%)   |               |          |

Source: Questions T through Z, AA and AB in Philadelphia and San Francisco surveys. See Appendix B.

Notes: No Response indicates that some respondents left these questions blank or checked the response choice labeled "Prefer not to say."

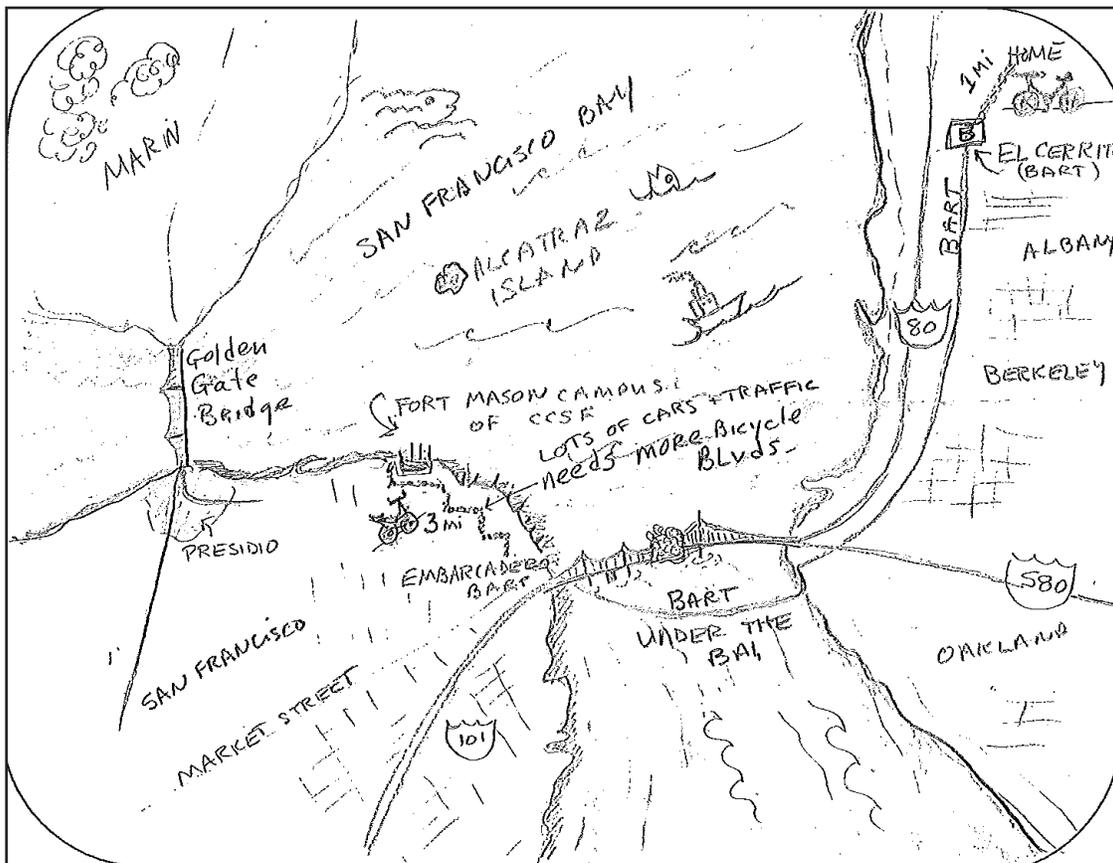
Due to rounding differences, not all percentages sum to 100%.

n = 74 for Philadelphia respondents.

n = 74 for San Francisco respondents.

In terms of car use, responses reflected higher average incomes and greater vehicle dependence in California. In Philadelphia, 61 percent of respondents reported having access to a car and 77 percent were licensed to drive, while in San Francisco, 86 percent of respondents had access to a car and 91 percent were licensed to drive. These statistics suggest that for most CTUs in our sample, combining bicycling and transit is, to some extent, a choice, rather than a necessity.

Beyond the statistics, the personalities of the respondents often emerged forcefully in their responses to the open-ended questions as well as in their illustrations of the cycle-transit trip that was the subject of their questionnaire responses. While some respondents chose not to include a map or drawing, those who did (almost 75 percent of respondents) provided the authors with a deeper understanding of the benefits and challenges that the respondents face in combining transit and bicycling. Some of the maps are prosaic and utilitarian, others are mini works of art, displaying an attention to detail that is extraordinary (Figure 1, for example).

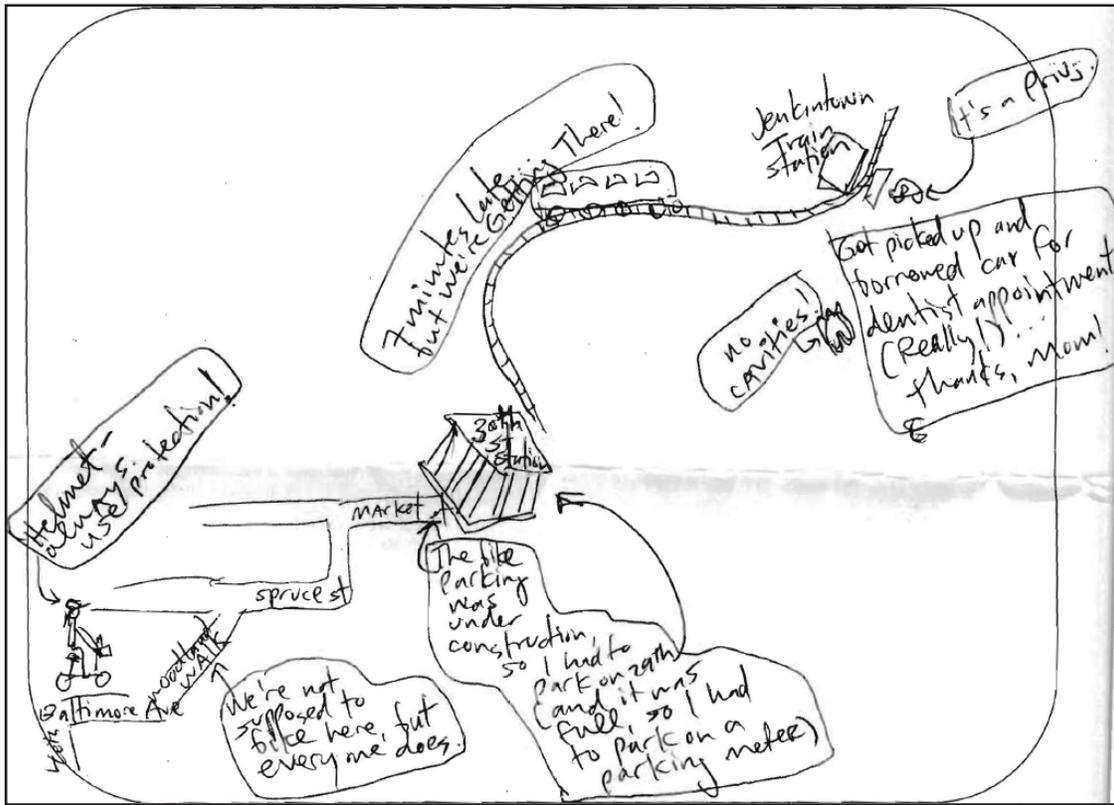


**Figure 1. Beautiful Detail in Map of a San Francisco Bay Area Cycle-Transit Trip**

Source: Holly, a San Francisco respondent.

Often respondents' sense of humor was revealed, as in Figure 2, where Sarah from Philadelphia<sup>26</sup> advised us to always use protection (on our heads, by wearing bicycle helmets, that is), thanked her mother for picking her up at the Jenkintown Train Station, and proudly proclaimed the result of her dental appointment was "no cavities!" Another Philadelphia respondent, Noah, admitted to feeling superior to other commuters; he wrote

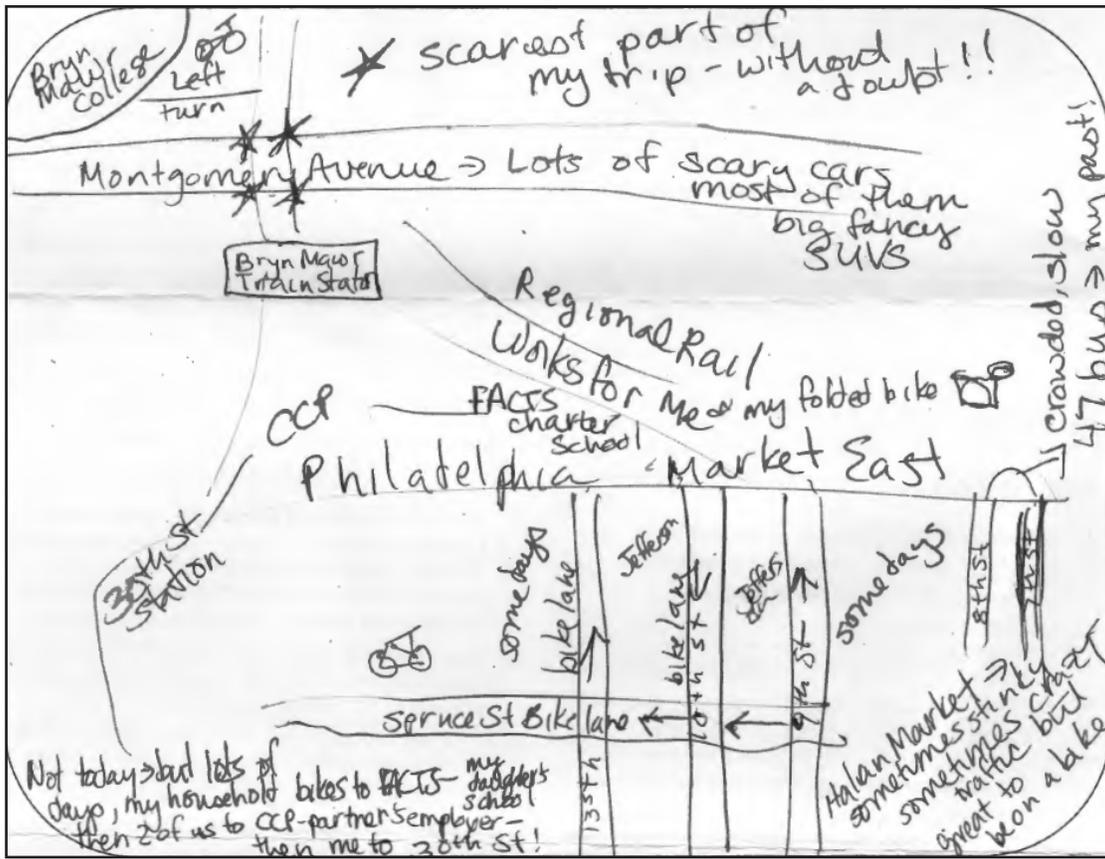
on his map “trip by bike to 30<sup>th</sup> St. Station goes smooth and saves me SEPTA fare. Also get to feel green and smug!”



**Figure 2. Humor and Responsibility Shine Through in a Philadelphia CTU Trip Map**

Source: Sarah, a Philadelphia respondent.

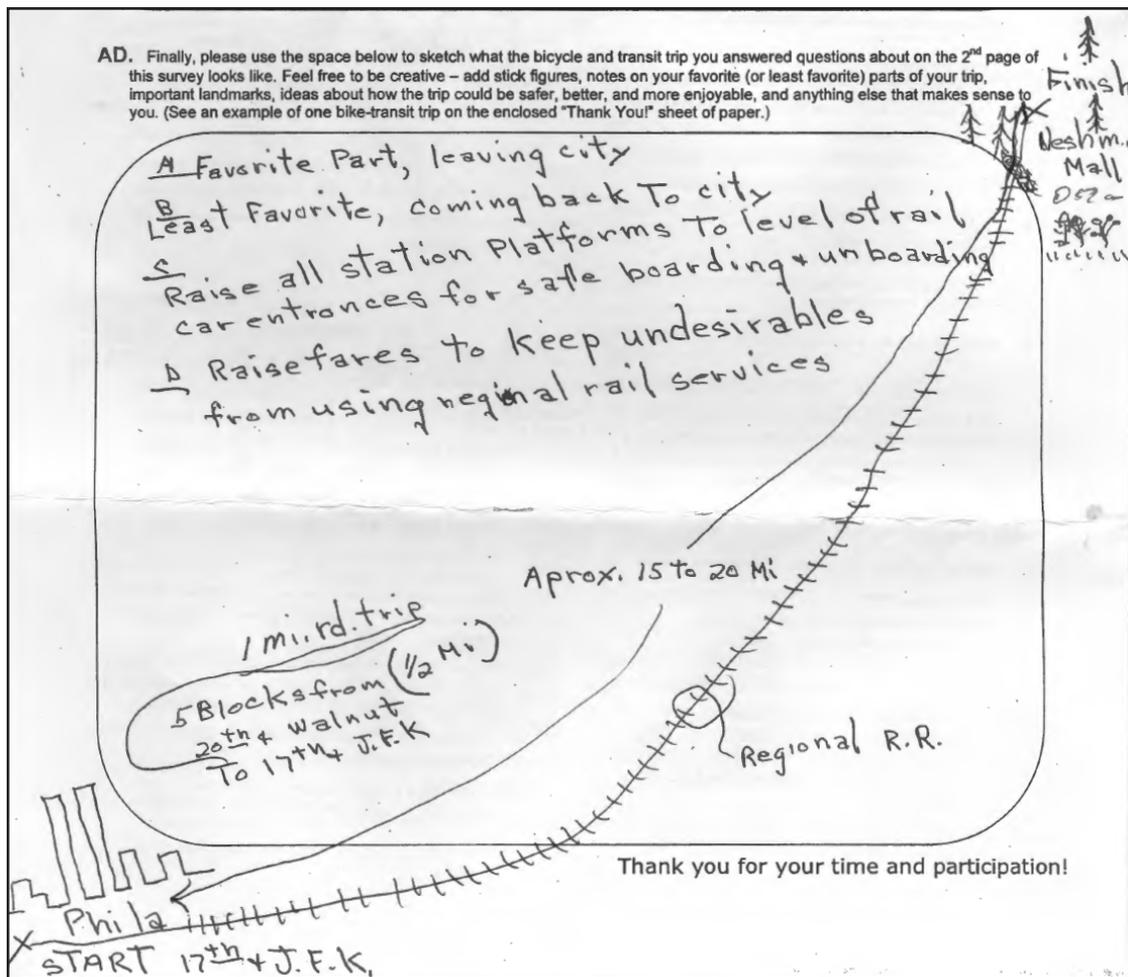
Samuel, in Philadelphia, wrote about the difficulty of getting to 30<sup>th</sup> St. Station with a bicycle because of congested roads with little space for bicyclists. Parking was difficult too, but he added that “I like my house, and my dog Tango... and my husband. We both ride bikes mostly.” Many other respondents made reference to their mothers, sisters, friends, partners, and children, and the ways in which they share cycle-transit trips with these relations or use cycle-transit trips to get to be with them. In Figure 3, for example, Zoe, who lives in South Philadelphia, indicated that “... lots of days, my household bikes to FACTS – my daughter’s school – then 2 of us to CCP – partner’s employer – then me to 30<sup>th</sup> St.!”



**Figure 3. Likes and Dislikes Along a Philadelphia Cycle-Transit Trip**

Source: Zoe, a South Philadelphia respondent.

The maps provided details, explanations, and sometimes comic relief, but occasionally the reader comes away not knowing precisely how to interpret respondents' comments. Some raised uncomfortable questions, such as who are the "undesirables" referred to in Figure 4 and why is leaving the city of Philadelphia Jason's favorite part of his trip? In any case, he did not appear to be a fan of Philadelphia's urban environment.



**Figure 4. One CTU Decidedly Not a Fan of the City**

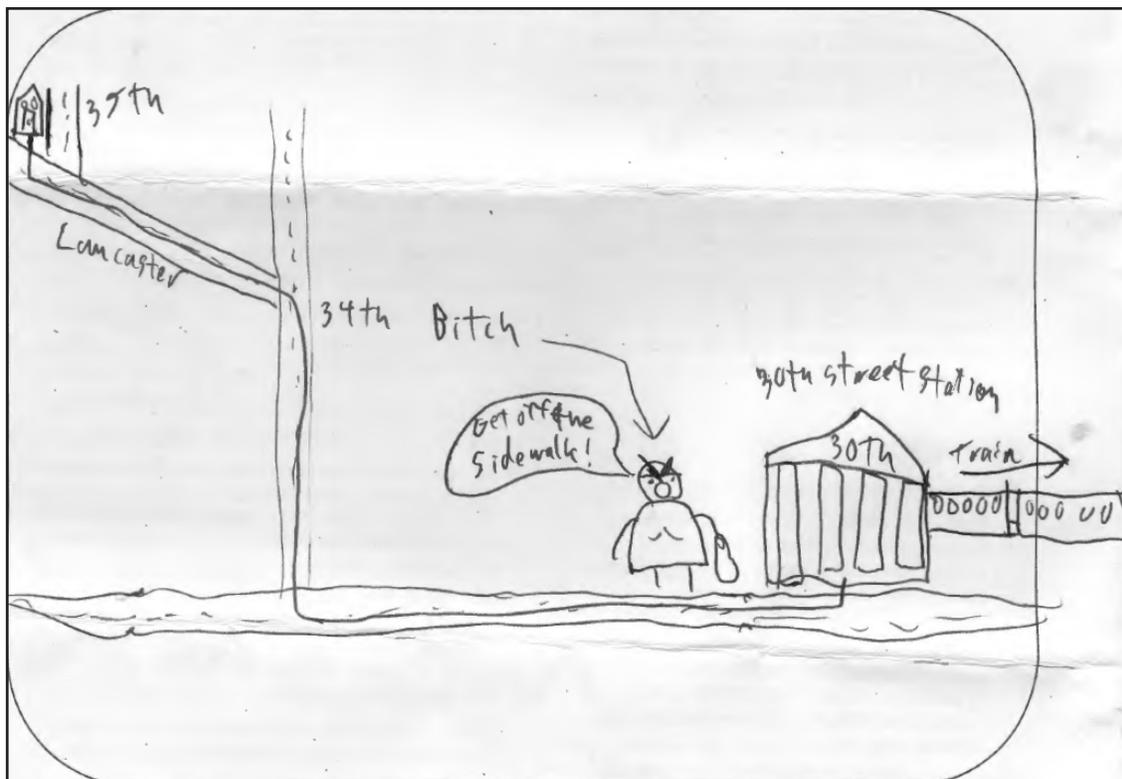
Source: Jason, a Philadelphia respondent.

John, in Philadelphia, used rude language to refer to a pedestrian who dislikes his riding on the sidewalk (Figure 5). He explained his choice to do so this way:

No bike lane on Market so I ride on the sidewalk which gets me glares and the occasional angry yell.

~ John, a Philadelphia respondent

John was not alone in noting the dangers of riding a bicycle to and from 30<sup>th</sup> St. Station; at least five other CTUs in Philadelphia made the same point. The lack of a safe place to ride on congested and dangerous Market Street in front of 30<sup>th</sup> St. Station sets bicyclists and pedestrians up for conflicts like these.



**Figure 5. Conflicts Occur When Bicycle-Unfriendly Roads Send Bicyclists to Sidewalks**

Source: John, a Philadelphia respondent.

While survey respondents in both Philadelphia and San Francisco shared many similar experiences, there were also clear differences between these two groups. Local transit system services, configurations, and environmental circumstances likely play a role in these.

In general, Philadelphia respondents appeared to use foldable bicycles more frequently than San Francisco respondents did. Seven Philadelphia respondents mentioned foldable bicycles and the ways in which they make it easier to combine bicycling and transit; none of the San Francisco survey respondents said they travel with foldable bicycles, and many complained of BART regulations, which state that folded bicycles are allowed on the trains at all times, but must be folded before entering the paid area of the downtown San Francisco and downtown Oakland BART stations. In a follow-up interview, one San Francisco respondent who rode Caltrain from San Francisco said that she purchased a foldable bicycle, but it was unclear whether she used it regularly.

### **What kind of CTUs are the respondents?**

In a general sense, CTUs fall into two broad categories: those who use bicycles as an access mode to a public transit stop or station, but do not travel on transit with their bicycles; and those who both access transit by bicycle and travel with their bicycles on transit vehicles. There are some additional divisions, as described in Table 4.

