

MBTA Youth Pass Pilot Evaluation

Final Report

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ABSTRACT

The Youth Pass Pilot has increased transit access for primarily low-income and minority youth, allowing them access to recreational opportunities, work, school, and medical appointments they would not have had otherwise. Participants are 92 percent minority and 76 percent low-income, and their MBTA usage on average increased approximately 30 percent during school months and 60 percent during summer months. Participants report that without the Youth Pass they would have still taken 60 percent of their trips on the MBTA, but they would have been unable to make 13 percent of their trips. Seventy-three percent of the applicants for the Youth Pass are eligible for the existing MBTA reduced-fare Student Monthly LinkPass, but unable to access it due to their school not offering it or the limitations on summer months.

The pilot is having minimum impacts on the MBTA revenues and service because of low participation. Data does suggest it is reducing payments in cash onboard vehicles. The collaborative partnership with municipalities has yielded an auditable reduced fare program with limited administrative impact for the MBTA. However, there is a high burden on the municipal partners due to the cash handling; the recommendation to continue the program past a pilot would be to put payment for the pass on the MBTA fare vending machines.

After the mid-pilot review, the MBTA Fiscal and Management Control Board voted to extend the Student Pass year round and put access to the pass on the fare vending machines. This left two categories of youth in the pilot without access to a reduced-fare pass: 12–18 year olds not in high school or middle school and 19–21 year olds who pass a means-tested screen. Using data collected during the pilot about MBTA usage, the cost to extend the Youth Pass to these two groups was estimated. The range of lost fare revenue estimates is based on assumptions of municipal opt-in and participation rates by eligible youth.

Using an estimate of 15 percent participation, the estimated cost of a full Youth Pass program in annual lost fare revenue would range from \$406,000 for the existing partner cities to \$593,000 if all 17 MBTA core municipalities join the program. The estimated fare revenue loss at a more conservative estimate of 30 percent participation would range from \$812,000 to \$1,186,000. The impact of the additional trips on MBTA service is expected to be minimal.

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Chapter 1—Youth Pass Pilot Program Background

The Massachusetts Bay Transportation Authority (MBTA) conducted a pilot program for a Youth Pass, a reduced-fare product that complements the existing Student Monthly LinkPass. The existing Student Monthly LinkPass provides unlimited travel on MBTA rapid transit and buses for middle and high school students for \$26 per month (going to \$30 on July 1, 2016). However, youth access to the Student Monthly LinkPass was limited by the following factors:

- Boston Public Schools subsidizes the pass only for the students who meet the minimum-distance-from-school requirement.
- Many other schools in the MBTA service area do not distribute Student Monthly LinkPasses (either subsidized or for sale) to their students.
- The Student Monthly LinkPass is available only to currently enrolled full-time students, which excludes many youth who are enrolled in alternative education programs.
- Most students could not obtain reduced-fare passes during the summer months.

In order to explore ways to address some of these barriers, the MBTA, along with community stakeholders and municipal partners, developed a Youth Pass pilot program. This pilot program was designed to test the feasibility of implementing a full Youth Pass program, which would provide all eligible youth in participating municipalities with equal access to a reduced-fare product and close some of the access gaps in the current Student Pass program. This program also pilots providing the same reduced-fare pass to young people 19 to 21 years old who are either enrolled in an alternative education program or satisfy a means test. This pilot program was approved by the MBTA/MassDOT Board of Directors in December 2014 and officially launched in July 2015, with the intention of running for one year. The pilot program is scheduled to end on June 30, 2016.

1.1 MBTA and Partner Collaboration

The Youth Pass Pilot is the result of a multi-year campaign by youth transportation advocates. In the summer of 2014, the leadership of MBTA/MassDOT created a Youth Pass Working Group with members of the advocacy community to develop the details of a pilot program. The pilot was approved by the MBTA/MassDOT Board in December 2014. Four municipalities agreed to participate in the pilot: Boston, Chelsea, Malden, and Somerville (with a non-profit serving as the implementing agency in Chelsea). The details of the program were developed through a collaborative effort between the MBTA and the municipal partners. Each implementing agency signed a Memorandum of Understanding with the MBTA and agreed to follow the rules for the program laid out in

a policy handbook written by the MBTA. After the program launched on July 1, 2015, the MBTA and the municipal partners met monthly to review the program's progress.