**Table 4. Types of Cycle-Transit Users (CTUs)**

| Type         | Response  | Philadelphia | San Francisco |
|--------------|---|--------------|---------------|
| 1            | Ride <i>to</i> transit <i>only</i> (leave bicycle at origin transit stop).                  | 22 (30%)     | 2 (3%)        |
| 2            | Ride <i>to</i> transit, travel <i>with</i> bicycle, but do not ride <i>from</i> transit.    | 5 (7%)       | 5 (7%)        |
| 3            | Travel <i>with</i> bicycle and ride <i>from</i> transit, but do not ride <i>to</i> transit. | 4 (5%)       | 6 (8%)        |
| 4            | Ride <i>to</i> , <i>on</i> , and <i>from</i> transit.                                       | 32 (43%)     | 54 (73%)      |
| 5            | No transit involved in trip (bicycle only).   | 5 (7%)       | 1 (1%)        |
| 6            | Other/missing data.   | 6 (8%)       | 6 (8%)        |
| <i>Total</i> |   | <i>74</i>    | <i>74</i>     |

Source: Derived from Questions A through E of Philadelphia and San Francisco surveys. See Appendix B.

Philadelphian respondents were much more likely to ride a bicycle to transit, park and lock it, and then continue without the bicycle (22 respondents, 30 percent, did so), than were San Franciscan respondents, only two of whom (3 percent) combined bicycling and transit this way (Type 1 in Table 4 above).

A few respondents said they traveled with their bicycles on transit and either rode to a transit stop or station, or rode from a stop or station, but not both (Types 2 and 3). Presumably, their origin or their destination was so close to transit that riding on one end of their transit trip was unnecessary. But they still preferred to keep their bicycle with them, rather than lock it up at a public facility at one end or the other. In Philadelphia, 9 of the respondents (12 percent) traveled this way; while in San Francisco, 11 of the respondents (15 percent) completed their trip in this manner.

In Philadelphia, 43 percent of the respondents completed their entire trip with a bicycle, riding from their origins to public transit, traveling with their bicycle on public transit, and riding the bicycle to their destinations from public transit (Type 4). In contrast, in San Francisco, almost three-quarters of respondents (73 percent) completed their trip in this manner (riding to, on and from transit for a single trip).

Interestingly, six of the respondents (five in Philadelphia and one in San Francisco) were not CTUs at all, as they had ridden bicycles and parked them at or near a public transit station or stop, but not used public transit for any portion of the trip (Type 5 in Table 4).<sup>27</sup> Nevertheless, their responses were included in our analysis because copies of the questionnaire had been left on their bicycles parked at transit station. Our assumption in both cities – that any bicycle locked at a transit station belonged to a CTU – proved false, as some bicyclists use transit station bicycle parking facilities without actually using transit vehicles. Apparently, some bicyclists with destinations close to transit stations prefer to use the bicycle parking in the stations to bicycle parking elsewhere, a finding with implications for the design and capacity of transit station bicycle parking facilities.

Reggie, from Philadelphia, was one of the few of the “other” type of CTU (Type 6 in Table 4), in that he only bicycled *from* transit to his destination, but did not access transit nor travel on a transit vehicle with his bicycle:

1) I drive from home to my local regional-rail station, 2) park and ride in to 30th St., where I keep my bike locked overnight. 3) I ride from 30th Street to work in the morning, 4) ride back to 30th in the evening, lock my bike, 5) take RR back to Mt. Airy [a neighborhood in the Northwest of Philadelphia], and 6) drive home.

~ *Reggie, a Philadelphia respondent*

He evidently feels confident leaving a bicycle overnight at the station (perhaps because it is an undesirable, low-value bicycle, he has high quality bicycle cables and locks, or both), confidence that few other CTUs in Philadelphia feel. Many other respondents who traveled through 30<sup>th</sup> St. Station expressly said that they would *not* leave their bicycles in the station's unsupervised bicycle parking areas. Concern for the security of locked bicycles was common and is discussed in detail below.

A second distinction amongst the respondents, and amongst CTUs in a broader sense, is between those who combined bicycling with lower-cost transit services (buses and, in Philadelphia, subways and trolleys, all of which during the survey distribution week had a base fare of \$2.00 per unlinked trip) and those who combined bicycling with higher-cost transit (Regional Rail and Amtrak services in Philadelphia; BART, Caltrain, and Golden Gate ferry services in San Francisco).

Table 5 highlights the differences between these two groups in demographic and socio-economic characteristics. In some ways, the two groups are similar: the gender balance, household sizes, and marital status are all roughly the same.

**Table 5. Demographic and Socio-Economic Characteristics of CTUs by Mode**

|                           | Bus, Subway<br>& Trolley | Rail &<br>Ferry |                               | Bus, Subway<br>& Trolley | Rail &<br>Ferry |
|---------------------------|--------------------------|-----------------|-------------------------------|--------------------------|-----------------|
| <b>Total</b>              | 39                       | 102             |                               |                          |                 |
| <b>Gender</b>             |                          |                 | <b>Income</b>                 |                          |                 |
| Male                      | 32 (82%)                 | 81 (79%)        | <\$20,000                     | 5 (13%)                  | 12 (12%)        |
| Female                    | 7 (18%)                  | 21 (21%)        | \$20,001-\$40,000             | 6 (16%)                  | 13 (13%)        |
| No Response               | 0 (0%)                   | 0 (0%)          | \$40,001-\$60,000             | 8 (21%)                  | 9 (9%)          |
|                           |                          |                 | \$60,001-\$80,000             | 4 (11%)                  | 13 (13%)        |
|                           |                          |                 | \$80,001-\$100,000            | 1 (3%)                   | 12 (12%)        |
|                           |                          |                 | >\$100,000                    | 10 (26%)                 | 36 (36%)        |
|                           |                          |                 | No Response                   | 4 (11%)                  | 6 (6%)          |
| <b>Race / Ethnicity</b>   |                          |                 | <b>Marital Status</b>         |                          |                 |
| White                     | 22 (56%)                 | 84 (82%)        | Married (or Domestic Partner) | 14 (36%)                 | 47 (46%)        |
| African American or Black | 7 (18%)                  | 4 (4%)          | Single                        | 18 (46%)                 | 47 (46%)        |
| Asian                     | 3 (8%)                   | 9 (9%)          | Divorced or Separated         | 2 (5%)                   | 7 (7%)          |
| Hispanic or Latino        | 3 (8%)                   | 3 (3%)          |                               |                          |                 |
| Two or more races         | 2 (5%)                   | 2 (2%)          |                               |                          |                 |
| No Response               | 2 (5%)                   | 0 (0%)          |                               |                          |                 |

|                                       | <b>Bus, Subway<br/>&amp; Trolley</b> | <b>Rail &amp;<br/>Ferry</b> |                         | <b>Bus, Subway<br/>&amp; Trolley</b> | <b>Rail &amp;<br/>Ferry</b> |
|---------------------------------------|--------------------------------------|-----------------------------|-------------------------|--------------------------------------|-----------------------------|
| <b>Highest Educational Attainment</b> |                                      |                             | Widowed                 | 1 (3%)                               | 0 (0%)                      |
| Less than High School                 | 3 (8%)                               | 0 (0%)                      | No Response             | 4 (10%)                              | 1 (1%)                      |
| High School/GED                       | 4 (11%)                              | 7 (7%)                      | <b>Access to Car</b>    |                                      |                             |
| Assoc. Degree                         | 6 (16%)                              | 12 (12%)                    | Yes                     | 25 (64%)                             | 81 (79%)                    |
| Bachelor's                            | 14 (37%)                             | 42 (42%)                    | No                      | 14 (36%)                             | 21 (21%)                    |
| Graduate                              | 11 (29%)                             | 40 (40%)                    | No Response             | 0 (0%)                               | 0 (0%)                      |
| No Response                           | 1 (3%)                               | 1 (1%)                      | <b>License to Drive</b> |                                      |                             |
| <b>Household Size</b>                 |                                      |                             | Yes                     | 27 (69%)                             | 92 (90%)                    |
| Maximum                               | 9                                    | 6                           | No                      | 11 (28%)                             | 8 (8%)                      |
| Minimum                               | 1                                    | 1                           | No Response             | 1 (3%)                               | 2 (2%)                      |
| Average                               | 2.8                                  | 2.6                         |                         |                                      |                             |

Source: Derived from Questions D, J, T through Z, AA, and AB of Philadelphia and San Francisco surveys; see Appendix B.

Note: No Response indicates some respondents left these questions blank or checked the response choice labeled "Prefer not to say." Percentages calculated based on respondents who had replied.

But bus and subway CTUs were more likely to be non-White than rail and ferry CTUs, more likely to have lower incomes (60 percent reported incomes of \$60,000 or less compared to 34 percent of rail and ferry CTUs), less education (35 percent had an associate's degree or less, compared to 19 percent of rail and ferry CTUs), and were less likely to have access to a car or a driver's license.

The differences between bus, subway and trolley CTUs and rail and ferry CTUs is important for two reasons. First, because the former appear to be a more diverse group of CTUs, the policies and investments that could improve cycle-transit coordination may be different for them than for rail and ferry CTUs. And second, it suggests that promotional efforts to encourage cycle-transit use should be tailored in ways that acknowledges the different backgrounds and circumstances of CTUs who use different modes of transit.

The differences are also significant because the survey distribution method we employed appears to have been more successful at contacting rail and ferry CTUs than bus, subway and trolley CTUs. This is clear in the numbers of respondents in the two categories (only 39 of the bus, subway and trolley users; and 102 of the rail and ferry users) and is, in part, an outcome of the decision to place survey-takers at major transit centers where rail, bus, subways and trolleys converge. Many CTUs likely begin and end the transit part of their trips at smaller transit stops and stations; but such trips are unpredictable from the researcher's perspective, and we did not have the resources to deploy more survey-takers in areas away from transit centers.

## For what trip purposes do CTUs combine bicycling and transit?

The vast majority of the survey respondents combined transit and bicycling for a work commute trip. However, 30 percent of the respondents in Philadelphia and 25 percent of those in San Francisco combined transit and bicycling for non-work trip purposes (see Table 6).

**Table 6. CTU Trip Purposes**

|                   | Philadelphia | San Francisco |
|-------------------|--------------|---------------|
| Work              | 49 (66%)     | 53 (72%)      |
| Social            | 5 (7%)       | 3 (4%)        |
| Personal Business | 8 (11%)      | 1 (1%)        |
| Recreation        | 4 (5%)       | 8 (11%)       |
| Shopping          | 2 (3%)       | 1 (1%)        |
| School            | 1 (1%)       | 5 (7%)        |
| Other             | 2 (3%)       | 1 (1%)        |
| No Response       | 3 (4%)       | 2 (3%)        |
| <i>Total</i>      | <i>74</i>    | <i>74</i>     |

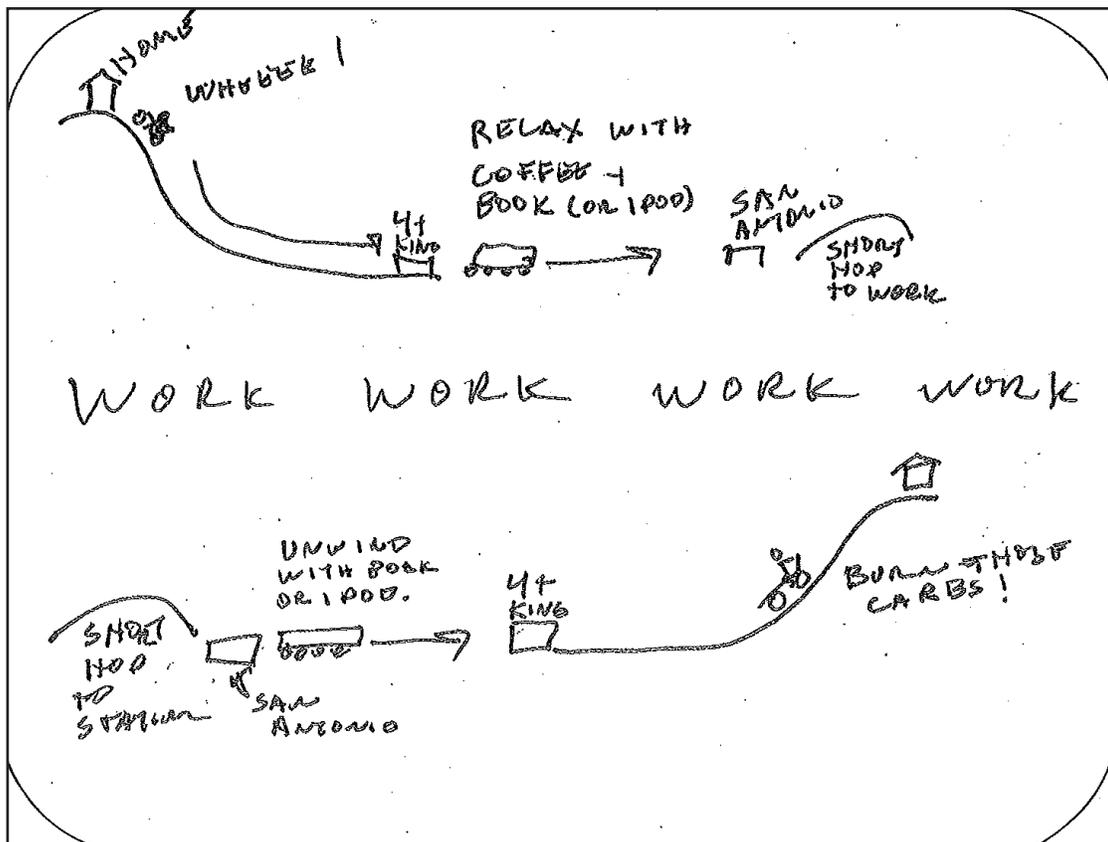
Source: Question K of Philadelphia and San Francisco surveys; see Appendix B.

For non-work-related trips, Philadelphia region respondents were more likely to combine bicycling and transit for personal business, while San Francisco region respondents predominantly used bicycling and transit for recreation when they were not commuting.

Some respondents indicated that they would combine bicycling and transit more often and for more trip purposes, if transit agency policies supported their doing so. Maya, from Philadelphia, for example, wrote that her level of experience in combining bicycling and transit was fairly low (Question P on the questionnaire) because “regional rail stops too early in the night.” What she meant by this is that:

I would combine bike & transit up to 2x/wk for social visits if regional rail ran later. Even if they stopped but added one late ride, last call, to get back home, I would rarely drive my car for such reasons.

*~ Maya, a Philadelphia respondent*



**Figure 6. A Multi-Purpose Commute Trip in a Bay Area Respondent's Map**

Source: John, a San Francisco respondent.

Other respondents also wrote that they appreciate the ability to make cycle-transit trips for reasons other than getting to and from work.

Bus/bike access is great... I use bike racks on buses if too drunk to ride or more shopping than fits my crate.

~ Farley, a Philadelphia respondent

One respondent from the San Francisco Bay Area used a map to illustrate a round-trip commute that combined three trip purposes (Figure 6): work, recreation ("WHEEEEE!") and exercise ("Burn those carbs!"). While the work commute predominated in our sample of respondents in the two cities, the multi-modal nature of combining bicycling and transit was reflected in a significant number of trips that accommodated multiple trip purposes.

### How often do respondents combine bicycling and transit?

In the week prior to each respondent's taking the survey, the average respondent combined bicycling and transit just under five times in Philadelphia and just under four times in San Francisco (see Table 7).

**Table 7. Estimated Weekly Number of Cycle-Transit Trips**

|         | Philadelphia | San Francisco |
|---------|--------------|---------------|
| Maximum | 30           | 10            |
| Minimum | 0            | 0             |
| Average | 4.8          | 3.8           |

Source: Question O in the Philadelphia and San Francisco surveys; see Appendix B.

Note however, that responses to this question (Question O in the surveys) may not be wholly reliable. The wording was not as well phrased as it should have been, and some respondents may have interpreted it to mean round-trips rather than individual trips. In theory, this question may have also produced an upward bias in the average number of trips per respondent, as those who make more trips were more likely to encounter one of our survey-takers. Thus, infrequent users are probably underrepresented. For these reasons, the finding cannot be more precise than to suggest that many respondents combined bicycling and transit multiple times in the previous week.

SEPTA bus operators provided additional information that indirectly sheds light on the number of trips that CTUs take on a weekly basis. Questioned about the numbers of CTUs encountered in the week prior to completing the survey, the average respondent operator reported transporting slightly more than four. About half of the operators had noticed individual CTUs using a SEPTA bus route more than once during the previous seven days, and roughly the same percentage had operated a bus in which all spaces on the front bicycle rack (the capacity of bus bicycle racks in the SEPTA fleet is two) had been occupied at least once. Eighty one (81) respondents (7 percent), had to leave at least one CTU at a bus stop during the previous week because the bicycle rack was already full. Clearly there are some CTUs who travel by bus multiple times a week and use the bus bicycle racks frequently enough that, in some cases, demand exceeds capacity.

## CYCLE-TRANSIT CATCHMENT AREAS

An important goal of this research project was to assess the catchment areas in which CTUs access transit stops and stations. The distances such travelers are willing to bicycle from their origins to transit and from transit to their destinations are important to measure for several reasons. Sometimes referred to as the “first” and “last” miles of transit-based trips (whether objectively measured as one mile or not), these distances can affect the service routing of transit lines and the spacing of stops and stations. They effectively help planners determine the potential ridership for those transit users who are willing and able to bicycle on the origin end of their trips, the destination end, or both.

### How far and for how long do respondents travel by bicycle?

On average, Philadelphia respondents estimated that they traveled 2.8 miles, taking 16.6 minutes, by bicycle as part of their trips (see Table 8 and Figure 7); San Francisco respondents estimated that they traveled an average of 5.4 miles and took 29.7 minutes to do so. The maximum estimated distance traveled was 12 miles in Philadelphia and 25 miles in San Francisco and the minimum was close to 0.25 miles in both case cities.

**Table 8. Respondent-Estimated Distances and Time Ridden**

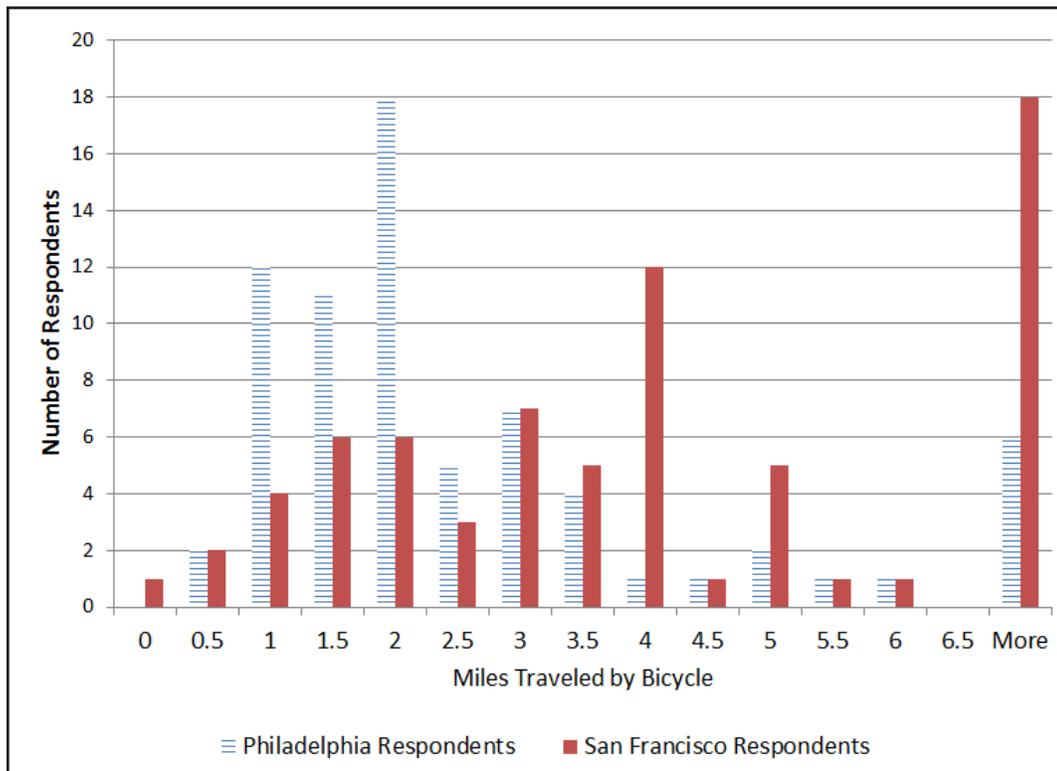
|         | Philadelphia |                 | San Francisco |                 |
|---------|--------------|-----------------|---------------|-----------------|
|         | Miles        | Time in Minutes | Miles         | Time in Minutes |
| Maximum | 12           | 75              | 25            | 120             |
| Minimum | 0.25         | 2               | 0.2           | 5               |
| Average | 2.8          | 16.6            | 5.4           | 29.7            |
| Median  | 2.0          | 15.0            | 3.3           | 22.5            |

Source: Questions F and G of the Philadelphia and San Francisco surveys; see Appendix B.

Notes: n = 74 for Philadelphia respondents.

n = 74 for San Francisco respondents.

In San Francisco respondent average and median distances traveled by bicycle and the average and median amounts of time taken to do so are much higher than in Philadelphia. Several possibilities could explain this. Simple topographic differences between the two regions could come into play. The San Francisco Bay Area is hillier than the Philadelphia metropolitan area and could require bicyclists to take more circuitous routes to reach transit stops and stations. Transit mode differences may also come into play (see Table 9 below); more Philadelphia respondents took slower, less costly forms of transit, and our findings (Table 10) suggest such CTUs bicycle shorter distances than do CTUs who ride heavy rail and/or ferries.

**Figure 7. Self-Estimated Distances Traveled by Bicycle as Part of Cycle-Transit Trips**

Source: Question F of Philadelphia and San Francisco surveys; see Appendix B.

Notes: n = 71 for Philadelphia respondents.

n = 72 for San Francisco respondents.

What is more, Philadelphia region respondents were much more likely to have both origins and destinations within the central city of the region than were San Francisco Bay Area respondents. While 33 Philadelphia region respondents began and ended their trips within the city of Philadelphia, only five Bay Area respondents began and ended their trips within the city of San Francisco. Of the Philadelphia region respondents, 34 began *or* ended their trip outside of Philadelphia, while five began *and* ended their trip outside of the city. In the Bay Area, almost all of the respondents (67 of 74 respondents, or about 91 percent) began *or* ended their trip outside of San Francisco and only two began *and* ended their trip outside of the city. It is noteworthy, however, that four Philadelphia region respondents had the longest CTU trips in our data set, beginning or ending their CTU trips in New York City.

Only 12 of the 57 (20 percent) Philadelphia respondents who provided sufficient information to calculate miles ridden traveled less than a mile as part of their cycle-transit trip. Another 28 (47 percent) traveled two miles or more. Even at a brisk pace, two miles would require about a half an hour to walk on foot, so these respondents had reduced their total travel time from origin to destination by a significant amount by substituting bicycling for walking.

**Table 9. Transit Modes Utilized by CTUs**

| Mode          | Philadelphia |                                | San Francisco |  |
|---------------|--------------|--------------------------------|---------------|--|
|               | n            | Notes                          | n             | Notes  |
| Heavy Rail    | 45           | 37 SEPTA Reg. Rail<br>8 Amtrak | 39            | 26 Caltrain<br>13 BART                                   |
| Light Rail    | 11           | SEPTA Trolley or Subway        | 0             | Bicycles not allowed on Muni light rail.                 |
| Bus           | 14           | SEPTA Bus or Bolt Bus          | 14            | Muni, AC Transit, Golden Gate Transit or Santa Clara VTA |
| Ferry         | --           |                                | 11            |  |
| Multi-Transit | 0            |                                | 6             |  |
| No Response   | 4            |                                | 4             |  |

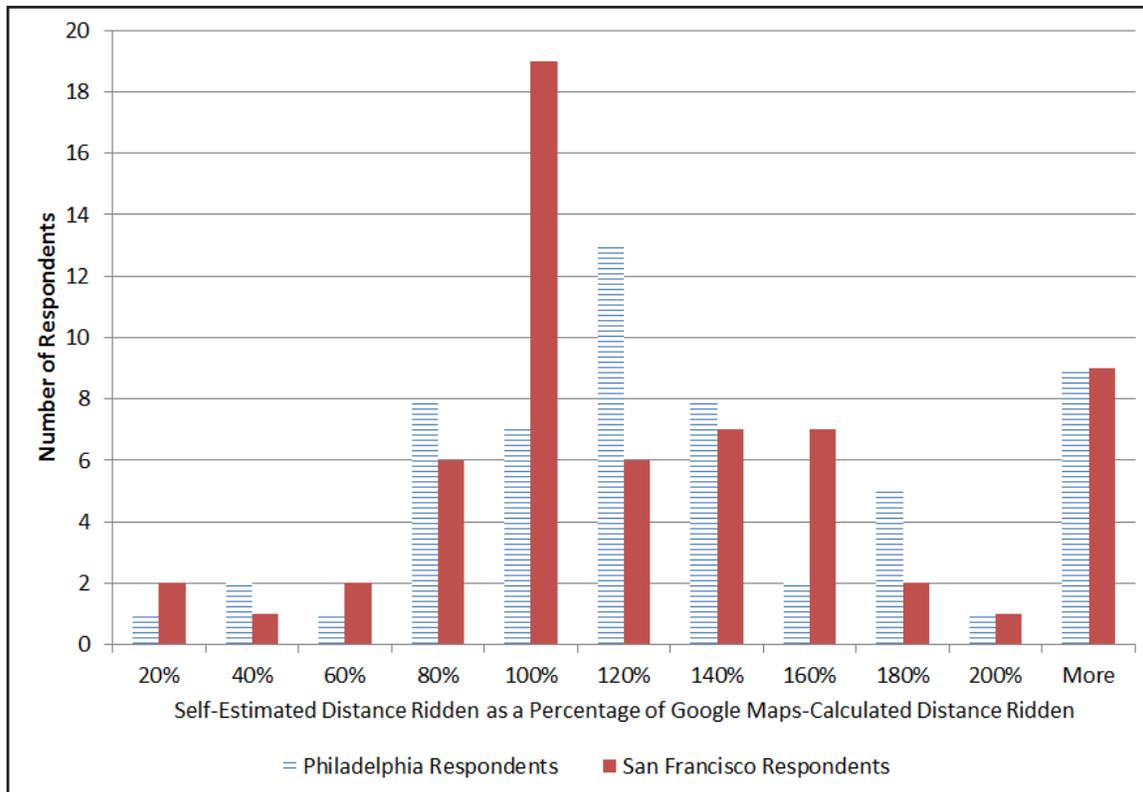
On average, CTUs who used buses, subways or trolleys traveled shorter distances and spent less time traveling by bicycle than did CTUs who used rail or ferry (Table 10).

**Table 10. Distances Bicycled by Bus, Subway, and Trolley, and CTUs and by Rail and Ferry CTUs**

|                                       | Bus, Subway and Trolley | Rail and Ferry |
|---------------------------------------|-------------------------|----------------|
| Bicycle Miles, CTU estimated          | 3.08                    | 4.31           |
| Bicycle Miles, Google Maps-calculated | 2.62                    | 3.63           |
| Bicycle Trip Time, CTU estimated      | 18.0                    | 24.1           |
| CTU Trips per Week                    | 8.0                     | 4.5            |

Source: Derived from Questions A through J of Philadelphia and San Francisco surveys; see Appendix B; and from Google Maps.

To assess the accuracy of respondents' self-estimated distances ridden by bicycle as part of their cycle-transit trips, we compared the estimates to distances calculated by Google Maps using origin and destination information provided by respondents. Of 74 Philadelphia region respondents, 57 provided sufficient information to permit a comparison; in the Bay Area 62 of 74 did. Sixty-two (62) percent of respondents' estimates (74 of 119 valid entries) were within the range of plus or minus 40 percent of the Google Maps calculations (see Figure 8).



**Figure 8. Comparison of Respondent-Estimated to Google Maps-Calculated Distances Ridden on Bicycle as Part of Cycle-Transit Trips**

Notes: n = 57 for Philadelphia respondents.  
n = 62 for San Francisco respondents.

Google Maps calculations put the average distance bicycled in Philadelphia as part of a bicycle-transit trip at 2.4 miles, 14 percent lower than the average respondent-estimated distance. But note that Google Maps calculations are not necessarily more accurate than the respondents' own estimations; in most cases CTUs would have had multiple routes between their origins and the transit stops or stations where they accessed a transit vehicle and between the location where they disembarked from a transit vehicle and their ultimate destination. Google Maps calculates distance based on the route its algorithms identified, but in the real world CTUs might have many good reasons to choose different routes. Safer or quieter or less steep roads, even if on slightly longer routes, might well have been preferable to a significant proportion of respondents.

In San Francisco, similar Google Maps calculations put the average distance at 4.1 miles, still well above the Google Maps average for Philadelphia and 24 percent below the average respondent-estimated distance (reported above) for San Francisco. Although the Google

Maps calculations revealed a smaller range of distances between the minimum distance traveled (0.3 mile) and maximum distance (18.3 miles), 33 percent of these Google Map distances were more than five miles in length (as opposed to 37 percent of the respondent-estimated distances) and just over six percent of the distances were more than ten miles in length. Again, CTUs may have chosen different routes than those shown on Google Maps as being the most convenient between origin and destination points.

## BENEFITS AND CHALLENGES OF CYCLE-TRANSIT TRAVEL

Responses to the survey and interview questions help us establish a profile of CTUs and describe the ways in which they coordinate bicycling and public transit. The questions posed also permit a clearer understanding of the reasons for traveling by bike and transit, the benefits perceived, and the challenges to doing so.

### Why do respondents travel on transit with their bicycles?

There are many potential reasons for combining cycling and public transit in a single journey, and respondent answers to the questionnaire reflect the diversity of motivations expressed (see Table 11 and Table 12). Some respondents shared a decidedly positive perspective on cycle-transit coordination.

Caltrain and biking work well together. It's been a very positive experience that has been a convenient (and cost effective) solution for me. Much better than driving.

~ Eugene, a San Francisco respondent

I am able to venture out and explore much more of the Bay Area due to the combined cycle/transit possibilities, and I love it!

~ Jean, a San Francisco respondent on a recreational cycle-transit trip

The most common reasons for traveling with a bicycle on transit in these cities were that it is faster, the trip is too long to do entirely by bicycle, it avoids the difficulty of riding in the dark or bad weather, and a bike is needed to reach the final destination. Avoiding busy or unsafe streets was of slightly less concern for respondents and avoiding steep hills was also less of a concern for respondents, (though, surprisingly, similar percentages of respondents in Philadelphia and in (hillier) San Francisco (20 and 24 percent) cited this reason.

**Table 11. Reasons for Combining Bicycling and Transit (Philadelphia Respondents)**

| I take my bike on transit vehicles because:           | Agree or Strongly Agree | Neither Agree nor Disagree | Disagree or Strongly Disagree | No Response |
|---|-------------------------|----------------------------|-------------------------------|-------------|
| I can avoid riding on busy or unsafe streets.         | 23 (31%)                | 15 (20%)                   | 13 (18%)                      | 23 (31%)    |
| My trip is too long to ride my bicycle the whole way. | 36 (49%)                | 9 (12%)                    | 8 (11%)                       | 21 (28%)    |
| I can avoid steep hills.                              | 15 (20%)                | 13 (18%)                   | 21 (28%)                      | 25 (34%)    |
| I can avoid riding in the dark or in bad weather.     | 33 (45%)                | 9 (12%)                    | 10 (14%)                      | 22 (30%)    |

| <b>I take my bike on transit vehicles because:</b>   | <b>Agree or Strongly Agree</b> | <b>Neither Agree nor Disagree</b> | <b>Disagree or Strongly Disagree</b> | <b>No Response</b> |
|--|--------------------------------|-----------------------------------|--------------------------------------|--------------------|
| Taking transit is faster than riding my bicycle.   | 35 (47%)                       | 7 (9%)                            | 8 (11%)                              | 24 (32%)           |
| It is easy to find space for my bike on transit vehicles.  | 20 (27%)                       | 16 (22%)                          | 16 (22%)                             | 22 (30%)           |
| There are not enough safe places to leave my bicycle at the station where I board a transit vehicle. | 28 (38%)                       | 12 (16%)                          | 11 (15%)                             | 23 (31%)           |
| I need my bicycle when I get off a transit vehicle to reach my destination.                          | 33 (45%)                       | 9 (12%)                           | 11 (15%)                             | 21 (28%)           |

Source: Question R on Philadelphia survey; see Appendix B.

**Table 12. Reasons for Combining Bicycling and Transit (San Francisco Respondents)**

| <b>I take my bike on transit vehicles because:</b>   | <b>Agree or Strongly Agree</b> | <b>Neither Agree nor Disagree</b> | <b>Disagree or Strongly Disagree</b> | <b>No Response</b> |
|--|--------------------------------|-----------------------------------|--------------------------------------|--------------------|
| I can avoid riding on busy or unsafe streets.  | 18 (24%)                       | 25 (34%)                          | 20 (27%)                             | 11 (15%)           |
| My trip is too long to ride my bicycle the whole way.  | 58 (78%)                       | 5 (7%)                            | 6 (8%)                               | 5 (7%)             |
| I can avoid steep hills.   | 18 (24%)                       | 18 (24%)                          | 27 (36%)                             | 11 (15%)           |
| I can avoid riding in the dark or in bad weather.  | 27 (36%)                       | 17 (23%)                          | 21 (28%)                             | 9 (15%)            |
| Taking transit is faster than riding my bicycle.   | 46 (62%)                       | 14 (19%)                          | 6 (8%)                               | 8 (11%)            |
| It is easy to find space for my bike on transit vehicles.  | 32 (43%)                       | 12 (16%)                          | 21 (28%)                             | 9 (12%)            |
| There are not enough safe places to leave my bicycle at the station where I board a transit vehicle. | 26 (35%)                       | 25 (34%)                          | 16 (22%)                             | 7 (9%)             |
| I need my bicycle when I get off a transit vehicle to reach my destination.                          | 56 (76%)                       | 9 (12%)                           | 4 (5%)                               | 5 (7%)             |

Source: Question R on San Francisco survey; see Appendix B.

Over a third (38 percent) of Philadelphia region respondents agreed or strongly agreed that the lack of safe places to park bicycles at transit stations is an important reason for traveling with their bicycles on transit; 35 percent of San Francisco Bay Area respondents felt the same. The difference may be due to the fact that several Bay Area transit agencies actively encourage the use of bicycles on their systems. For example, although BART's policy of allowing bicycles on certain cars during non-peak hours is similar to SEPTA's policy, Caltrain (regional rail operator) has cars specifically designed to accommodate bicycles at all hours. Similarly, the major ferry services crossing the bay also accommodate bicycles on board.

I actually need my bike mostly as a “bridge” between two modes of transit that do not connect (AC Transit, Caltrain).

~ *Julie, a San Francisco Bay Area respondent*

The reasons for combining bicycling and transit can be complex or simple, single- or multi-purposed, vitally important to a CTU or, sometimes, only a whim. Ian wrote that “exercising (riding a bike partway to work) makes you work better.” Andrew explained that he is “happy to be able to pay my respects so easily” to family members buried in the North Cedar Hill

Cemetery that he rides past on his way to Suburban Station (a Center City Philadelphia transit center), and Adam described two different cycle-transit combinations he can take to and from work, one of which involves riding “transit all the way home if [I’m] too tired to ride.”

### How does bicycle parking affect CTU trips?

With respect to bicycle parking (see Table 13 and Table 14), a majority of respondents in each of the case cities said that bicycle racks are available at transit stops and stations, but many also said that they do not use bicycle parking, but instead prefer to travel with their bicycles. They would continue to do so, they said, even if there were secure bicycle parking facilities. This could reflect either that respondents need their bicycles at the destination end of their transit link or that they are not confident in the security of transit station bicycle parking. In Philadelphia, 32 percent of respondents to this question said they would use secure parking, if it were available, and 30 percent said they would go out of their way to use secure parking. In San Francisco, just 22 percent said they would use secure parking, and 18 percent said they would go out of their way to use secure parking.

**Table 13. CTUs and Bicycle Parking (Philadelphia Respondents)**

| Question   | Yes      | No       | Don't Know | No Response |
|--|----------|----------|------------|-------------|
| Is there a bike rack or other bicycle parking at the station where you got on SEPTA?   | 42 (57%) | 19 (26%) | 10 (14%)   | 3 (4%)      |
| If a secure facility were available to store your bike at the station where you got on SEPTA, would you use it instead of bringing your bike on a SEPTA transit vehicle? | 24 (32%) | 29 (39%) | 12 (16%)   | 9 (12%)     |
| Would you ride your bike to a less convenient SEPTA transit stop or station if that station had secure bike parking?   | 22 (30%) | 34 (46%) | 14 (19%)   | 4 (5%)      |

Source: Question S from Philadelphia survey; see Appendix B.

**Table 14. CTUs and Bicycle Parking (San Francisco Respondents)**

| Question   | Yes      | No       | Don't Know | No Response |
|--|----------|----------|------------|-------------|
| Is there a bike rack or other bicycle parking at the station where you got on transit?   | 52 (70%) | 18 (24%) | 4 (5%)     | 0 (0%)      |
| If a secure facility were available to store your bike at the station where you got on transit, would you use it instead of bringing your bike on a transit vehicle? | 16 (22%) | 47 (64%) | 11 (15%)   | 0 (0%)      |
| Would you ride your bike to a less convenient transit stop or station if that station had secure bike parking?   | 13 (18%) | 49 (66%) | 11 (15%)   | 1 (1%)      |

Source: Question S from San Francisco survey; see Appendix B.

Clearly, the security factor at transit stops weighs heavily on the minds of many bicyclists who decide to take their bicycles on transit, especially those who have experienced waiting long periods for transit vehicles that can accommodate more bicycles.

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I have to wait for a later train about once a month. If I were confident that my bicycle would not be stolen when parked (or lose a wheel, etc.), I would definitely leave it at the station more frequently.

~ *Claire, a San Francisco respondent*

I would also love secure and sheltered bike racks. I sometimes leave my bike at home for fear of not having anywhere safe to park it.

~ *Jean, a San Francisco respondent*

Safer places at stops to put bike due to theft [in response to Question AC requesting any additional comments].

~ *Tom, a Philadelphia respondent*

In addition to a perceived need for more *secure* bicycle parking is the need for *sufficient* spaces for bicycles, a challenge many respondents noted. Particularly in Philadelphia this is keenly felt, in part because of a 2013-2015 major construction project at 30<sup>th</sup> Street Station, the Center City multi-modal transit center serving Amtrak and SEPTA trains, intercity buses belonging to the Bolt Bus and Megabus companies, and SEPTA buses, subways and trolleys.

The same necessity that led Fred to lock his bicycle to a stop sign (Figure 9), led Sarah to explain that because:

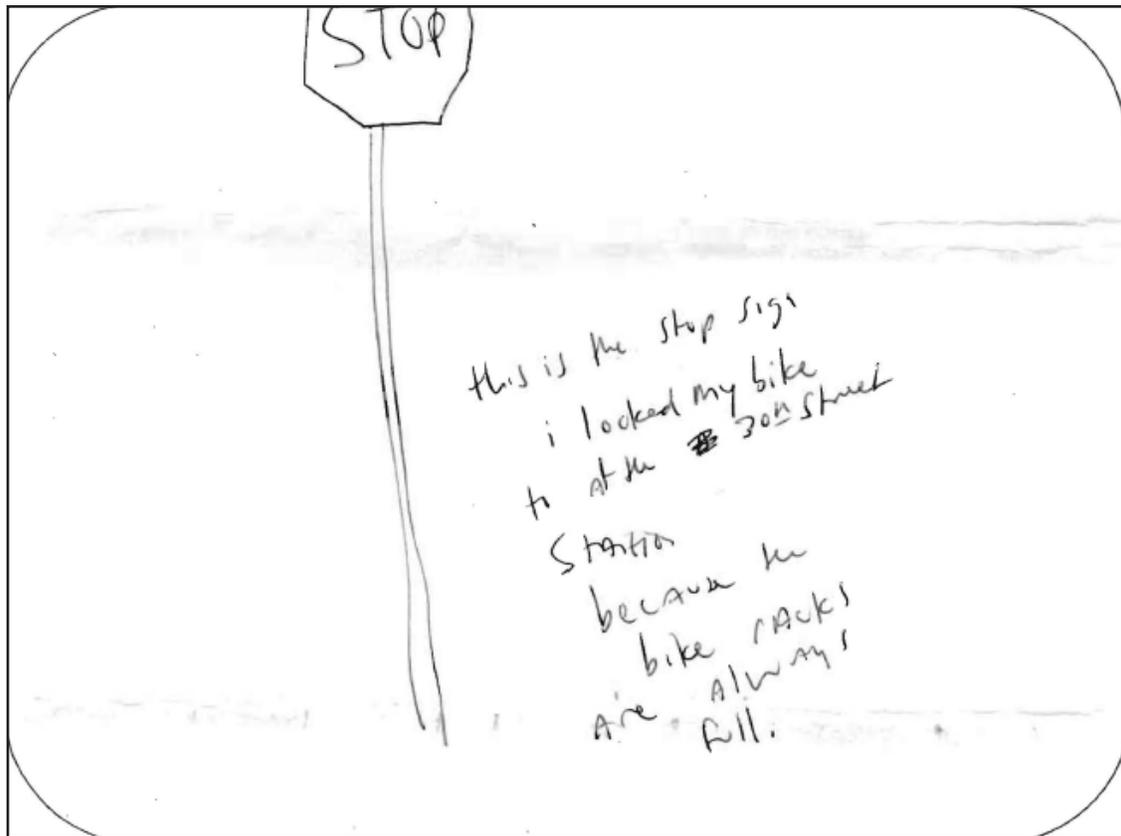
The bike parking [at 30<sup>th</sup> St. Station] was under construction, I had to park on 29<sup>th</sup> (and it was full, so I had to park on a parking meter).