1.2 Youth Pass Pilot Program

The Youth Pass Pilot program was limited to 1,500 participants between the ages of 12 and 21 in the cities of Boston, Chelsea, Malden, and Somerville, which serve as municipal partners in administering the program. For the pilot program, all individuals ages 12 through 18 who live in participating municipalities were eligible, and individuals 19 to 21 years old were eligible if they meet needs-based criteria by demonstrating one or more of the following: enrollment in high school, a General Education Development (GED) program, or another education program; a job training program; a state or federal public benefit program (such as the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition program for Women, Infants, and Children (WIC), Transitional Aid for Families with Dependent Children (TAFDC), public housing or other assistance programs); or Mass Health. Youth who were accepted into the pilot program could purchase a Youth Pass product through their local municipal partner organization. The Youth Pass functions like a LinkPass (providing unlimited travel on MBTA local bus and subway), but is branded as a Youth Pass. Monthly Youth passes were sold at the Student Monthly LinkPass price of \$26. The 7-day Youth Pass cost \$7.

The Youth Pass Pilot was designed to meet the following major goals:

- Create affordable transit access for pilot participants
- Provide the data required to assess the impact of a Youth Pass on the mobility of youth and their engagement in civic and community activities
- Have a limited impact on the MBTA's revenue
- Provide the data required to estimate the impact of a permanent Youth Pass program on MBTA fare revenue and service delivery
- Assess whether municipal partners can distribute reduced fare MBTA passes in an audit-proof manner that minimizes the MBTA's administrative burden

Municipal partners were responsible for the following aspects of the program:

- Recruiting participants
- Receiving enrollment forms and verifying eligibility for the program (including the collection of required documents)
- Taking photos and producing the Youth Pass cards using card printers provided by the MBTA. The Youth Pass Card is a picture ID printed on a blank Charlie Card with its own unique design
- Administering surveys to participants

- Collecting payment from participants for passes each month (or week, if applicable) and using MBTA-provided retail sales terminals (RSTs) to add the appropriate product onto the pass
- Administering the program in a way that could be tracked and audited
- Providing language assistance, including interpretation and translation of materials into languages other than English, based on the needs of their community and consistent with the protocols identified in the MBTA's Limited English Proficiency Plan

The MBTA and the partners worked together to market the Youth Pass pilot. Youth interested in participating in the program were able to apply via an online form on the MBTA website through the end of April 2016. During the initial application period, waiting lists were established because the number of applicants exceeded the number of available pilot slots in some municipalities. All applicants were given a chance to participate after these initial waiting lists were cleared.

Youth from the applicant pool were contacted by the municipal partner agency to arrange a time to come into their office to enroll. When enrolling youth, the municipal partner determined applicant eligibility, and applicants completed an intake survey. Enrollees also filled out a permission form allowing the MBTA to anonymously track their trips for 30 days so that the MBTA would have pre-pilot trip usage data to compare to data gathered during the pilot program. If enrollees did not already have a CharlieCard that the MBTA could track, they received one without value to use to gather 30 days of pre-pilot trip data (participants had to add value to the card during the first 30 days).

After 30 days, the participant could return and have their picture taken for a Youth Pass card. Once they completed this process, participants could purchase a monthly or Youth Pass, depending on availability in each municipality. Chelsea, Malden, and Somerville offered both monthly and weekly passes, while Boston initially only offered the monthly pass, but added the weekly midway through the pilot. Participants were required to fill out a survey each month when they returned to purchase the pass.

1.3 Pilot Evaluation

The proposal for the Youth Pass Pilot, passed by the MBTA/MassDOT Board of Directors, identified research questions the pilot was designed to answer. A mid-point evaluation of the program was completed in December 2015, along with a Title VI fare equity analysis, as required by the Federal Transit Administration (FTA) for the pilot to proceed beyond six months. This report provides a final evaluation of these questions, using data collected through March 2016. It focuses on three main areas: the benefits of the program to the participants, the costs of the program to the MBTA, and the administrative feasibility of the program model.

1. *Impacts on Youth Riders*

- a. Does the Youth Pass increase use of public transit and access to opportunities for program participants?
- b. Does the Youth Pass change youth riders' attitudes toward the MBTA and public transit?

2. *Impacts on the MBTA*

- a. What is the impact of the Youth Pass program on MBTA fare revenues?
- b. Does increased ridership from the Youth pass result in violations of MBTA service standards? In particular, does the Youth Pass program result in additional trips taken during peak ridership periods?
- c. Does the Youth Pass improve MBTA service by decreasing cash handling, conflict with MBTA employees, and fare evasion?

3. *Administrative Feasibility*

- a. What are the administrative costs of the pilot program to the MBTA?
- b. What are the administrative costs to the municipal partners, and is it sustainable?
- c. Does the pilot create a procedure that is audit-proof, limits fraud, and is able to be replicated?

This report also describes two scenarios for a permanent Youth Pass program, should it be continued after June 30, 2016.