~ *Sarah, a Philadelphia respondent*

Samuel, also from Philadelphia, argued not only for more bicycle parking, but for well-designed, full-featured bicycle parking facilities:

[There was] not one extra bike rack (even though the bike racks get really full and crowded!!!) Very disappointing and vexing. Seriously, we need more covered, well-lit bike racks.

~ *Samuel, a Philadelphia respondent*



**Figure 9. A Lack of Sufficient Bicycle Parking Necessitates Alternatives**

Source: Fred, a Philadelphia respondent.

Note: Fred's note read: "This is the stop sign I locked my bike to at the 30<sup>th</sup> Street Station because the bike racks are always full."

Some respondents found a solution to the lack of bicycle parking by avoiding the problem altogether:

I have a folding bike and therefore carry my bike with me and do not need to lock up.

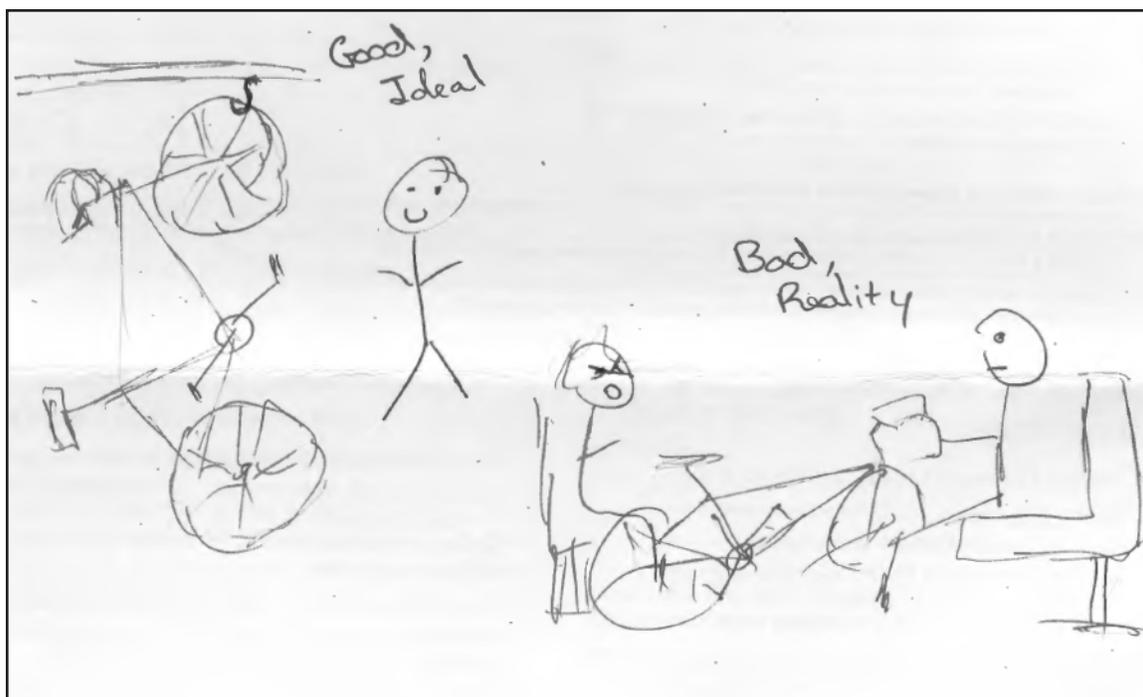
~ *Michael, a Philadelphia respondent*

Bicycle parking proved to be a challenge, not only at transit stations in Philadelphia and San Francisco, but on transit vehicles, particularly in Philadelphia where older SEPTA Regional Rail cars have no space dedicated for bicycles and the dedicated spaces in new Regional Rail cars can require asking seated passengers to move to other seating.

Kevin, the illustrator of Figure 10 below, explained that:

It would be nice to have a better way of storing bikes on the train. I know Seattle Metro have hooks which provide better and safer storage on trains and Metro.

~ *Kevin, a Philadelphia respondent*



**Figure 10. The Ideal Versus the Reality for CTUs on SEPTA Regional Rail Cars**

Source: Kevin, a Philadelphia respondent.

He need not look all the way to the other side of the country, however. New Jersey Transit's light rail River Line, running between Trenton and Camden, also features hooks for hanging bicycles vertically in rail cars.

### **What would CTUs do if unable to combine bicycling and transit?**

An additional question this project sought to answer was whether the ability to combine bicycling and public transit permits CTUs to make trips that might not otherwise have happened at all, or that would have required significantly higher costs in time or money.

In Philadelphia, in response to the question "If you could not travel with your bicycle or lock it safely at a transit stop, how would you make this trip?," about 70 percent (52 of 74 respondents) said they would continue to use public transit, but would combine it with another mode other than bicycling. Eleven (11) percent (8 of 74) said they would continue to ride the bicycle and use it for the entire trip, about 14 percent (10 of 74) said they'd use another mode for the full trip (nine of whom said they would drive, and one each of whom said he/she would walk, take a taxi, or skateboard). One person said that she would not make the trip at all.

In San Francisco, a similar number of respondents (51 of 74, or 69 percent) said that they would continue to use public transit, but would combine it with another mode. Only four percent (3 of 74 respondents) would stay with the bicycle and use it for the entire trip, 14 percent (10 of 74) would use another mode for the full trip, eight of whom said they would drive, one would take a motorcycle and one would either drive, take Muni or take BART.

Clearly, the coordination of bicycling and transit does not, in general, permit respondents to make trips they could not have otherwise made: only one person said that was the case, and it may well have been that the trip was not a high priority, in the first place.

If I could not take my bike with me, or at least have one waiting in Mountain View, I would have to drive all the way from San Francisco to Mountain View [a distance of about 40 miles by car].

*~ John, a San Francisco respondent*

Transit proved to be the element of cycle-transit trips that most respondents would retain in this hypothetical scenario: more than six times as many said they would keep the transit part of their trip (by combining it with driving, walking or another mode) than said they would retain the bicycle part of their trip. But if those respondents walked to transit or drove (parking at a transit station or being dropped off by someone else), they would increase the cost of their trip in time or money or both. For those who would not retain either the bicycling or the transit part of their trip, the same effect of higher costs would be felt (except, perhaps, for the respondent, who said he or she would use a skateboard as an alternative mode).

While this finding is not surprising, respondents' answers allow us to affirm that the transit element of cycle-transit trips is, in most cases, more effective in satisfying travel demands. Where travelers are unable to combine bicycling and transit, they are more likely to rely on motorized transportation in the form of transit vehicles, private cars or light-duty trucks, or a combination of these. Some respondents are able and willing to rely on non-motorized transportation by continuing to bicycle or by combining walking and transit, but they are in the minority.

### **Does cycle-transit coordination convey freedom or anxiety to CTUs?**

The ability to coordinate bicycling and public transit elicited a range of emotional responses from respondents. Some praised the ability to make travel choices with more freedom to shape their trips the way they wanted, while others expressed anxiety about some of the challenges of combining bicycling and transit.

In answers to the open-ended questions and in follow up interviews, respondents expressed excitement at having discovered the benefits of bicycle riding in the cities of San Francisco and Philadelphia. Many stated that they had only really tried this combination in the recent past.

I had never combined bicycle and transit travel before moving to San Francisco two years ago, although I have used public transportation all over the world. Here, my husband and I mainly use bicycle/transit for recreational trips, to take us further than we could comfortably ride our bikes alone. I find it easy and helpful.

*~ Jean, a San Francisco respondent*

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I often combine public transit as part of my exercise/recreational bike rides. Most importantly, it extends my range and lets me see and explore new areas. If I ride from my home to Trenton, Hammonton, or Atlantic City, I can return on public transit (NJ Transit Train, River Line, Market St. Subway and/or SEPTA bus).

*~ Matt, a Philadelphia respondent*

I like to use my bike in combination with public transit because it gives me the freedom to skip a leg of my trip (if I want to) and the chance to catch up a bus that would have just gone by. Biking certainly shortens walking parts of my trips. Also, I cross the bay to go to work and I can't do that by bike. I have to use public transit. Finally, having a sizable biking portion makes for good exercise.

*~ Ken, a San Francisco respondent*

Other respondents found that combining bicycling and transit gave them freedom not just to travel where and how they would like, but freedom from perceived inferior alternatives:

Favorite part of commute is looking at I-95 all backed up to and from work.

*~ Sergio, a Philadelphia respondent*

However, in some cases, individuals were still hesitant to combine bicycling and transit on a regular basis for fear that something might go wrong along the way.

Would love to do Muni/bike but don't know how. I am too intimidated by process to try.

*~ Travis, a self-described "first timer" CTU, a San Francisco respondent*

SEPTA bus drivers are kind of surly sometimes and they're always in a rush. It's like having to ... I don't even know... like, how does the thing [the bus bicycle rack] go down? How does it [the bike] not fly off? If I absolutely needed to [I would try]. One of these days I'm going to have to because the bus routes are a lot more all-encompassing.

*~ Maya, a Philadelphia respondent*

On weekends, you never know if there are other bikes on the train, so you could wait for train, but not get on because they have already reached quota.

*~ Hannah, a Philadelphia respondent*

I held off for years because I didn't know how to use the bus bike rack. There should be some way to help people learn to use it. One time I brought my bike to catch a bus on time BUT bus was late (an hour!) so I wasted my time anyways and should have just biked.

*~ Barbara, a Philadelphia respondent*

Many more comments, in both the open-ended questions responses and in the interviews, indicate respondents could be uncertain or concerned about their choice to combine bicycling and transit. Some worried about not finding space on bus bicycle racks or not

knowing how to use them. Others felt they would risk a stolen or damaged bicycle if they locked it up at a transit stop or station. Still others were concerned that they would be kicked off or kept off trains by inconsistent enforcement of rules, be yelled at by pedestrians, or feel targeted by aggressive motorists or unfriendly bus operators. While cycle-transit coordination policies were considered a boon by many respondents, many others, even while using the cycle-transit facilities and taking advantage of cycle-transit policies, felt anxious about some aspects of their choice to be a CTU.



I could enjoy a bike ride through the Wissahickon [part of Philadelphia's Fairmount Park] in the afternoon and then I'd take it [public transit] back at night, then bike from 30th St. Station to my place in West Philly. It would save me a little bit of money, because I didn't have to pay for one way on the train, and then I get to enjoy the bike ride too.

*~ Sarah, a Philadelphia respondent*

It [being able to combine bicycling and transit] allows me to go to many more places that I would not have access to... If I did not have a bicycle, I would be very limited as far as where I could go.

*~ Phillip, a San Francisco respondent*

In Figure 11, Michael in Philadelphia was able to complete a three-link bicycle trip of over 15 miles (to his doctor's office, a meeting at the main branch of the Philadelphia Free Library, and to a second meeting at the University of Pennsylvania), knowing he would be able to make a cycle-transit trip to return home to Northwest Philadelphia.

### **CTU catchment areas are significantly larger than pedestrian catchment areas.**

The study revealed that many transit-access trips by bicycle far exceeded the distance that transit riders would be willing to walk to and from transit. In both cities, while many bicycle trips did not exceed three miles, there were cases of individuals who travelled over much longer distances to reach transit.

Joint use of bicycle and transit expands my reach and allows me greater freedoms on both ends of my trip.

*~ Steve, a San Francisco respondent*

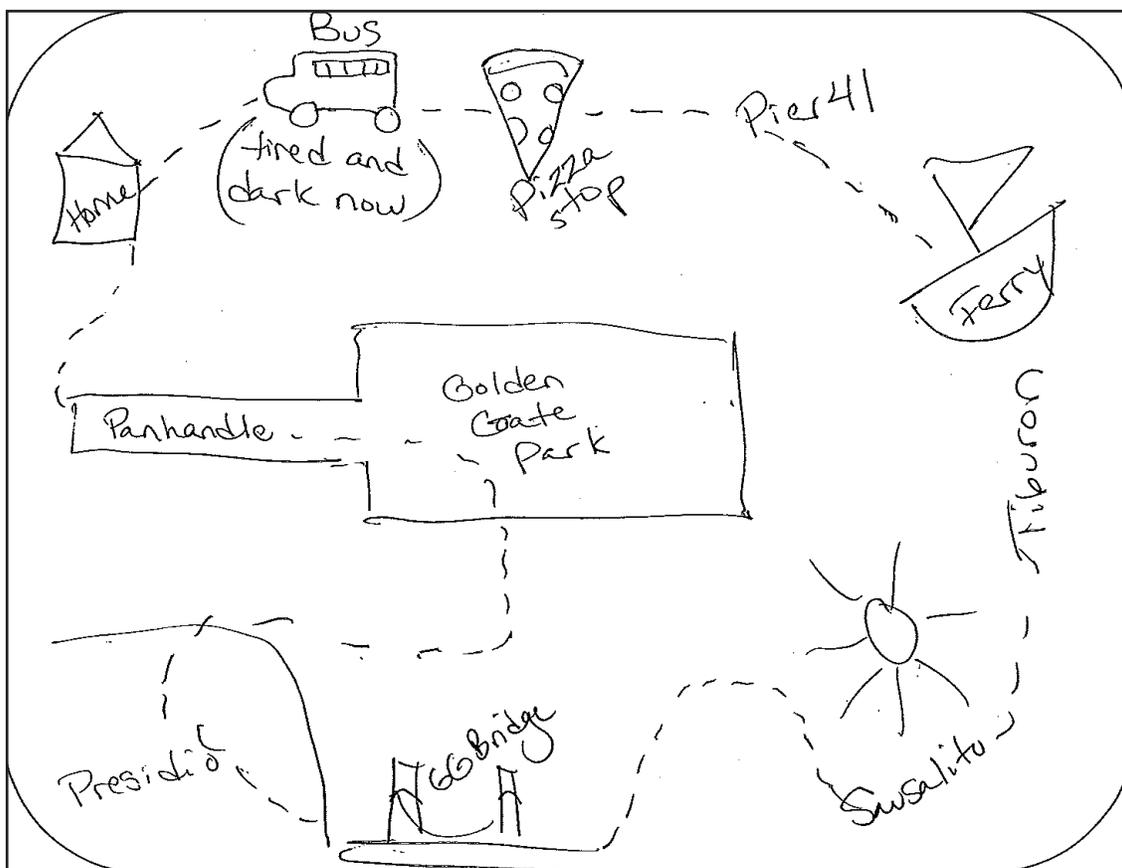
In large part, this may be due to the fact that without a bicycle, transit users are obliged to either drive or get a ride in a car, walk (limiting their geographic reach), or take another transit vehicle, which would still limit their reach to just beyond transit corridors. In addition to the physical exertion of having to walk farther, the additional time required would be a limiting factor.

Thus, the findings of this study suggest that in the two case cities, the area of geographic access to transit was significantly enlarged by the integration of bicycling and transit modes, with important cost benefits and time savings for first and last mile travel by CTUs.

### **The notion of a "CTU catchment area" is complex.**

CTUs do not necessarily take the shortest route to public transit. Sometimes, they go farther to access a transit vehicle than is strictly necessary and, in other instances, they use the ability to rely on transit in one direction as a reason for bicycling all the way to a destination in opposite direction. The ability to combine bicycling and transit permits some travelers to include segments of their trips on bicycle that are recreational or exercise oriented.

The map below (Figure 12) shows how Jean in San Francisco traveled from the city to Marin County and back again by bicycle, ferry and public transit for a full-day recreational trip. By the time the day was turning to night and her energy was flagging, she was able to put her bicycle on the front of a bus and get back to her starting point, home. In contrast, most cycle-transit trips to and from work were much more direct, reflecting more constrained amounts of time that commuters have to travel.



**Figure 12. Recreational Bicycle Trip Made Possible by Public Transit**

Source: Jean, a San Francisco respondent.

Similarly, bicycle trips for personal business and work reasons, as illustrated in Figure 11, can be longer than the trip purposes might otherwise permit *because* of the CTU's ability to return to his or her origin by bicycle and transit. Some CTUs also are able to bicycle to a more distant transit stop or station than they would do if they were obliged to make their "first mile" access-to-transit trip on foot. By doing so, they can avoid a transfer, a slower transit mode, or a stop with less frequent service.

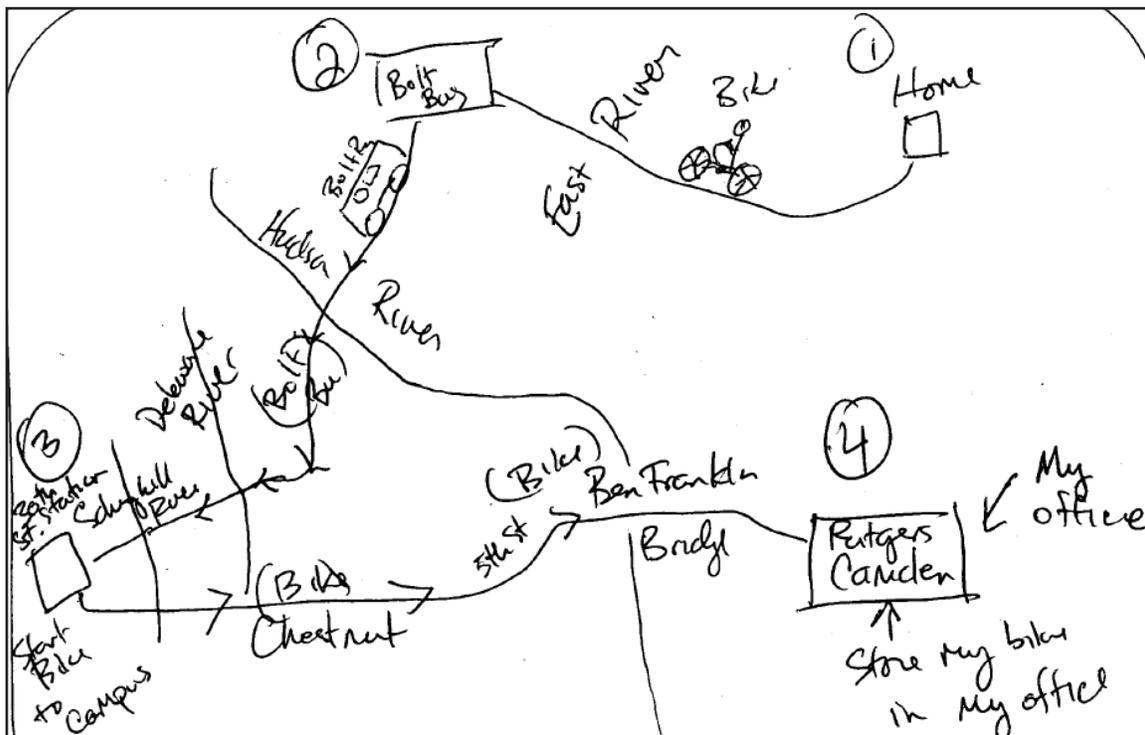
In all such cases, the transit catchment area, as defined by bicycle access to a transit stop or station, is a flexible concept that can shift depending upon personal, temporal, seasonal, or other circumstances. With the ability to bicycle to a transit stop or station, the catchment area can grow or shrink, stretch in one direction while contracting in another, from day to day. The result is that, although it may have ultimate limits and boundaries, its shape is not fixed in a way that can be easily measured or definitively described.

## CTU respondents reflect the larger population of U.S. bicycle commuters.

CTUs who responded to our surveys reflect a commonly held stereotype about U.S. urban bicyclists: that they are predominantly White, male and college-educated. While the study was not intended to reflect a random sample, the low percentages of women and non-Whites raises questions about the perceptions that many members of the public have of the desirability, safety, convenience and benefits of combining bicycling and transit. Is it possible that some potential CTUs feel unwelcome on transit with their bicycles, whether for vaguely or clearly defined reasons, because they do not resemble a “typical” CTU? While we cannot answer this question with the data collected and analyzed for this project, acknowledging the possibility and signaling to researchers that it is a legitimate question is an important conclusion of our work.

## CTUs value highly the ability to travel to, on, and from transit with their bicycles.

Not all of our CTU respondents travel *on* transit vehicles with their bicycles; a significant proportion of CTUs uses bicycles solely as an access mode to transit. However, the efforts that transit agencies have made to facilitate both getting *to* and *from* transit and travelling *on* transit with bicycles appear to be widely appreciated. Nevertheless, CTUs often choose to forego a short-distance trip on transit if they feel that they will have to wait for a transfer, or that intra-city transit times are high (as was the case in San Francisco).



**Figure 13. Three Rivers Traversed by Bike and Bus: Brooklyn to Camden**

Source: Francis, a Philadelphia respondent

The average of over 2.5 miles travelled by bicycle may be undertaken in order to get to the transit stop *nearest* the traveler’s origin, or to a *preferred* transit stop or station (one that might avoid a transit transfer, for example). In either case, the distance travelled

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would generally take two to three times as long on foot as by bicycle and, round-trip, can significantly reduce time spent traveling during a day.

With the bicycle-transit connection I can get to other parts of San Francisco quicker than I would if I were traveling on foot.

*~ Phillip, a San Francisco respondent*

Some distances traveled by bicycle are significantly longer, as are combined bicycle-transit trips. Francis, the New Yorker who drew Figure 13 above, had long bicycle rides on the home end – Brooklyn to Manhattan – and on the destination end – 30<sup>th</sup> St. Station in Philadelphia to the Rutgers University campus in Camden, New Jersey, in addition to a 100-mile intercity bus trip.

### **CTUs perceive benefits well beyond simple time savings.**

CTUs benefit from bicycle-friendly transit policies and facilities by being able to travel longer distances and avoid bicycle travel at inconvenient times (at night, in wet or snowy conditions) and in places that are unsafe or undesirable (e.g., on steep hills or in unfamiliar neighborhoods). Unusual circumstances also lead some CTUs to combine bicycling and transit when they might not otherwise do so, for example, this respondent's situation:

I usually take my bike on a bus late at night after drinking or if shopping is involved.

*~ Farley, a Philadelphia respondent*

One Philadelphia bus operator commented on the same circumstance, but took a less sympathetic view of it:

Some passengers are intoxicated with their bikes. That's a problem!

*~ A SEPTA bus operator working from the Midvale depot.*

As a taxi ride can be a safer alternative for an inebriated motorist, a transit ride can be for a CTU who would be ill-advised to bicycle while drunk.

### **Cycle-transit trips could be accomplished by other means, but at greater costs.**

The ability to combine bicycling and transit does not necessarily enable trips that would not otherwise have been possible. Only one respondent of 148 clearly said that a cycle-transit trip would not have happened at all, if bicycling and transit could not be combined. But many respondents would have had to rely on alternatives that were much costlier in time (walking to transit, instead of bicycling, for example), in money (driving to transit, or driving instead of bicycling and using transit), and in environmental impacts. The benefits of cycle-transit coordination policies and facilities to CTUs are clear and appreciated. The indirect benefits, of motorized trips avoided and of the public health effects of active modes of transportation, cannot be quantified through the analysis in this study, but they are real, even if they remain largely unknown at this point.

**CTUs speak clearly about how cycle-transit coordination could work better.**

CTUs appreciate the cycle-transit coordination efforts transit agencies have made, but easily identify other efforts to make combining bicycling and transit more appealing. For example, more secure and sheltered bicycle parking, greater availability of bicycle lockers at stations, dedicated spaces on rail vehicles, better cycle-transit orientation materials, and removal of barriers to bicycle use on transit during peak hours could lead to increases in travel to, on and from transit by bicyclists.

The transit agencies should be as accommodating of bicycles as they can and plan ahead with more capacity for bicycles.

*~ Steve, a San Francisco respondent in a subsequent interview*

I would like to see these grooves installed alongside stairs that you can run your bike tire in... platform level ingress/egress at more (all?) Regional Rail stations... shelters at all locations! Not a 3-walled, 2 person stall. A real shelter!

*~ Doug, a Philadelphia respondent*

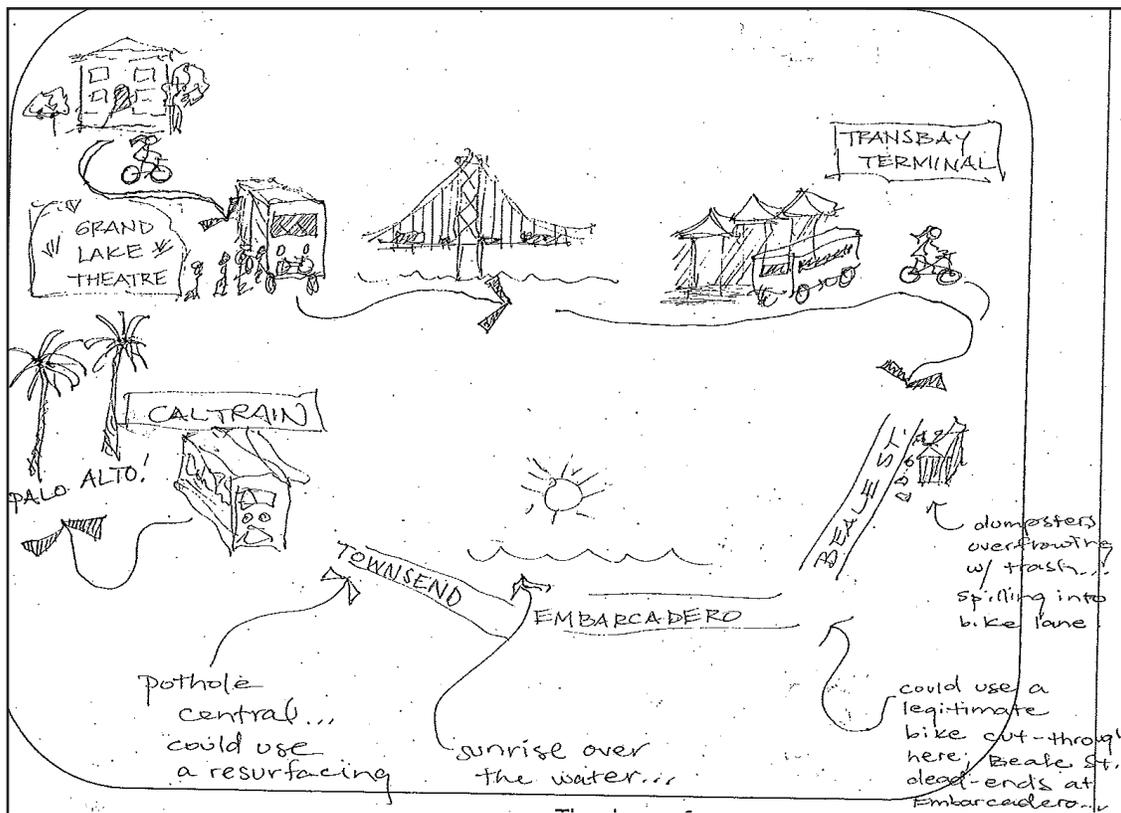
I strongly feel that transit should become much more friendly and encouraging of those of us who use bike x transit combination trips. SEPTA has made a lot of improvement in the past decade, but more should be done. More safe places to park your bike; buses and trolleys that accommodate more bikes; and subway cars that allow you to use bikes even during peak hours.

*~ Zach, a Philadelphia respondent*

I would say from my marketing experience that video is a lot more powerful these days than pamphlets or whatever. So if you have some money budgeted to this I'd say make a sweet video and post that all over YouTube [in response to a question about making cycle-transit coordination work better for more Philadelphians].

*~ Sarah, a Philadelphia respondent*

Julie in San Francisco illustrated her Oakland to Palo Alto via San Francisco trip (Figure 14) with numerous suggested improvements.



**Figure 14. Problems and Solutions Identified by a Frequent CTU**

Source: Julie, a San Francisco respondent.

**More, and more secure, bicycle parking is needed.**

More, and more secure, bicycle parking at transit stations would help keep some bicycles off of public transit vehicles, allowing for even greater CTU access to transit. Several respondents indicated that they travel on transit with their bicycles for lack of a secure location to lock and leave their bicycles. Brandon, quoted below, for example, does not need to travel on a SEPTA bus with his bicycle – his workplace is right next to the stop where he gets off the bus – but does so in order to minimize the risk of his bicycle being stolen or damaged.

I would feel safe leaving my bike at 30th [St. Station], but I can take it inside at work, so there’s no reason to risk it, right? PS: My work is literally right where I’m dropped off. So I don’t really need my bike once I’m there.

~ Brandon, a Philadelphia respondent

While about two-thirds of the survey respondents in San Francisco indicated that they would still not park their bicycles if there were secure bicycle parking, fewer than half of the respondents in Philadelphia said that they would not park their bicycles in a secure facility. In both cases, substantial numbers of CTUs would benefit from improvements in bicycle parking facilities. What is more, even bicyclists who do not ride on public transit, sometimes use transit station bicycle parking. Rather than discourage this practice because

of perceived costs to transit agencies, it could be encouraged with joint city-transit agency efforts to provide secure, high quality, well designed bicycle racks in high-traffic locations in urban areas.

### **Many CTUs feel responsible toward other transit users.**

Some CTUs recognize and are eloquent about the responsibilities they have towards other transit users. Despite a common perception of bicyclists as rule breakers and risk takers,<sup>28</sup> many respondents in this survey voluntarily acknowledged that they have responsibilities as CTUs to respect other travelers, to follow policies that restrict bicycle access on transit vehicles, to avoid locking bicycles on railings and other structures that inconvenience pedestrians, and more. Others encouraged their fellow CTUs who use rail transit to consider buying folding bicycles, both as a convenience to themselves (it permits them to travel at any time, not just during off-peak hours) and to other travelers.

I think it's the cyclist's responsibility to have a light bicycle (laughs) if they're going to do this kind of travel [on transit vehicles]. I would say from the perspective of the other travelers on the train I felt like they were scared of the bike coming by. Especially if someone has a helmet or a lock hanging off of the bike, and they don't know how to do it, or whatever. It seems like some of the other passengers were kind of fearful.

*~ Sarah, a Philadelphia respondent*

Bicycle culture [should] change: While parking bikes consider others (cars, pedestrians, other bikes); Observation of traffic laws by bicyclists will improve overall acceptance of bikes as legitimate transportation; Use signals and have a bell and lights.

*~ Roger, a Philadelphia respondent*

As far as SEPTA goes... they've been very accepting of the bicycle and me and the only time that they haven't been – and this is just on a “well this happened this time on the train” – is when they're a car short and there's standing room only. And at that point I realize that if I try to get the bike on the train I'm taking three people's places, mine and two places for the bicycle. And it's just not fair for the people trying to get home on that train. So what I'll do in that case is I'll wait for the next train. And I think that that's the way to do it. It's the way to be. To work within the system. If I appreciate being able to take the bike on the train, I want to respect and be appreciative of others and their need to get to where they're going, if there's limited seating.

*~ James, a Philadelphia respondent*

## **POLICY IMPLICATIONS**

Three key findings emerged from this project's surveys and interviews of CTUs and bus operators. First is the documentation of the range of distances and average and median distances that CTUs cover by bicycle in accessing public transit; second, the findings highlight the high value of cycle-transit coordination policies and investments to travelers who prefer or need to use non-motorized and shared modes of transportation; and third, the findings demonstrate that these policies and investments not only lead to increased

ridership on public transit vehicles – a direct benefit for the public transit agencies that have worked to facilitate the integration of bicycling and transit – but also result in more frequent use of bicycles for conveniently covering the first and last mile of their trips, i.e., for commuting and other trip purposes. One surprising and invaluable result of these findings is that the very notion of a transit catchment area proves to be more complex and fluid when the access mode to a transit stop or station is a bicycle.

We see several important implications of these findings for policy makers, transportation planners and transit agency managers. These professionals may want to consider the following recommendations:

- **Make cycle-transit coordination a high and funded priority.**  
Transit agencies should provide adequate funding for cycle-transit coordination, as should other local planning agencies responsible for implementing bicycle improvements. Systematically incorporate this priority in regional and citywide transportation plans and strategies.
- **Plan for a future in which demand for cycle-transit use increases.**  
Provide more, and more secure, bicycle parking; higher-capacity bicycle racks on buses (at the front of or underneath the vehicle), particularly buses used on the more popular routes for CTUs; and better-designed and higher-capacity spaces on rail cars for bicycles. To the extent possible, extend the hours of access to rail cars for CTUs.
- **Develop joint transit agency/municipal bicycle parking facilities.**  
Our study revealed that some bicyclists use public transit station bicycle parking facilities, even though they do not include public transit as part of their trips. Rather than restrict transit bicycle parking to only transit users, transit agencies can partner with municipalities to develop and maintain high quality bicycle parking facilities that serve the needs of a diverse population of bicyclists.
- **Incorporate joint cycle and transit planning and implementation.**  
Consider such plans not just in transit and travel demand management plans, but also in larger municipal, county and regional transportation circulation plans.
- **Improve transit agency data collection on the numbers and behaviors of CTUs.**  
A few transit agencies, such as Greater Cleveland's RTA, have developed simple methods of documenting the use of bus bicycle racks and the numbers and timing of bicycles transported on rail vehicles. Surveys and interviews, like the ones used in this study, would prove even more valuable if they could be analyzed in the context of a more complete picture of CTU behaviors.
- **Develop better orientation materials.**  
Create publications, web pages, and videos accessible online through which to further support the joint use of bicycles and transit, providing updated informational materials that further educate CTUs and the community. This could include wayfinding at transit stations and terminals that identifies access to nearby bicycle routes.

- **Study strategies for further facilitating physical access by bicycles.**  
Consider access to, from and within transit stations and terminals so that CTUs can easily change modes at almost any time of the day.
- **Encouraging the growth and expansion of bicycle share programs.**  
Particularly in U.S. cities where bicycle-friendly transit agencies operate, this could change the balance of types of CTUs, as more travelers could combine bicycling and transit without needing to travel *on* transit vehicles with their bicycles.
- **Explore the cost implications of expanding bicycle capacity on transit vehicles.**  
Consider including three-bicycle bus racks (front and side-loading), as well as special train cars for bicycles.

This project has further documented the growth and importance of bicycle-transit integration, especially in older cities where transit service is extensive and bicycle infrastructure encourages the use of the bicycle for trips of one to four miles. This report adds to a growing literature on the topic. As policies and investments in cycle-transit coordination improve and make combining bicycling and public transit easier, more convenient, and more popular, the challenges of meeting rising demand will grow. But growing demand for transit and for bicycling is a good problem to have, as it further demonstrates the attractiveness of sustainable modes of transportation. Pursuing the policy recommendations outlined above will help meet that demand in ways that avoid inconvenience to other transit users and provide direct benefits to CTUs and indirect benefits to all users of our road and transit networks.

## **APPENDIX A: BUS OPERATORS SURVEY MATERIALS**

The following survey was distributed in June 2012 to 2,612 SEPTA bus operators in eight of nine SEPTA bus depots (all but the Elmwood depot). The purpose of the survey was to obtain responses that would help identify routes and areas where survey-takers in the Philadelphia metropolitan area would have the best chances of encountering CTUs.

A survey of “cycle-transit users” is being put together by researchers at Temple University for distribution in September 2012 and they have asked SEPTA to help identify the best bus routes and locations for finding SEPTA passengers who travel *with* their bicycles. Because you’re familiar with when and how often passengers put their bikes on bus bicycle racks, your answers to the following questions will be very helpful.

Your responses to this questionnaire will be completely anonymous—you do not need to write your name or account number on this survey—and your assistance will be appreciated very much.

Please answer the following questions based upon your work operating SEPTA buses *during the past seven days*:

1. How many days did you operate a bus during the past seven days? \_\_\_\_\_ days
2. Which bus routes did you operate during the past seven days?  
Routes \_\_\_\_\_
3. How many bicycles did you transport during the past seven days on the buses you operated? (If you cannot recall the exact number, please give an estimate.)  
\_\_\_\_\_ bicycles
4. Did you have any passengers who traveled with their bikes two or more times during the past seven days?
  - a. Yes
  - b. No
  - c. I’m not sure
5. How many times during the past seven days were there two bikes *at the same time* in the bicycle rack of a bus you were operating?
  - a. Never
  - b. One time
  - c. Two times
  - d. Three times
  - e. Four or more times
6. How many times did you leave a passenger with a bike at a bus stop because the bicycle rack on the front of the bus already had two bikes in it?
  - a. Never
  - b. One time
  - c. Two times
  - d. Three times
  - e. Four or more times
7. During *what days of the week* do more passengers place their bikes in the bus bicycle racks?
  - a. On weekdays
  - b. On weekends and holidays
  - c. Equally on weekdays and on weekends and holidays
8. During *what times of the day* do more passengers place their bikes in the bus bicycle racks?
  - a. Morning peak hours
  - b. Daytime off peak hours
  - c. Afternoon peak hours
  - d. Evenings and nights
  - e. Equally throughout the day
9. If you have other comments about SEPTA passengers who use bus bicycle racks, please write them on the back of this sheet of paper.

*Thank you for your help with this project.*

## **APPENDIX B: CYCLE-TRANSIT USERS SURVEY MATERIALS**

The following two surveys were distributed to cycle-transit users at transit stations in the Philadelphia, Pennsylvania metropolitan area in December 2012 and in San Francisco in April 2013. In all, 471 surveys were distributed; of those completed, some were filled out immediately by respondents in the presence of survey-takers, some were mailed back in self-addressed stamped envelopes after being directly handed to CTUs and some were mailed back having been left attached to parked bicycles. The survey instruments are identical in concept. Local transit agency names are used in each instrument, as required.



Location: \_\_\_\_\_

#

**A few words before you fill this out this questionnaire:**

Temple and San Jose State University researchers are conducting a study in the Philadelphia and San Francisco metropolitan areas.

- This study involves research. The purpose of the research is to learn more about people who combine bike and transit trips (we call them "Cycle-Transit Users" or CTUs) and what their motivations, behaviors and preferences are.
- This survey will take about ten minutes to complete and is voluntary. You can agree to take part in the research study, you can choose to not take part, or you can agree to take part, then change your mind. Whatever you decide, it will not be held against you.
- We don't believe that any of the questions in it will cause you any harm or distress. If you prefer not to answer any of the questions in the survey, feel free to skip them.
- Your responses will be completely confidential: the completed survey will be kept in a secure location and will not be shared with anyone else, and your responses will not be reported in a way that could be identified with you.
- We'd like to thank you for taking this survey with a \$10 Wawa gift card (a separate form should be returned with your mailing address).
- You should know that your participation could help transportation planners do a better job of planning for bicyclists, transit users, and other travelers.
- If you have any questions about this survey, please contact Professor Bradley Flamm at Temple University's Center for Sustainable Communities (267-468-8305 or [bflamm@temple.edu](mailto:bflamm@temple.edu)). ~ Thank you!

## About Your Trip

Transportation planners define a “trip” as a journey from one place to another place (for example, *from* home to the workplace). A trip can include the use of one or more “modes” of travel (that is, driving, public transit, walking, etc.). For this first set of questions, we would like to know more about a trip that you are taking (or have already taken) today that involves *both* bicycling and public transit. (Please answer these questions after you have completed your trip or as if you had already completed it.)

### The origin and destination of your trip

- A. Where was the *origin* (that is, the starting place) of this bicycle-transit trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- B. Where was the *destination* (that is, the final ending place) of this bicycle-transit trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- C. Did you ride your bicycle *to* a transit stop *from* your origin?

Yes  No

- D. Did you travel *with* your bicycle on a transit vehicle (a bus, trolley, subway or train) as part of your trip?