Much of the data for the analysis in this report comes from the participants, either from surveys or from the Automated Fare Collection (AFC) system records of their transit usage. A full list of the data sources used for this report is in Appendix A. MBTA staff and the Central Transportation Planning Staff (CTPS) conducted the analysis of this data.

Chapter 2—Pilot Impacts on Youth Riders

This chapter describes the characteristics of Youth Pass applicants and pilot participants, and discusses the impact of the Youth Pass on pilot participants’ travel behavior.

2.1 Pilot Program Applicant Characteristics

Tables 2-1, 2-2, and 2-3 describe the applicants from each municipality and within each reported age group, or reported school-enrollment category. This data is taken from applications received as of May 1, 2016, after which applications for the pilot program were no longer accepted. In total, 4,531 youth applied to the program, and CTPS used data from 4,509 of these applicants for further analysis.¹

Table 2-1 shows that most applicants reported that they live in Boston (approximately 78 percent), and most were in the 13-to-18-year-old age group (approximately 74 percent).

TABLE 2-1
Pilot Program Applicants
by Reported Municipality and Age Group

City	13–18 Years Old	Percent	19–21 Years Old	Percent	Total
Boston	2,589	57.4%	939	20.8%	3,528
Chelsea	342	7.6%	63	1.4%	405
Malden	301	6.7%	109	2.4%	410
Somerville	103	2.3%	63	1.4%	166
Total	3,335	74.0%	1,174	26.0%	4,509

Data source: MBTA Youth Pass Pilot program application data

Note: All percentages are of total applicants.

¹ The MBTA was restricted by law from collecting data on youth ages 12 and under as part of the pilot program. According to applicant-provided birth years, 22 applicants were 12 years old or younger. Their data is not included in Tables 2-1 through 2-4.

Table 2-2 shows that approximately three quarters of applicants were enrolled in school.

TABLE 2-2
Pilot Program Applicants
by Reported Municipality and School Enrollment

City	Enrolled in School	Percent	Not Enrolled in School	Percent	Total
Boston	2,505	56.3%	983	22.1%	3,488
Chelsea	323	7.3%	76	1.7%	399
Malden	299	6.7%	102	2.3%	401
Somerville	112	2.5%	51	1.1%	163
Total	3,239	72.8%	1,212	27.2%	4,451

Data source: MBTA Youth Pass Pilot program application data.

Note: All percentages are of total applicants. Fifty-eight applicants who did not provide school enrollment data, or provided conflicting school enrollment information, were not included in this table.

Table 2-3 categorizes applicants based on both age and school enrollment. The largest group of applicants was made up of youth ages 13-18 who are enrolled in school, while the second largest group was made up of youth aged 19-21 who were not enrolled in school. About 73 percent of Youth Pass pilot program applicants were enrolled in middle or high school, though this share varied by reported age group. Approximately 90 percent of applicants under the age of 18 were enrolled in school, while 79 percent of applicants between 19 and 21 years old were not enrolled in school.