Yes  No

- E. Did you ride your bicycle *from* a transit stop *to* your destination?

Yes  No

### The bicycle portion of your trip

- F. How many miles did you ride your bicycle (the total from origin to transit and from transit to destination)?

Distance (in miles): \_\_\_\_\_

- G. How much time did you ride your bicycle (the total from origin to transit and from transit to destination)?

Time (in minutes): \_\_\_\_\_

### The transit portion of your trip

- H. Where did you *first board* a transit vehicle?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- I. Where did you *exit* a transit vehicle for the last time as part of this trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- J. What type(s) of transit service did you use on this trip?

Bus  Trolley  Regional Rail  
 Market-Frankford, Broad St. or Norristown High Speed Line  
 Other (please describe): \_\_\_\_\_

### Trip purpose

- K. What is the primary purpose of this trip? (Check the *one* best answer)

Work  School

Shopping  Social

Recreation (or to get to a recreational activity)

Personal business (for example, a dental appointment)

Other (please describe): \_\_\_\_\_

### Possible alternatives to this trip

- L. If you could *not* travel with your bicycle or lock it safely at a transit stop, how would you make this trip?

By *transit* combined with another mode (walk, car, etc.)

By *bicycle* only (→ skip to **Question O**)

By *another mode* or several modes, not including transit (please describe): \_\_\_\_\_  
 (→ skip to **Question O**)

I would not make the trip at all (→ skip to **Question O**)

- M. How would you reach transit from your origin if you could not ride your bike or lock it safely at a transit stop? (Check all that apply)

Walk

Drive myself (car or motorcycle) and park at a transit stop

Get a ride in a car driven by someone else

Other (please describe): \_\_\_\_\_

- N. How would you get to your destination from where you got off transit if you did not have your bike with you? (Check all that apply)

Walk

Drive myself (car or motorcycle) from transit stop to destination

Get a ride in a car driven by someone

Other (please describe): \_\_\_\_\_

### Experience as a cycle-transit user

- O. Over the course of the past year, how many times *in a typical week* have you made trips that combine bicycling and public transit?

Average number of cycle-transit trips per week: \_\_\_\_\_

- P. In your own words, please describe your level of experience as a cycle-transit user:

## About Your Bicycling and Transit Use

**Q.** Consider all of the trips you made during the last seven days (up to and including yesterday). For every *trip purpose* listed on the left below, please indicate how many *days* you made at least one trip with each mode of transportation listed at the top. Your answers should be between 0, if you made no such trips during the week, to 7, if you used a mode every day of the week.

|  | Bike Only | Transit Only | Combine Bike and Transit | Walk Only | Drive Only | Other Mode or Combination of Modes |
|--|-----------|--------------|--------------------------|-----------|------------|------------------------------------|
| Work or School Trip  |           |              |                          |           |            |                                    |
| Shopping Trip or Personal Business (such as a dental appointment or haircut) |           |              |                          |           |            |                                    |
| Recreational Trip or Exercise  |           |              |                          |           |            |                                    |
| Social Trip  |           |              |                          |           |            |                                    |
| Other (please describe):<br>_____  |           |              |                          |           |            |                                    |

**R.** We are interested in the reasons why you take your bike with you *on* transit vehicles (if you do *not* take your bike on transit vehicles, please skip to the **Question S**). Please place an "x" or check mark in the box that indicates the extent to which you agree or disagree with each of the following statements.

| I take my bike on transit vehicles because:   | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
|---|----------------|-------|----------------------------|----------|-------------------|
| I can avoid riding on busy or unsafe streets  |                |       |                            |          |                   |
| My trip is too long to ride my bicycle the whole way  |                |       |                            |          |                   |
| I can avoid steep hills   |                |       |                            |          |                   |
| I can avoid riding in the dark or in bad weather  |                |       |                            |          |                   |
| Taking transit is faster than riding my bicycle   |                |       |                            |          |                   |
| It is easy to find space for my bike on transit vehicles  |                |       |                            |          |                   |
| There are not enough safe places to leave my bicycle at the station where I board a transit vehicle |                |       |                            |          |                   |
| I need my bicycle when I get off a transit vehicle to reach my destination                          |                |       |                            |          |                   |

**S.** Please answer the follow questions about bicycle parking:

|  | Yes | No | Don't Know |
|--|-----|----|------------|
| Is there a bike rack or other bicycle parking at the station where you got on SEPTA?   |     |    |            |
| If a secure facility were available to store your bike at the station where you got on SEPTA, would you use it instead of bringing your bike on a SEPTA transit vehicle? |     |    |            |
| Would you ride your bike to a less convenient SEPTA transit stop or station if that station had secure bike parking?   |     |    |            |

## About You

**T.** Gender?  Male  Female  Prefer not to state

**U.** Age? \_\_\_\_\_ years  Prefer not to state

**V.** Race and ethnicity? (Check all that apply)  
 African-American or Black  White  Asian  
 Hispanic or Latino  American Indian or Alaskan Native  
 Other: \_\_\_\_\_  Prefer not to state

**W.** What is your approximate total household income per year?  
 \$20,000 or less  \$20,001 to \$40,000  
 \$40,001 to \$60,000  \$60,001 to \$80,000  
 \$80,001 to \$100,000  more than \$100,000  
 Prefer not to state

**X.** Are you:  single, never married  married  widowed  
 divorced or separated  Prefer not to state

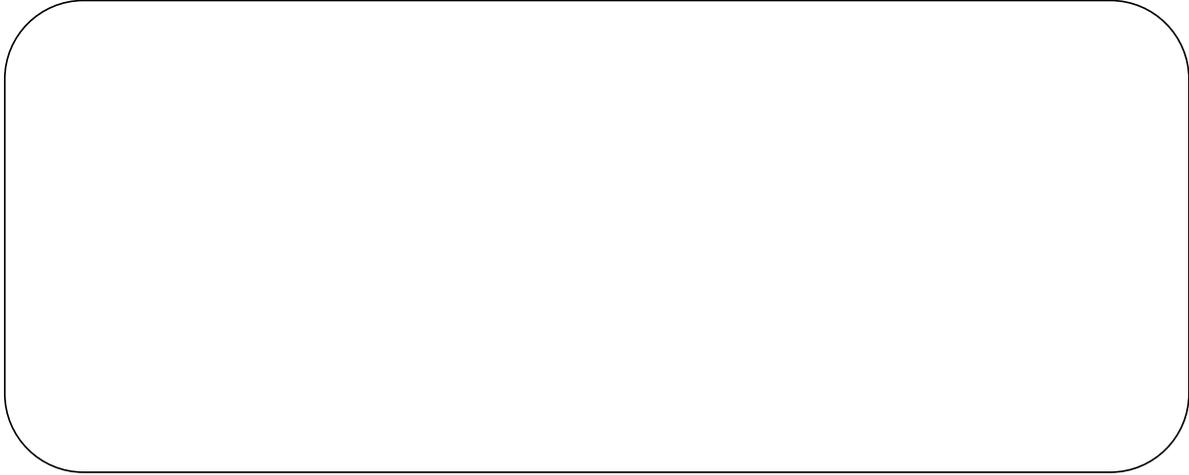
**Y.** What is the highest level of education you have attained?  
 Less than high school degree  High school or GED  
 Assoc. degree or tech training  Bachelor degree  
 Graduate degree (Masters, Professional or Doctorate)  
 Prefer not to state

**Z.** Do you have access to a motor vehicle (like a car, truck, or motorcycle) that you can regularly use either as a driver or passenger?  Yes  No  Prefer not to state

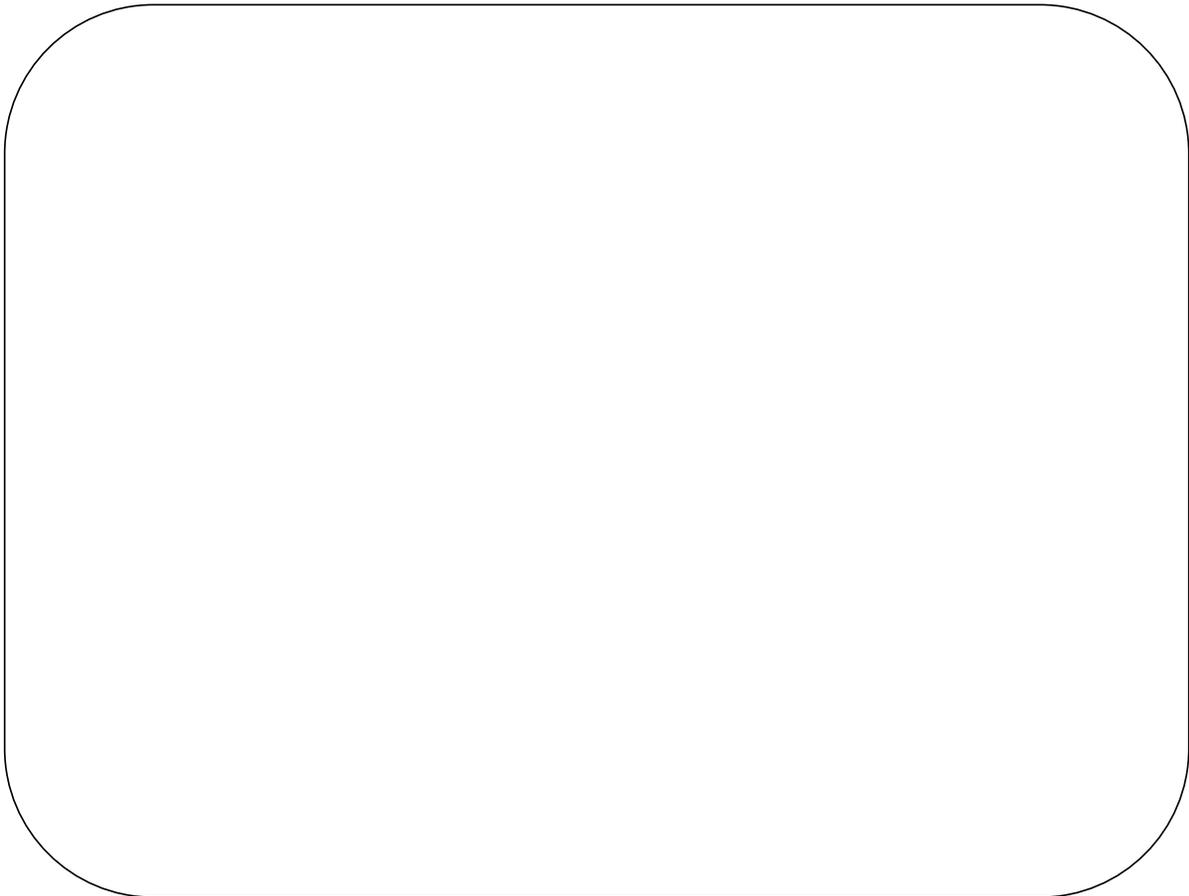
**AA.** Do you have a valid driver's license?  Yes  No  
 Prefer not to state

**AB.** How many people, *including yourself*, live in your household? \_\_\_\_\_ people live in my household

**AC.** If you have any other comments about combining bikes and transit in the Philadelphia metro area, please write them here.



**AD.** Finally, please use the space below to sketch what the bicycle and transit trip you answered questions about on the 2<sup>nd</sup> page of this survey looks like. Feel free to be creative – add stick figures, notes on your favorite (or least favorite) parts of your trip, important landmarks, ideas about how the trip could be safer, better, and more enjoyable, and anything else that makes sense to you. (See an example of one bike-transit trip on the enclosed “Thank You!” sheet of paper.)



Thank you for your time and participation!

## Cycle User's Survey "Thank You" Sheet

Front

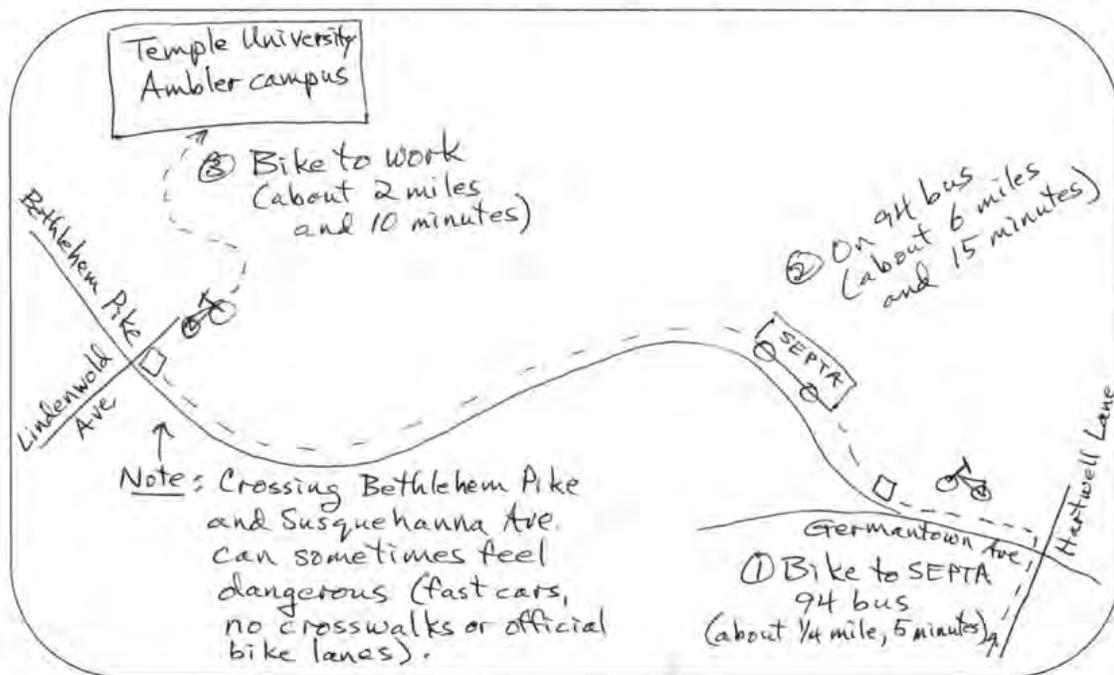
Thank you!

We appreciate your help and would like to send you a \$10 Wawa gift card as an expression of our thanks. If you would like to receive this small gift, please provide your name and mailing address in the space below and return this sheet of paper with your completed questionnaire.

*One last request:* if you would be willing to answer a few follow-up questions from one of our researchers sometime in the next few weeks (the purpose would be to learn more details about your experiences combining bicycling and public transportation), please check this box , provide a telephone number where we can reach you (\_\_\_\_) \_\_\_\_ - \_\_\_\_, and let us know of a few days and times that are best to reach you \_\_\_\_\_.

Back

Here is what one bicycle-transit trip looks like, as an example for question AB on the questionnaire.





Hello,

A survey-taker working with Temple University's Center for Sustainable Communities has placed the attached questionnaire on your bicycle.

Researchers are conducting a study, hoping to reach cyclists who use their bikes to connect *to* or *from* public transit on the way to their final destination.

Did *you* ride your bike to this transit station *to connect to public transit*? If so, we want to hear from you!

Your participation can help biking and public transportation become better in the future.

Open this envelope for more details. If you are interested in participating, please read the front page of the survey carefully before beginning.

~Thank you!

Bradley Flamm  
Assistant Professor  
Department of Community & Regional Planning  
Temple University  
580 Meetinghouse Road  
Ambler, PA 19002  
Tel: 267-468-8305  
E-mail: [bflamm@temple.edu](mailto:bflamm@temple.edu)

\*Research funding provided by the Mineta Transportation Institute.



Photo Credit: *S.F. Chronicle, February 18, 2013*

**A few words before you fill this out this questionnaire:**

Temple and San Jose State University researchers are conducting a study in the Philadelphia and San Francisco metropolitan areas.

- This study involves research. The purpose of the research is to learn more about people who combine bike and transit trips (we call them "Cycle-Transit Users" or CTUs) and what their motivations, behaviors and preferences are.
- This survey will take about ten minutes to complete and is voluntary. You can agree to take part in the research study, you can choose to not take part, or you can agree to take part, then change your mind. Whatever you decide, it will not be held against you.
- We don't believe that any of the questions in it will cause you any harm or distress. If you prefer not to answer any of the questions in the survey, feel free to skip them.
- Your responses will be completely confidential: the completed survey will be kept in a secure location and will not be shared with anyone else, and your responses will not be reported in a way that could be identified with you.
- We'd like to thank you for taking this survey with a \$10 Peet's gift card (a separate form should be returned with your mailing address).
- You should know that your participation could help transportation planners do a better job of planning for bicyclists, transit users, and other travelers.
- If you have any questions about this survey, please contact Charles Rivasplata of San Jose State University (415-701-5383, or [Charles.Rivasplata@sfmta.com](mailto:Charles.Rivasplata@sfmta.com)). ~ Thank you!

## About Your Trip

Transportation planners define a “trip” as a journey from one place to another place (for example, *from* home to the workplace). A trip can include the use of one or more “modes” of travel (that is, driving, public transit, walking, etc.). For this first set of questions, we would like to know more about a trip that you are taking (or have already taken) today that involves *both* bicycling and public transit. (Please answer these questions after you have completed your trip or as if you had already completed it.)

### The origin and destination of your trip

- A. Where was the *origin* (that is, the starting place) of this bicycle-transit trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- B. Where was the *destination* (that is, the final ending place) of this bicycle-transit trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- C. Did you ride your bicycle *to* a transit stop *from* your origin?

Yes  No

- D. Did you travel *with* your bicycle on a transit vehicle (a bus, trolley, subway or train) as part of your trip?

Yes  No

- E. Did you ride your bicycle *from* a transit stop *to* your destination?

Yes  No

### The bicycle portion of your trip

- F. How many miles did you ride your bicycle (the total from origin to transit and from transit to destination)?

Distance (in miles): \_\_\_\_\_

- G. How much time did you ride your bicycle (the total from origin to transit and from transit to destination)?

Time (in minutes): \_\_\_\_\_

### The transit portion of your trip

- H. Where did you *first board* a transit vehicle?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- I. Where did you *exit* a transit vehicle for the last time as part of this trip?

Cross Streets: \_\_\_\_\_

City or Town: \_\_\_\_\_

- J. What type(s) of transit service did you use on this trip?

Bus  Trolley  Regional Rail

Market-Frankford, Broad St. or Norristown High Speed Line

Other (please describe): \_\_\_\_\_

### Trip purpose

- K. What is the primary purpose of this trip? (Check the *one* best answer)

Work  School

Shopping  Social

Recreation (or to get to a recreational activity)

Personal business (for example, a dental appointment)

Other (please describe): \_\_\_\_\_

### Possible alternatives to this trip

- L. If you could *not* travel with your bicycle or lock it safely at a transit stop, how would you make this trip?

By *transit* combined with another mode (walk, car, etc.)

By *bicycle* only (→ skip to **Question O**)

By *another mode* or several modes, not including transit (please describe): \_\_\_\_\_ (→ skip to **Question O**)

I would not make the trip at all (→ skip to **Question O**)

- M. How would you reach transit from your origin if you could not ride your bike or lock it safely at a transit stop? (Check all that apply)

Walk

Drive myself (car or motorcycle) and park at a transit stop

Get a ride in a car driven by someone else

Other (please describe): \_\_\_\_\_

- N. How would you get to your destination from where you got off transit if you did not have your bike with you? (Check all that apply)

Walk

Drive myself (car or motorcycle) from transit stop to destination

Get a ride in a car driven by someone

Other (please describe): \_\_\_\_\_

### Experience as a cycle-transit user

- O. Over the course of the past year, how many times *in a typical week* have you made trips that combine bicycling and public transit?

Average number of cycle-transit trips per week: \_\_\_\_\_

- P. In your own words, please describe your level of experience as a cycle-transit user:

### About Your Bicycling and Transit Use

**Q.** Consider all of the trips you made during the last seven days (up to and including yesterday). For every *trip purpose* listed on the left below, please indicate how many *days* you made at least one trip with each mode of transportation listed at the top. Your answers should be between 0, if you made no such trips during the week, to 7, if you used a mode every day of the week.

|  | Bike Only | Transit Only | Combine Bike and Transit | Walk Only | Drive Only | Other Mode or Combination of Modes |
|--|-----------|--------------|--------------------------|-----------|------------|------------------------------------|
| Work or School Trip  |           |              |                          |           |            |                                    |
| Shopping Trip or Personal Business (such as a dental appointment or haircut) |           |              |                          |           |            |                                    |
| Recreational Trip or Exercise  |           |              |                          |           |            |                                    |
| Social Trip  |           |              |                          |           |            |                                    |
| Other (please describe):<br>_____  |           |              |                          |           |            |                                    |

**R.** We are interested in the reasons why you take your bike with you *on* transit vehicles (if you do *not* take your bike on transit vehicles, please skip to the **Question S**). Please place an “x” or check mark in the box that indicates the extent to which you agree or disagree with each of the following statements.

| I take my bike on transit vehicles because:   | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
|---|----------------|-------|----------------------------|----------|-------------------|
| I can avoid riding on busy or unsafe streets  |                |       |                            |          |                   |
| My trip is too long to ride my bicycle the whole way  |                |       |                            |          |                   |
| I can avoid steep hills   |                |       |                            |          |                   |
| I can avoid riding in the dark or in bad weather  |                |       |                            |          |                   |
| Taking transit is faster than riding my bicycle   |                |       |                            |          |                   |
| It is easy to find space for my bike on transit vehicles  |                |       |                            |          |                   |
| There are not enough safe places to leave my bicycle at the station where I board a transit vehicle |                |       |                            |          |                   |
| I need my bicycle when I get off a transit vehicle to reach my destination                          |                |       |                            |          |                   |

**S.** Please answer the follow questions about bicycle parking:

|  | Yes | No | Don't Know |
|--|-----|----|------------|
| Is there a bike rack or other bicycle parking at the station where you got on SEPTA?   |     |    |            |
| If a secure facility were available to store your bike at the station where you got on SEPTA, would you use it instead of bringing your bike on a SEPTA transit vehicle? |     |    |            |
| Would you ride your bike to a less convenient SEPTA transit stop or station if that station had secure bike parking?   |     |    |            |

### About You

**T.** Gender?  Male  Female  Prefer not to state

**U.** Age? \_\_\_\_\_ years  Prefer not to state

**V.** Race and ethnicity? (Check all that apply)  
 African-American or Black  White  Asian  
 Hispanic or Latino  American Indian or Alaskan Native  
 Other: \_\_\_\_\_  Prefer not to state

**W.** What is your approximate total household income per year?  
 \$20,000 or less  \$20,001 to \$40,000  
 \$40,001 to \$60,000  \$60,001 to \$80,000  
 \$80,001 to \$100,000  more than \$100,000  
 Prefer not to state

**X.** Are you:  single, never married  married  widowed  
 divorced or separated  Prefer not to state

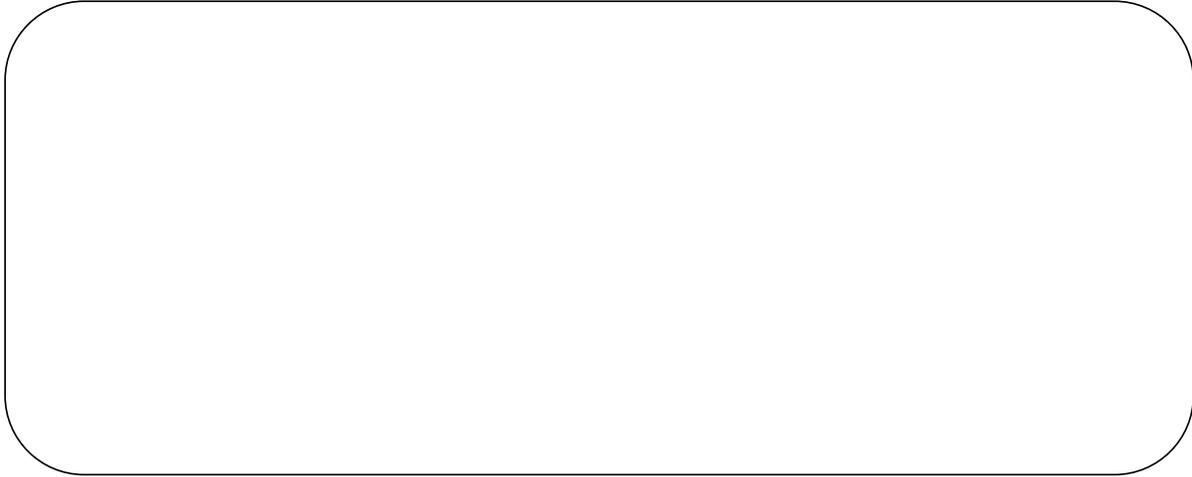
**Y.** What is the highest level of education you have attained?  
 Less than high school degree  High school or GED  
 Assoc. degree or tech training  Bachelor degree  
 Graduate degree (Masters, Professional or Doctorate)  
 Prefer not to state

**Z.** Do you have access to a motor vehicle (like a car, truck, or motorcycle) that you can regularly use either as a driver or passenger?  Yes  No  Prefer not to state

**AA.** Do you have a valid driver's license?  Yes  No  
 Prefer not to state

**AB.** How many people, *including yourself*, live in your household? \_\_\_\_\_ people live in my household

**AC.** If you have any other comments about combining bikes and transit in the Philadelphia metro area, please write them here.



**AD.** Finally, please use the space below to sketch what the bicycle and transit trip you answered questions about on the 2<sup>nd</sup> page of this survey looks like. Feel free to be creative – add stick figures, notes on your favorite (or least favorite) parts of your trip, important landmarks, ideas about how the trip could be safer, better, and more enjoyable, and anything else that makes sense to you. (See an example of one bike-transit trip on the enclosed “Thank You!” sheet of paper.)



Thank you for your time and participation!



## **APPENDIX C: SURVEY TAKER MATERIALS**

The following are materials used to recruit and train survey-takers employed in Philadelphia and San Francisco to distribute the surveys at transit centers. These materials include the employment letter that was required to be signed and returned to the project researchers, the letter of instructions provided to each survey-taker, and screen shots of a PowerPoint presentation used to train survey-takers.

November 28, 2012

Dear [            ],

Thank you for your interest in our research project to better understand *transit users' perceptions of bike-friendly policy impacts on accessibility to transit services*. The Center for Sustainable Communities and Temple University is pleased to offer you the position of Survey Taker, with your tenure starting **December 3, 2012** and ending **December 9, 2012**.

The Center for Sustainable Communities (CSC) at Temple University Ambler develops and promotes new approaches to protect and preserve quality of life through sustainable development. We act as a resource for government agencies, community organizations, and developers, providing objective information and services to improve decision-making relative to land use, water resources, community, and transportation planning and development.

The CSC, in partnership with SEPTA and the Bicycle Coalition of Greater Philadelphia, is studying the behavior and motivations of *Cycle Transit Users* (CTUs) – that is, public transit users who use a bike as part of their trip or commute. These CTUs include those who bike *to* or *from* a public transit stop or station, as well as those who bring their bike *on* a transit vehicle, such as a train or bus. Part of this research is to survey CTUs “in the field” on their day’s travel patterns, their preferences and motivations for integrating biking and transit. The data gathered from this study will shed light on CTUs’ perceptions of SEPTA’s bike-transit integration policies, and will suggest to what extent these policies help to extend the geographic area of accessibility to public transit.

In order to reach these CTUs, survey takers are being engaged to intercept subjects at major transit stations and hubs. There are several ways a survey taker can facilitate the completion of a survey by a CTU:

- Having a CTU complete a survey in the presence of a survey taker
- Handing a survey to a CTU to complete and mail in later
- Attaching surveys to bicycles parked in bike racks at or adjacent to transit stations or hubs

### ***Employment Expectations***

Your employment as a survey taker with CSC will take the form of an *independent contractor position*.

The survey sites are geographically dispersed, ranging from North and West Philadelphia to Norristown and King of Prussia, so willingness to travel to these or other locations is required. Most shifts are scheduled for Monday to Friday, with additional shifts available on Saturday and Sunday. Viewing a short online training video *before* Monday, December 3, 2012, when the survey distribution begins, is required and will be compensated as one hour of work.

Survey takers are expected to arrive on-time to their shifts, to work the entire shift, and to follow the procedures explained in the training video.

The length of work shifts vary depending on the survey site and the time of day, and range from two to five hours each. The earliest shifts will start at 7:00 am and the latest shifts will end at 6:00 pm. Survey takers are only to work during their scheduled hours: compensation cannot be offered for services rendered beyond these scheduled hours.

### ***Compensation***

Your compensation will be \$15 / hour, which will be subject to all relevant taxation. All survey takers will also be provided a week-long SEPTA TransPass (if needed and requested) to facilitate travel to and from survey sites. Documentation of hours and locations worked on timesheets is

required. Receiving your compensation is also dependent on the accurate and timely completion of the following documents:

- Temple University Independent Contractor Determination and Certification form
- Temple University Professional Services Agreement
- Independent Contractor Request for Payment form
- IRS Form W-9 (Request for Taxpayer Identification Number and Certification)

These documents must be received by the Center for Sustainable Communities before payment can be made. Individuals whose documentation is received after December 9, 2012 or is incomplete cannot be guaranteed payment. Payment for all services will be remitted in one lump sum *after* all hours have been completed.

We look forward to working with you as we implement our survey. Please let us know if you have any additional questions.

Sincerely,

Bradley Flamm  
Assistant Professor, Department of Community and Regional Planning  
Center for Sustainable Communities, Temple University  
Telephone: 267-468-8305  
E-mail: [bflamm@temple.edu](mailto:bflamm@temple.edu)

---

*I hereby accept the Survey Taker position, subject to the terms above.*

---

Signature

---

Printed Name

---

Date

December 4, 2012

### Instructions to Survey-Takers

#### Before first shift begins:

- Sign two copies of employment letter (one for yourself, and one for Temple U)
- Review training video

#### For each shift:

- Arrive at assigned location by start time (you should have a printed page with the shifts you agreed to take)
- Screen to identify cycle-transit users (CTUs): Questionnaires should only go to people who are clearly combining cycling and public transit.

**Thank you!**

We appreciate your help and would like to send you a \$10 Wawa gift card as an expression of our thanks. If you would like to receive this small gift, please provide your name and mailing address in the space below and return this sheet of paper with your completed questionnaire.

One last request: if you would be willing to answer a few follow-up questions from one of our researchers sometime in the next few weeks (the purpose would be to learn more details about your experiences combining bicycling and public transportation), please check this box  provide a telephone number where we can reach you ( ) \_\_\_\_\_ and let us know a few days and times that are best to reach you \_\_\_\_\_

**Figure 1:** “Thank you” form for requesting gift card. This should be distributed with every copy of the questionnaire.

**A Target of Twelve:** We expect that for most shifts the number of CTUs encountered *in person* will be ten or less (perhaps significantly less<sup>1</sup>). But we do not know for sure; there may be more CTUs out there than we or SEPTA estimate.

- The **highest priority** is to distribute the survey to CTUs you see entering, leaving or waiting in a transit center *with* a bicycle. These are the people you will ask to fill out the survey then and there, if they have the time, or to take the survey materials with them to complete and mail in later.
  - If a CTU fills it out then and there, please seal the completed questionnaire and the “thank you” form (see Figure 1 to the right) in an *unstamped* envelope and hold on to it.
  - If a CTU takes the questionnaire and “thank you” form with him or her, make sure to provide a *stamped* and addressed envelope (you will have as many stamps as you have surveys, but please only use them when necessary).
- Distribute as *many* copies of the questionnaire to this category of CTUs during your shift as you can. If that is only two or three, that’s fine (if you don’t encounter more CTUs than that, that’s important information for us). If you encounter more than twelve, all the better – go ahead and distribute as many questionnaires as you can this way.

<sup>1</sup>SEPTA’s last official count of cycle-transit users in 2010 had relatively low system-wide totals of bikes-on-transit (2,230 total for the week of 4/25/10 to 5/1/10: 467 on buses, 253 on regional rail and 1,510 on the subway lines). As we’re covering a limited number of locations for a limited number of hours, ten per shift seems like a reasonable estimate.

- **The second priority:** CTUs who have parked their bicycles at transit centers. If, ten or fifteen minutes before the end of the shift, you have distributed twelve or more questionnaires already, please do not place any questionnaires on parked bicycles.
- If, however, at the end of the shift you have not yet distributed twelve copies of the questionnaire *and* there are bicycles locked up at the transit center that, in your judgment, are likely to have been left there by CTUs, then, and only then, attach copies of the questionnaire (along with the “thank you” form, a *stamped* return envelope, and the yellow explanation letter depicted in Figure 2 on the previous page) to bicycles parked at the transit center.
- But only attach as many as let you reach a total of 12 distributed questionnaires for the shift. So, if, for example, you distributed 3 questionnaires that were filled out in your presence and 5 that CTUs took with them, then attach up to 4 questionnaires to parked bicycles.



**Figure 2:** Letter to place only on parked bicycles.

- Be friendly, polite, and respectful to everybody you encounter.
- Introduce yourself by name and briefly state the purpose of the survey (to learn more about who cycle-transit users are and how they combine bicycling and public transit).
- Ask CTUs who are willing to fill out the questionnaire then and there to read the front cover of the questionnaire *before they start answering questions* so that they are aware of the three key ideas that research ethics require: 1) that their participation is completely voluntary, 2) that their consent is informed (they know what the survey is about and what the potential risks and benefits are), and 3) that their responses are confidential.
- Add the three character code for the location to each questionnaire before giving it to a CTU. (For example, FRK for Fern Rock Transportation Center bus area and WTC for the Wissahickon Transportation Center.)

After each shift:

- Keep records of a) your time worked (on the survey taker timesheet) and b) the questionnaires distributed (on the activity log). There is one timesheet for *all* of the shifts you work and one activity log for *each* shift that you work.
- Communicate with us after *each* shift by sending us an e-mail (to Bradley Flamm at [bflamm@temple.edu](mailto:bflamm@temple.edu) and to Brian Olszak at [tud51061@temple.edu](mailto:tud51061@temple.edu) or by calling 2674688305) and include the location, hours and number of questionnaires distributed by method (completed in your presence, handed to a CTU who will complete and mail it in later, or left on a parked bicycle).

After completing your last shift:

- Use the US Postal Service pre-paid flat rate mailing envelope to send us:
  - Your time sheet (one for all shifts)
  - Activity logs that you filled out (one for each shift)
  - Any unused postage stamps
  - All questionnaires completed by CTUs in your presence (each one sealed in an unstamped envelope with the “thank you” form)
  - (And, if you haven’t already given them to us, your completed employment forms)

We will input data from the completed questionnaires as they come in to our office and let you know the results of our analysis when our report is complete. We will also submit all paperwork for payment to Temple University as quickly as we can and work with the administrative staff to get payment to you as soon as possible.

# CTU Survey-Taker Training and Orientation

Assistant Professor Bradley Flamm

Research Assistant Brian Olszak

Dept. of Community and Regional Planning



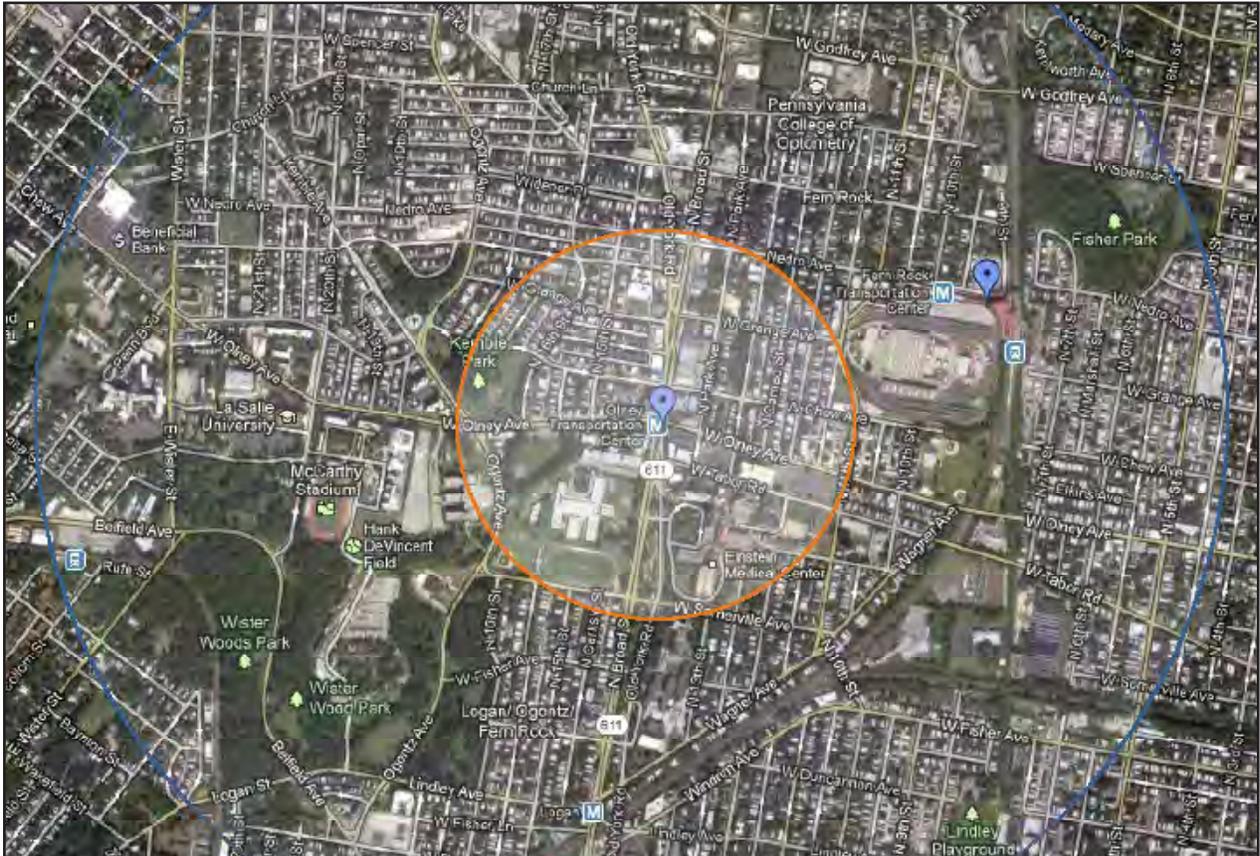
Center for Sustainable Communities  
TEMPLE UNIVERSITY

## What we'll cover in this session

- What the study is / why we think it's worthwhile
- Role of the survey-takers
- Research ethics
- Getting questionnaires to the target population
- Keeping track of your work and getting paid

## Purposes of Study

- Study characteristics of **cycle-transit users (CTUs)** riding bikes:
  - *To* transit
  - *From* transit
  - *On* transit
- Find out how effective agency policies are at meeting CTUs' needs
- Determine the extent that geographic access to transit is *expanded*



## A two-city research project



## Role of the Survey Takers

- We need to intercept CTUs while they're traveling by bike and transit
- Reaching CTUs in three ways:
  - Facilitating their completion of a survey (C)
  - Handing a survey to a CTU in-transit (H)
  - Placing a survey on a parked bicycle (P)



## Research Ethics

As researchers, we have to ensure:

- Voluntary participation
- Informed consent
  - What the questionnaire is about
  - What the potential risks and benefits are
- Confidentiality
- Screening subjects

**A few words before you fill this out this questionnaire:**

Temple and San Jose State University researchers are conducting a study in the Philadelphia and San Francisco metropolitan areas.

- This study involves research. The purpose of the research is to learn more about people who combine bike and transit trips (we call them "Cycle-Transit Users" or CTUs) and what their motivations, behaviors and preferences are.
- This survey will take about ten minutes to complete and is voluntary. You can agree to take part in the research study, you can choose to not take part, or you can agree to take part, then change your mind. Whatever you decide, it will not be held against you.
- We don't believe that any of the questions in it will cause you any harm or distress. If you prefer not to answer any of the questions in the survey, feel free to skip them.
- Your responses will be completely confidential: the completed survey will be kept in a secure location and will not be shared with anyone else, and your responses will not be reported in a way that could be identified with you.
- We'd like to thank you for taking this survey with a \$10 Wawa gift card (a separate form should be returned with your mailing address).
- You should know that your participation could help transportation planners do a better job of planning for bicyclists, transit users, and other travelers.
- If you have any questions about this survey, please contact Professor Bradley Flamm at Temple University's Center for Sustainable Communities (267-468-8305 or [bflamm@temple.edu](mailto:bflamm@temple.edu)). ~ Thank you!