TABLE 2-3
Pilot Program Applicants
by Reported Age and School Enrollment

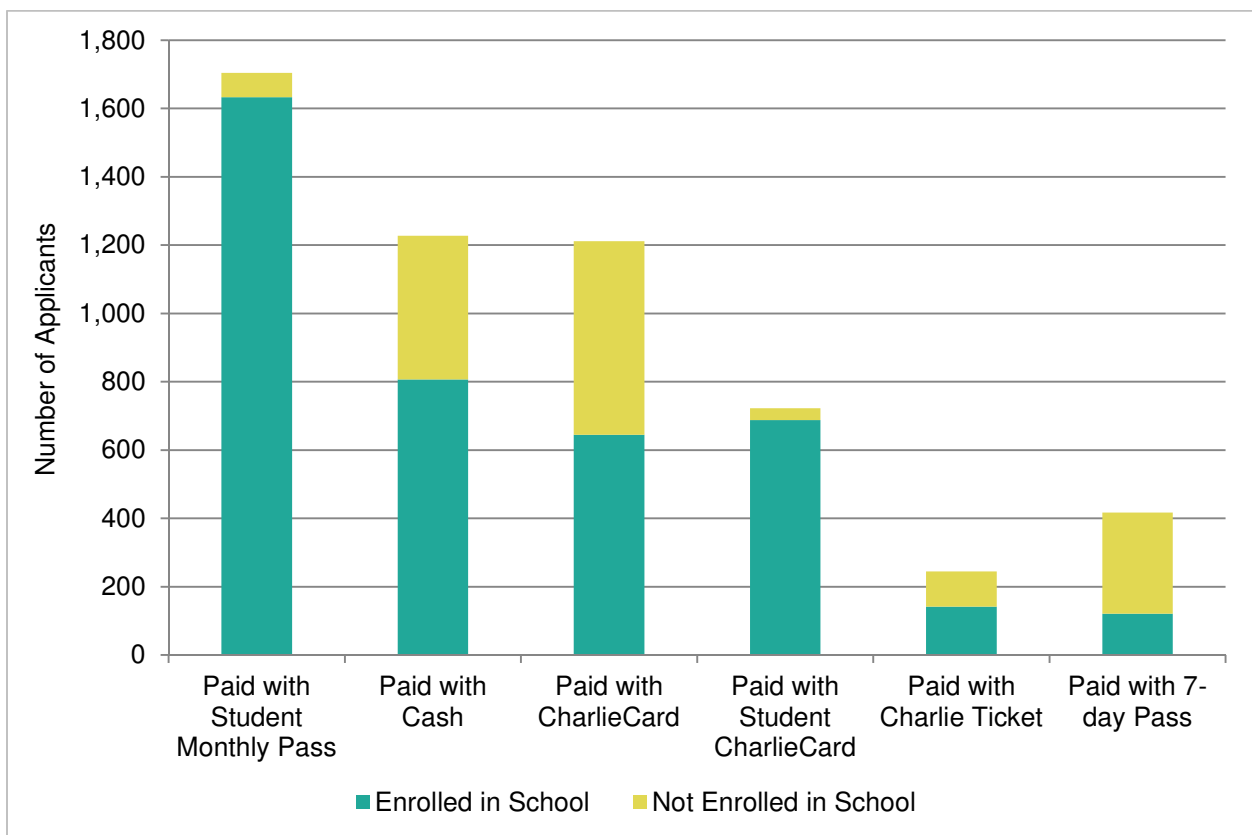
Age of Applicant	Enrolled in School	Percent	Not Enrolled in School	Percent	Total
13–18 Years Old	3,000	67.4%	319	7.2%	3,319
19–21 Years Old	239	5.4%	893	20.1%	1,132
Total	3,239	72.8%	1,212	27.2%	4,451

Data source: MBTA Youth Pass Pilot program application data

Note: All percentages are of total applicants.

Figure 2-1 describes the fare products that applicants reported using to pay MBTA fares. In general, Youth Pass pilot program applicants used different methods of payment depending on their school-enrollment status. Predictably, more school-enrolled applicants used student fare products, such as the Student Monthly LinkPass, while applicants who were not enrolled in school more commonly used a CharlieCard, cash, or a 7-Day LinkPass.

**FIGURE 2-1
Fare Payment Methods used by Pilot Program Applicants**



Data source: MBTA Youth Pass Pilot program application data

Note: Applicants were allowed to select more than one option.

Table 2-4 focuses more specifically on applicants who have reported paying for MBTA trips with student fare media. Approximately 50 percent of school-enrolled applicants and approximately 6 percent of out-of-school applicants reported using Student Monthly LinkPasses; fewer in each group reported using Student Stored-Value CharlieCards.

TABLE 2-4
Student Fare Media used by Pilot Program Applicants

School Enrollment Category	Have paid with a Student Monthly LinkPass	Percent	Have paid with S-Card	Percent	Have paid with S-Card or Monthly Pass	Percent	Total Applicants in Category
Enrolled in School	1,633	50.4%	688	21.2%	2,321	71.7%	3,239
Not Enrolled in School	71	5.9%	34	2.8%	105	8.7%	1,212
Total	1,704	38.3%	722	16.2%	2,426	54.5%	4,451

Data source: MBTA Youth Pass Pilot program application data

Note: All percentages are of the row total.

Approximately 73 percent of all applicants are enrolled in school, and are therefore eligible for student fare products, as shown in Table 2-3; youth who are not enrolled in school may be able to obtain student passes if they are enrolled in GED/High School Equivalency, adult education, or other programs. Table 2-4 shows that approximately 72 percent of the applicants who are enrolled in school reported having used a monthly Student Monthly LinkPass or having paid for trips at the student reduced fare using the stored value purse on their student CharlieCard. This suggests that there are barriers or problems that prevent some students from obtaining student-price fare products.

Table 2-4 also shows that only about half of the school-enrolled youth who applied to the program reported having paid for trips with a Student Monthly LinkPass. The MBTA and CTPS hypothesize that many applicants who have used the Student Monthly LinkPass applied to the program to get access to reduced-price passes during summer months. This hypothesis is supported by the finding that Boston experienced a large turnover of Youth Pass users when the school year started. However, the findings from the Youth Pass pilot application process, discussed above, highlight some other distribution problems that may exist in the current Student Pass program. The applicants who reported using a Student CharlieCard with a stored-value purse meet the eligibility requirements for the Student Monthly LinkPass, but likely have no easy method to obtain one. Some of the barriers they face may be institutional; for example, Malden High School provides students with Student Stored Value cards but no method to purchase the Student Monthly LinkPass. Chapter 5 discusses MBTA initiatives to address these barriers to access, and how these initiatives may affect the target market of a potential permanent Youth Pass program.

2.2 Youth Pass Participant Characteristics

Pilot Participation Rates

The MBTA and CTPS reviewed the available data on Youth Pass usage, from the end of June 2015 through March 2016.² Because pilot participants needed to provide 30 days of pre-pilot travel data prior to receiving a Youth Pass, pilot participants who used a Youth Pass throughout March 2016 would likely have had to enroll in the program on or before January 31, 2016. As of January 31, 2016, 919 applicants had taken an enrollment survey.³

To learn more about Youth pass sales and the number of people using Youth Passes, the MBTA and CTPS reviewed two sets of data for the period between June 2015 and March 2016:

- Youth Pass purchases, according to data from the Retail Sales Terminals (RSTs) provided to participating municipalities⁴
- Youth Pass usage data from the MBTA's Automated Fare Collection (AFC) system

The AFC usage data showed that 770 individuals had used monthly and/or weekly Youth Passes to make trips from July 2015 through March 31, 2016, and CTPS analyzed data from 762 of these individuals.⁵ For the period between June 25, 2015 and March 21, 2016, CTPS identified 897 individual serial numbers associated with Youth Pass purchases, according to data from the Retail Sales Terminals (RSTs) provided to participating municipalities. This time window was selected in order to better compare AFC and RST data. In general, RST sales activity increases significantly after the 21st of each month, which suggests that after this date, many people may be purchasing passes to use during the following month. The difference in the count of individual serial numbers in the RST sales data and the number of individuals appearing in the AFC usage data may occur because some youth may have lost and replaced

² Automated Fare Collection system transaction data (AFC data) is created when people interact with fare gates at MBTA stations or with fare boxes on MBTA transit vehicles. It can take several weeks to retrieve all data from MBTA stations and vehicles, so AFC data for a particular month is typically not available until several weeks after the end of that month. March 2016 was the last month with complete data that could be used in the development of this report.

³ Ten of these individuals would have been excluded from further analysis because they were 12 or younger or because they lacked information on their school enrollment.

⁴ This information likely approximates the number of individuals who are participating in the pilot program, although it may overestimate the number of total participants, as some individuals received replacement Youth Passes and thus would have more than one number in the RST records.

⁵ This information is based on data provided by the MBTA on May 3, 2016. There were a total of 770 individuals who used a Youth Pass between July 2015 and March 2016; however, eight individuals were removed from the data set because their application forms listed incomplete or conflicting school-enrollment information, or because the participants were 12 years old.

cards, or because insufficient information was available from municipal records to link purchases to specific participants. In any case, both counts are less than the number of participants who took an enrollment survey. This may indicate that a number of participants were unwilling or unable to commit the time and complete the multiple steps necessary to fully enroll in the program and receive a Youth Pass.

Throughout this report, CTPS uses the application and pass usage data available for the 762 participants identified in the AFC data to make inferences about the larger population of Youth Pass users.

Table 2-6 categorizes the Youth Pass users identified in the AFC system by their age and school-enrollment characteristics. Approximately 68 percent of these individuals are between 13 and 18 years old, while the remaining 32 percent are between 19 and 21 years old. Most are between 13 and 18 years old and are enrolled in school (60 percent). Youth who are 19 to 21 years old and are not enrolled in school make up the second largest subcategory of Youth Pass users (26 percent).

TABLE 2-6
School Enrollment and Age Characteristics
of Youth Pass Participants in AFC Data (July 2015 – March 2016)

School Enrollment	13–18 Years Old	Percent	19–21 Years Old	Percent	All Youth Pass Users
Middle School	39	5.1%	0	0.0%	39
High School	413	54.2%	45	5.9%	458
Not Enrolled in School	69	9.1%	196	25.7%	265
Total	521	68.4%	241	31.6%	762

Data sources: MBTA Youth Pass pilot program application data; MBTA Youth Pass pilot AFC data
 Note: This includes those who purchased Youth Passes that were active in late June 2015. All percentages are of total applicants.

The results in Table 2-6 also show that the samples of Youth Pass participants in some of these age- and school-enrollment categories are small. To increase sample sizes for analysis and estimation purposes, CTPS examined Youth Pass user behavior according to whether or not a participant was in school. Table 2-7 shows the shares of Youth Pass participants in the AFC data by whether or not they were enrolled in school.