## Survey-taker responsibilities

- Arrive at assigned locations on time
- Screen to identify CTUs
- Be friendly, polite, and respectful
- Introduce yourself and the purpose of the survey
- Instruct CTUs to read front cover of questionnaire
- Distribute questionnaires (C, H or P)
- Keep records
- Communicate with us after each shift
- Submit time-sheets, activity logs and questionnaires

**A Survey About Combining Bicycling and Public Transit Use in the Delaware Valley**

Photo credit: Philadelphia Transit Vendors (PTV) Website at <http://www.philadelphiatransitvendors.info/index.php>

location: \_\_\_\_\_

**A few words before you fill this out this questionnaire:**

Temple and San Jose State University researchers are conducting a study in the Philadelphia and San Francisco metropolitan areas.

- This study involves research. The purpose of the research is to learn more about people who combine bike and transit trips (we call them "bike-transit users" or CTUs) and what their motivations, behaviors and preferences are.
- This survey will take about ten minutes to complete and is voluntary. You can agree to take part in the research study, you can choose to not take part, or you can agree to take part, then change your mind. Whatever you decide, it will not be held against you.
- We don't believe that any of the questions in it will cause you any harm or distress. If you prefer not to answer any of the questions in the survey, feel free to skip them.
- Your responses will be completely confidential: the completed survey will be kept in a secure location and will not be shared with anyone else, and your responses will not be reported in a way that could be identified with you.
- We'd like to thank you for taking the survey with a \$10 Wave gift card (a separate form should be returned with your mailing address).
- You should know that your participation could help transportation planners do a better job of planning for bicyclist, transit users, and other travelers.
- If you have any questions about this survey, please contact Professor Bradley Flamm at Temple University's Center for Sustainable Communities (267-465-8508 or [bradflamm@temple.edu](mailto:bradflamm@temple.edu)). Thank you!

**Thank you!**

We appreciate your help and would like to send you a \$10 Wave gift card as an expression of our thanks. If you would like to receive this small gift, please provide your name and mailing address in the space below and return this sheet of paper with your completed questionnaire.

Here is what our questionnaire will look like. Each question has a question mark on the questionnaire.

ORANGE: We appreciate your experience using our survey wherever you need you.

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**Ballo**

A survey taker working with Temple University's Center for Sustainable Communities has placed the attached questionnaire on your bicycle. Researchers are conducting a study, hoping to reach cyclists who use their bikes to connect to or from public transit on the way to their final destination. Did you use your bike to this transit station to connect to public transit? If so, we want to hear from you!

**Survey Respondent**  
**Bikes-on-Buses Project**

Temple University  
Center for Sustainable Communities  
580 Meetinghouse Rd  
Ambler PA 19002

you are about page of

# You'll be equipped

**SEPTA**

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UNITED STATES POSTAL SERVICE

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**Bradley Flamm**  
Survey Taker

Transit Users' Perceptions of Bike-Friendly Policy  
Impacts on Accessibility to Transit Services



Center for Sustainable Communities  
Survey Taker Activity Log  
*Transit Users' Perceptions of Bike-Friendly Policy Impacts on Accessibility to Transit Services*  
December 3 - 9, 2012

Name: Brian Sample  
Date: 12/3/12  
Location: Norristown Transit Center Hours (start & end): 7:00a - 9:00a

| Time | Method* | ID#      | Time | Method* | ID# |
|------|---------|----------|------|---------|-----|
| 7:01 | P       | WTC 1076 |      |         |     |
| 7:07 | H       | WTC 1077 |      |         |     |
| 7:25 | H       | WTC 1078 |      |         |     |
| 7:49 | C       | WTC 1079 |      |         |     |
| 8:01 | H       | WTC 1080 |      |         |     |
| 8:02 | H       | WTC 1081 |      |         |     |
| 8:19 | H       | WTC 1082 |      |         |     |
| 8:28 | H       | WTC 1083 |      |         |     |
| 8:34 | C       | WTC 1084 |      |         |     |
| 8:43 | H       | WTC 1085 |      |         |     |
| 8:58 | H       | WTC 1086 |      |         |     |

Center for Sustainable Communities  
Survey Taker Time Sheet  
*Transit Users' Perceptions of Bike-Friendly Policy Impacts on Accessibility to Transit Services*  
December 3 - 9, 2012

Name: \_\_\_\_\_

|                |   | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Video Training | Total |
|----------------|---|--------|---------|-----------|----------|--------|----------|--------|----------------|-------|
| Date           |   |        |         |           |          |        |          |        |                |       |
| Location       |   |        |         |           |          |        |          |        |                |       |
| Start Time     |   |        |         |           |          |        |          |        |                |       |
| End Time       |   |        |         |           |          |        |          |        |                |       |
| Total Hrs/Day* |   |        |         |           |          |        |          |        | 1              |       |
| Tally          | C |        |         |           |          |        |          |        |                |       |
|                | H |        |         |           |          |        |          |        |                |       |
|                | P |        |         |           |          |        |          |        |                |       |

Key

C Surveys *completed* in presence of survey taker  
H Surveys *handed* to intercepted CTU, to mail in later  
P Surveys placed on *parked* bicycles

\* For each Norristown and King of Prussia shift, add one hour.



Center for Sustainable Communities  
Survey Taker Time Sheet  
*Transit Users' Perceptions of Bike-Friendly Policy Impacts on Accessibility to Transit Services*  
December 3 - 9, 2012

Name: Brian Sample

|                | Monday | Tuesday | Wednesday    | Thursday | Friday | Saturday | Sunday | Video Training | Total |
|----------------|--------|---------|--------------|----------|--------|----------|--------|----------------|-------|
| Date           | 12/3   |         | 12/5         |          | 12/7   |          |        |                |       |
| Location       | WTC    |         | FTC/OTC      |          | KOP    |          |        |                |       |
| Start Time     | 7:00a  |         | 7:00a/10:00a |          | 2:00p  |          |        |                |       |
| End Time       | 9:00a  |         | 9:00a/1:00p  |          | 6:00p  |          |        |                |       |
| Total Hrs/Day* | 2      |         | 5            |          | 4+1    |          |        | 1              | 13    |
| Tally          | C      | 2       | 7            |          | 8      |          |        |                | 17    |
|                | H      | 8       | 17           |          | 11     |          |        |                | 36    |
|                | P      | 1       | 4            |          | 5      |          |        |                | 10    |

Key

|   |  |
|---|--|
| C | Surveys <i>completed</i> in presence of survey taker       |
| H | Surveys <i>handed</i> to intercepted CTU, to mail in later |
| P | Surveys placed on <i>parked</i> bicycles                   |

\* For each Norristown and King of Prussia shift, add *two* hour.



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## Employment Documents

- Employment Letter
- Contractor Determination and Certification Form
- Professional Services Agreement
- Federal W-9 Form
- Contractual Agreement – Request for Payment

## Thank you!

- Next step: Send us an e-mail message to confirm video training
- Questions and comments?
  - Call Brad Flamm at (267) 468-8305
  - E-mail to Brad Flamm at [bflamm@temple.edu](mailto:bflamm@temple.edu)
  - E-mail to Brian Olszak at [tud51061@temple.edu](mailto:tud51061@temple.edu)

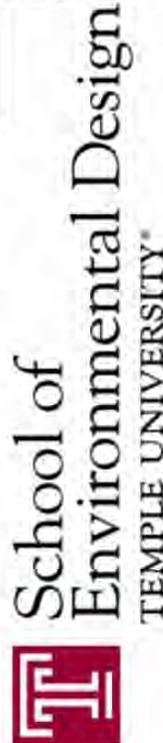
Center for Sustainable Communities  
 Survey Taker Time Sheet  
*Transit Users' Perceptions of Bike-Friendly Policy Impacts on Accessibility to Transit Services*  
 December 3 - 9, 2012

Name: \_\_\_\_\_

|                | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Video Training | Total |
|----------------|--------|---------|-----------|----------|--------|----------|--------|----------------|-------|
| Date           |        |         |           |          |        |          |        |                |       |
| Location       |        |         |           |          |        |          |        |                |       |
| Start Time     |        |         |           |          |        |          |        |                |       |
| End Time       |        |         |           |          |        |          |        |                |       |
| Total Hrs/Day* |        |         |           |          |        |          |        | 1              |       |
| Tally          | C      |         |           |          |        |          |        |                |       |
|                | H      |         |           |          |        |          |        |                |       |
|                | P      |         |           |          |        |          |        |                |       |

Key

- C Surveys **completed** in presence of survey taker
  - H Surveys **handed** to intercepted CTU, to mail in later
  - P Surveys placed on **parked** bicycles
- \* For each Norristown and King of Prussia shift, add *one hour*.





## **APPENDIX D: TELEPHONE INTERVIEW MATERIALS**

This appendix includes the materials used to conduct follow-up telephone interviews with a subset of CTU respondents to the printed surveys. The first page is the script of introduction read to the interviewee; the second page is the list of questions read to the interviewee, and the closing thank-you script. Prompts that could be used by the interviewer appear in italics.

Introduction:

Thank you for agreeing to answer some follow up questions to the survey you recently took concerning the coordination of bicycles and public transit services. That survey and this interview are being conducted by researchers associated with Temple University and San Jose State University who are supervised by Temple University's Professor Bradley Flamm of the Department of Community and Regional Planning and the Center for Sustainable Communities. We appreciate your time and interest in this study.

Before we begin, we would like to read a few important statements about this project and this interview.

- This study involves research. The purpose of the research is to learn more about people who combine bike and transit trips (we call them "Cycle-Transit Users" or CTUs) and what their motivations, behaviors and preferences are.
- This interview will take about twenty minutes to complete and is voluntary. You can agree to take part in the research study, you can choose to not take part, or you can agree to take part, then change your mind. Whatever you decide, it will not be held against you.
- We don't believe that any of the questions in this interview will cause you any harm or distress. If you prefer not to answer any of the questions, feel free to say so and we will skip them.
- Your responses will be completely confidential. This conversation will not be recorded with any form of audio-recording technology, but the interviewer will take written notes. These notes will be kept in a secure location and will not be shared with anyone else, and your responses will not be reported in a way that could be identified with you.
- There is no expected direct benefit to you for your participation, but we hope the results of this study will help transportation planners do a better job for bicyclists, transit users, and other travelers.

If you have any follow-up questions after the completion of this interview, please contact Professor Flamm at 267-468-8305 or by e-mail at **bflamm@temple.edu**.

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Telephone Interview Questions:

Please describe in as much detail as you would like your experiences combining travel by bicycle and public transportation.

*(Prompts, if needed: When was the first time you combined bicycle and public transit travel? How often do you travel by bicycle and public transit? Do you find it easy, difficult, cumbersome, helpful? Have you combined bicycle and transit travel on transit agencies other than SEPTA?)*

Does your ability to combine travel by bicycle with public transit allow you to make trips that you would not otherwise be able to make? If so, please describe how this is so.

*(Prompts, if needed: Are you able to travel longer distances? Was your choice of residence influenced by access to public transit services? Would you have to use other forms of transportation, such as a car or taxi, if you were unable to travel by transit with a bicycle?)*

Are there changes to SEPTA's policies on the coordination of bicycle and public transit that would change the way you travel?

*(Prompts, if needed: Would access to more trains be helpful to you? Would larger bus bicycle racks be welcome? Would the installation of secure and sheltered bicycle racks at transit stops and stations give you more options? Would the availability of bicycle rental, bike-share stations, or bicycle sales and repair kiosks give you more travel options?)*

How do you think SEPTA could encourage more transit users to combine their travel with bicycling? What policies or investments could SEPTA make to increase the number of cycle-transit users?

Is there anything else concerning the combination of bicycling and public transit that you would like to say or comment on?

Conclusion:

Thank you for your interest in this research project and for your time. If you have any additional questions about this project, please contact Bradley Flamm by calling him at 267-468-8305 or sending him an e-mail message at [bflamm@temple.edu](mailto:bflamm@temple.edu).



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## ABBREVIATIONS AND ACRONYMS

|            |   |
|------------|---|
| AC Transit | Alameda-Contra Costa Transit                                |
| ACS        | American Community Survey                                   |
| BART       | Bay Area Rapid Transit                                      |
| BOB        | Bikes-on-Bus  |
| CSC        | Center for Sustainable Communities                          |
| CTU        | Bicycle Transit Users                                       |
| GHG        | Greenhouse Gas  |
| Muni       | San Francisco Municipal Transportation Agency (aka SFMTA)   |
| NJ TRANSIT | New Jersey Transit  |
| NMT        | Non-Motorized Transportation                                |
| PATCO      | Port Authority Transit Corporation                          |
| RTA        | Regional Transit Authority                                  |
| SamTrans   | San Mateo County Transit District                           |
| SEPTA      | Southeastern Pennsylvania Transportation Authority          |
| SFMTA      | San Francisco Municipal Transportation Authority (aka Muni) |
| SOV        | Single Occupant Vehicle                                     |
| SUV        | Sport Utility Vehicle                                       |
| TDM        | Travel Demand Management                                    |



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## ENDNOTES

1. 2012 American Community Survey 1-Year Estimates (Table S0801, COMMUTING CHARACTERISTICS BY SEX), accessed at <http://factfinder2.census.gov> on December 11, 2013.
2. U.S. Department of Transportation, Federal Highway Administration, Summary of Travel Trends, 2009 National Household Travel Survey, accessed on December 11, 2013 at <http://nhts.ornl.gov/2009/pub/stt.pdf>, 2011.
3. 2007-2011 American Community Survey 5-Year Estimates (Table B08006, SEX OF WORKERS BY MEANS OF TRANSPORTATION TO WORK), accessed at <http://factfinder2.census.gov> on December 11, 2013.
4. As previous researchers, such as Kevin Krizek and his co-authors in a 2011 Mineta Transportation Institute report entitled *Bicycling Access and Egress to Transit: Informing the Possibilities*, have done, we use the term “cycle-transit user” and the acronym CTU to refer to *bicyclists* who combine their travel with public transit.
5. Some analysts have argued that, based on average public transit vehicle occupancies at the national level, travel by private car is more energy efficient on a per-passenger-mile basis (see, for example, the November 14, 2012, Marketplace radio program entitled “Save the earth, drive your car,” at <http://www.marketplace.org/topics/sustainability/freakonomics-radio/save-earth-drive-your-car>). National averages, of course, include all transit vehicle miles of service at all hours in all locations throughout the country. Transit users in large cities like Philadelphia and San Francisco, however (particularly those using transit during peak travel hours when ridership is at its highest), are responsible for significantly lower energy use on a passenger-mile basis than are single-occupancy motorists.
6. Todd Litman, *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook* (Victoria, British Columbia, Canada: Victoria Transport Policy Institute, 2013); Susan Shaheen, Stacey Guzman, and Hua Zhang 2010. “Bikesharing in Europe, the Americas, and Asia,” *Transportation Research Record: Journal of the Transportation Research Board* no. 2143 (2010): 159-167. doi: 10.3141/2143-20.
7. Robert Schneider, *Integration of Bicycles and Transit*, Synthesis 62, (Washington, D.C.: Transportation Research Board, 2005).
8. Christopher Hagelin, *A Return on Investment Analysis of Bikes-on-Bus Programs* (Tampa, FL: Center for Urban Transportation Research of the University of South Florida, 2005).
9. Kevin J. Krizek, Eric Stonebraker, and Seth Tribbey, *Bicycling Access and Egress to Transit: Informing the Possibilities*, MTI Report 10-07 (San Jose, CA: Mineta Transportation Institute at San Jose State University, April 2011); Kevin J. Krizek and

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- Eric W. Stonebraker, "Assessing Options to Enhance Bicycle and Transit Integration." *Transportation Research Record* no. 2217 (2011): 162-167. doi: 10.3141/2217-20.
10. Rui Wang and Chen Liu, "Bicycle-Transit Integration in the United States, 2001-2009." *Journal of Public Transportation* no. 16 (3) (2013): 95-119.
  11. John Pucher, Jennifer Dill, and Susan Handy, "Infrastructure, programs, and policies to increase bicycling: An international review," *Preventive Medicine* no. 50, Supplement (0) (2010): S106-S125. doi: 10.1016/j.ypmed.2009.07.028.
  12. American Public Transit Association (APTA), *2012 Public Transportation Fact Book* (Washington, DC: American Public Transportation Association, 2012).
  13. Moshe Givoni and Piet Rietveld, "The access journey to the railway station and its role in passengers' satisfaction with rail travel," *Transport Policy* no. 14 (5) (2007): 357-365. doi: 10.1016/j.tranpol.2007.04.004.
  14. John Tagliabue, "The Dutch Prize Their Pedal Power, but a Sea of Bikes Swamps Their Capital," *New York Times*, June 20, 2013.
  15. John Pucher and Ralph Buehler, *City Cycling* (Cambridge, MA: MIT Press. 2012).
  16. Karel Martens, "The bicycle as a feeding mode: experiences from three European countries," *Transportation Research Part D: Transport and Environment* no. 9 (4) (2004): 281-294. doi: 10.1016/j.trd.2004.02.005.
  17. Moshe Givoni and Piet Rietveld, "The access journey to the railway station and its role in passengers' satisfaction with rail travel," *Transport Policy* no. 14 (5) (2007): 357-365. doi: 10.1016/j.tranpol.2007.04.004.
  18. Christopher Hagelin, *A Return on Investment Analysis of Bikes-on-Bus Programs* (Tampa, FL: Center for Urban Transportation Research of the University of South Florida, 2005).
  19. Eric Adjei, *Multi-modal Urban Transport: Integrating Non-Motorized and Bus Transport* (Enschede, The Netherlands: International Institute for Geo-Information Science and Earth Observation, 2010).
  20. Erick Guerra, Robert Cervero, and Daniel Tischler. "The Half-Mile Circle: Does It Best Represent Transit Station Catchments?" *Transportation Research Record* (2276) (2012): 101-109. doi: 10.3141/2276-12.
  21. For a discussion of the impact of weather variables on bicycle riding, see Victor W. Stover and Edward D. McCormack. "The impact of weather on bus ridership in Pierce County, Washington." *Journal of Public Transportation* 12(1) (2012): 95 –110.

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22. Bradley J. Flamm, "Determinants of bicycle-on-bus boardings: A case study of the Greater Cleveland RTA," *Journal of Public Transportation* no. 16 (2) (2013): 67-84.
  23. In the *2007-2011 American Community Survey 5-Year Estimates* (Table B19013, MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS, IN 2011 INFLATION-ADJUSTED DOLLARS), median household incomes were 32% higher in the San Francisco-Oakland-Fremont metropolitan area than they were in the Philadelphia-Camden-Wilmington metropolitan area.
  24. SEPTA, Media Relations Department, *Media Guide* (Philadelphia, PA: SEPTA, 2013).
  25. BART Marketing and Research Department, and Corey Canapary & Galanis Research, *2008 BART Station Profile Survey* (Oakland, CA: Bay Area Rapid Transit, 2008).
  26. All names used in this report are pseudonyms.
  27. The Philadelphia-San Francisco distribution of cycle-only respondents should not be understood to mean that there are more such commuters in Philadelphia than there are in San Francisco, but is an outcome of differences in survey distribution in the two cities; in Philadelphia, a higher proportion of questionnaires were left on parked bicycles than in San Francisco.
  28. Michelle Daley, and Chris Rissel, "Perspectives and Images of Cycling as a Barrier or Facilitator of Cycling," *Transport Policy* 18, no. 1 (2011): 211-16.



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Bradley Flamm is Assistant Professor in the Department of Community and Regional Planning at Temple University (Ambler, Pennsylvania). He teaches transportation planning, planning methods, and sustainable development courses. His research interests are focused on the environmental and energy impacts of transportation systems and on greenhouse gas (GHG) emissions and climate change action planning at the municipal level. He chairs the Transportation Sub-Committee of Temple University's Sustainability Task Force and is co-chair of the Ambler Campus Sustainability Council. He has a BA from the University of California (Berkeley) in Political Science, a Master of Regional Planning from Cornell University, and a PhD in City and Regional Planning from the University of California (Berkeley).

### **CHARLES RIVASPLATA, PhD**

Charles Rivasplata is a lecturer in the Urban and Regional Planning Department at San José State University, where he teaches transport planning classes. He is also a senior transport planner at the San Francisco Municipal Transportation Agency (SFMTA). He earned dual master's degrees in Civil Engineering and City and Regional Planning from the University of California, Berkeley (1991), and a PhD in Transportation Policy from the University of California, Davis (2006). His doctoral dissertation focused on the impacts of reforms on transit integration in the U.K. His academic research has centered on a number of topics, including transit privatization and deregulation, paratransit operation, regional governance, and travel demand management (TDM).



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