TABLE 2-7

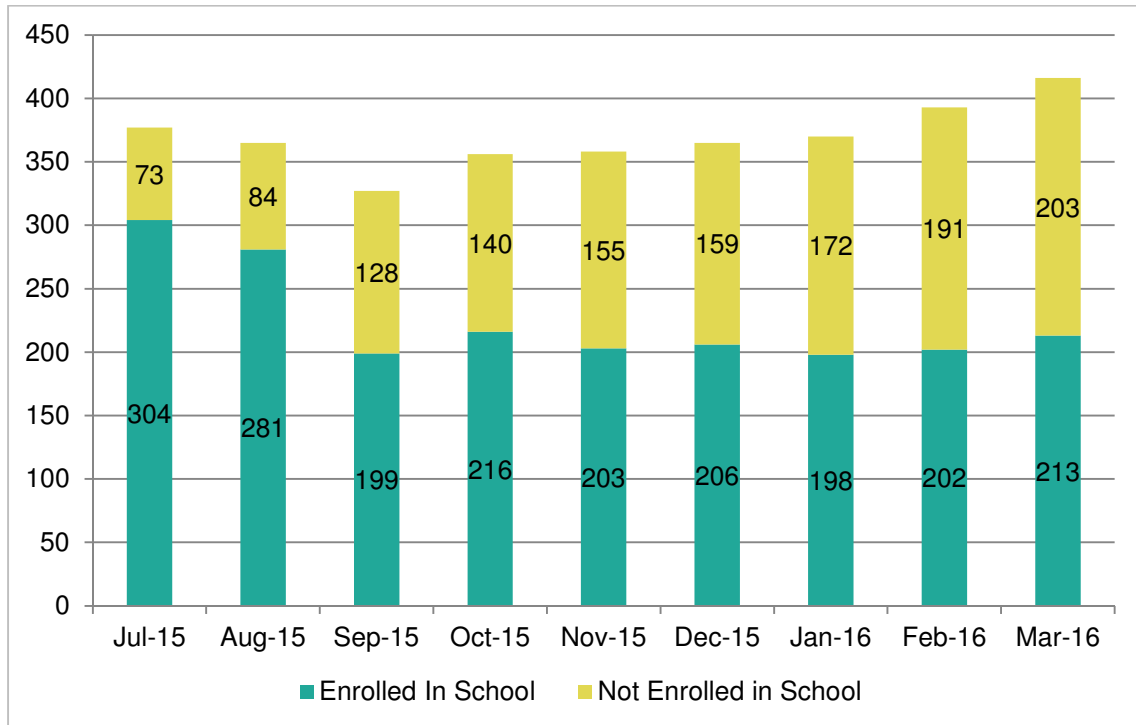
**Youth Pass Participants in AFC Data,
by School Enrollment Category (through March 2016)**

School Enrollment	Number of Participants	Percent
Enrolled in School	497	65.2%
Not Enrolled in School	265	34.8%
Total	762	100.0%

Data sources: MBTA Youth Pass pilot program application data; MBTA Youth Pass pilot AFC data
 Note: This includes participants who purchased Youth Passes that were active in late June 2015.

Figure 2-2 shows the number of active Youth Pass users by month.

**FIGURE 2-2
Active Youth Pass Users
by School Enrollment Category, by Month**



Data sources: MBTA Youth Pass pilot program application data; MBTA Youth Pass pilot AFC data.

Note: June 2015 data is not shown. Two people were active on June 30, 2015. One used a 7-day pass solely on that day, while the other continued using their 7-day pass in July 2015.

Overall, the number of people in the Youth Pass program has grown since its launch in July 2015. During the nine months covered by this report, the number of participants who were enrolled in school peaked during summer months and stayed at a stable level during school months. This is likely because the participants who were enrolled in school may have been able to take advantage of Student Monthly LinkPasses (which cost the same as the Youth Pass), or reduced single-ride fares for students, and thus no longer found it advantageous to obtain a Youth Pass. Meanwhile, participation by youth not enrolled in school increased steadily from July 2015 to March 2016 (the end of our analysis dataset). During July 2015, approximately 19 percent of Youth Pass users were not enrolled in school. By comparison, in March 2016, approximately 49 percent of Youth Pass users were not enrolled in school. The number of youth not enrolled in school also increased over time, from 73 active during July 2015 to 203 active during March 2016.

2.3 Youth Pass Participant’s Use of Public Transit

Pre-Pilot Data

As discussed in Chapter 1, youth who enrolled in the Youth Pass program were asked to provide 30 days of pre-pilot trip data so that it would be possible for the MBTA and CTPS to compare their travel behavior and expenditures before the pilot program to those during the pilot program. Each participant was given a blank CharlieCard, which they could load with passes and/or stored value. To date, 814 youth have provided pre-pilot data. Of these, only 653 provided data and later made trips with a Youth Pass, which may suggest that a large number of youth completed some steps in the Youth Pass enrollment process, but then never returned to obtain a Youth Pass product. Of these, CTPS selected a subset of 634 pre-pilot participants for further analysis; these individuals 1) were older than 12, 2) provided sufficient school-enrollment information, and 3) made trips using a Youth Pass product before March 31, 2016. Table 2-8 displays these pre-pilot participants by school enrollment status. As shown, approximately two-thirds of these pre-pilot participants are enrolled in school.

TABLE 2-8
Pre-Pilot Participants in Youth Pass Program,
by School Enrollment Category

School Enrollment	Number of Participants	Percent
Enrolled in School	408	64.4%
Not Enrolled in School	226	35.6%
Total	634	100.0%

Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data

CTPS hypothesized that the average number of trips youth might make in a month would vary depending on the time of year, particularly a summer month versus a school month. This was expected to be particularly true for youth enrolled in school. As part of testing this hypothesis, CTPS classified pre-pilot participants according to whether they provided data during school months (late May through June 2015, and September 2015 through March 2016), or during summer months (July and August 2015). Table 2-9 shows the breakdown of pre-pilot participants by these two time categories. Twenty-five pre-pilot data participants were excluded because their data could not be easily classified into one of these categories.⁶

**TABLE 2-9
Number of Pre-Pilot Participants,
by School Enrollment and Time-of-Year Categories**

School Enrollment	School Months	Percent	Summer Months	Percent	Total
Enrolled in School	314	51.6%	76	12.5%	390
Not Enrolled in School	161	26.4%	58	9.5%	219
Total	475	78.0%	134	22.0%	609

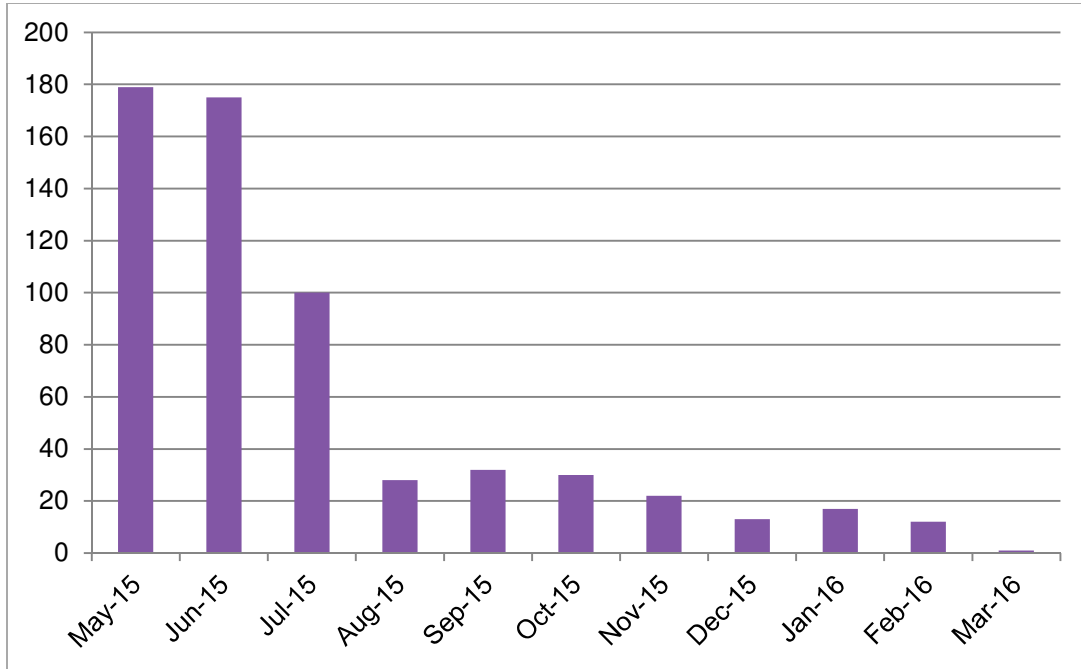
Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data.

Note: Percentages are of total pre-pilot participants.

As shown in Table 2-9, most pre-pilot participants provided data during school months. This is likely driven by the fact that there are more school year months than summer months, and by the fact that the majority of pre-pilot participants made their first identified trip in late May or June 2015, as shown in Figure 2-3.

⁶ If data from a pre-pilot participant was split between a school and summer month, CTPS looked at whether there was a span of 21 days or greater between her first and last trips in the pre-pilot AFC data set. If so, CTPS examined whether more than two-thirds of those days fell in a school or summer month, and assigned the participant to the school month group or summer month group, accordingly. Twenty-five pre-pilot participants could not be classified using this method, and so were excluded from further analysis.

**FIGURE 2-3
Pre-Pilot Participants, by Month of First-Identified Trip
in Pre-Pilot AFC Data**



Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data

General Changes in Trip Behavior

CTPS analyzed the average number of trips made by youth each month during the school year and during the summer. Comparisons between Youth Pass data and pre-pilot data show that in each school enrollment category and in general, Youth Pass participants increased their ridership once they received the pass.

Table 2-10 describes the average number of unlinked trips that youth made during a school month, using data from the “School” period category of pre-pilot participants, and Youth Pass Pilot program data for school months during the pilot program (September 2015 through March 2016).⁷ Estimates of trips made during the Youth Pass program include any trips on local buses, the Silver Line, and the rapid transit system, which are trips that are covered by LinkPasses. These estimates include trips that were made using the stored value purses on the Youth Pass CharlieCards. On average, youth using Youth Passes during a given month made one of these trips or fewer; but in some cases youth may have paid single-ride or transfer fares before they could renew their

⁷ An unlinked trip is an individual trip on any single transit vehicle; a single journey, often composed of many unlinked trips on multiple vehicles, is a “linked” trip. These estimates of unlinked trips are based on the number of times people tapped their CharlieCard to interact with an AFC faregate or farebox.

monthly or 7-day Youth Pass. Including these trips makes it possible to provide a more comprehensive picture of trip-making behavior during the Youth Pass pilot.

TABLE 2-10
Average Unlinked Trips per Month for School Months

Participant Category	Pre-Data: School Month	Youth Pass: School Month	Change (Total)	Change (Percentage)
Enrolled in School	48.3	54.1	+5.8	+12.0%
Not Enrolled in School	37.3	62.2	+24.9	+66.8%
Average for All Participants	44.6	57.6	+13.0	+29.1%

Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data; MBTA Youth Pass pilot AFC data;

Note: The pre-pilot and Youth Pass average monthly trip estimates do not include any trips that were paid for in cash, because these cannot be tracked on the AFC system.

Participants who are not enrolled in school show the largest increase in average unlinked trips per month when the pre-pilot data and Youth Pass pilot program data are compared. In an average school month, out-of-school participants make an additional 25 unlinked trips, or an increase of 67 percent. Prior to the Youth Pass pilot program, on average, these individuals were making fewer trips per school month than those who were enrolled in school, and they are making more trips per month on average than youth enrolled in school once they are in the pilot program.

The average numbers of trips per month in Table 2-10 include all youth enrolled in school in the School pre-pilot category, regardless of the fare product that they used to pay for their trips. Table 2-11 looks more closely at trip-making by youth that did not use a monthly Student Monthly LinkPass when providing pre-data during school months.

TABLE 2-11
Average Unlinked Trips per Month for School Months
(No Student Monthly LinkPass Use in Pre-Pilot Data)

Participant Category	Pre-Data: School Month	Youth Pass: School Month	Change (Total)	Change (Percentage)
Enrolled in School (Did not use monthly Student Pass)	27.4	54.1	+26.9	+97.4%
Not Enrolled in School	37.3	62.2	+24.9	+66.8%
Average for All Participants	32.6	57.6	+25.0	+76.7%

Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data; MBTA Youth Pass pilot AFC data.

Note: The pre-pilot and Youth Pass average monthly trip estimates do not include any trips that were paid for in cash, because these cannot be tracked on the AFC system.

When youth who used Student Monthly LinkPasses are removed from the analysis, the number of trips per month made by youth enrolled in school increases by almost 100 percent once they have access to a Youth Pass. This increase speaks to the ways that multi-trip pass products, like the Student Monthly LinkPass, may help youth increase their mobility.

Table 2-12 describes the average unlinked trips per month that youth made during a summer month, according to data from the pre-pilot participants in the “Summer” time category, and youth pass pilot program data from the Summer months of the pilot program. As for the school months, estimates of trips made during the Youth Pass program include any trips that were made using the stored value purses on the Youth Pass CharlieCards (on average, active Youth Pass participants made less than one stored-value trip per month during July or August). This table shows the net difference and percentage change in the average number of monthly trips across the two data sets.

TABLE 2-12
Average Unlinked Trips per Month for Summer Months

Participant Category	Pre-Data: Summer Month	Youth Pass: Summer Month	Change (Total)	Change (Percentage)
Enrolled in School	32.1	57.6	+25.5	+79.4%
Not Enrolled in School	43.1	63.7	+20.6	+47.8%
Average for All Participants	36.9	58.9	+22.0	+59.6%

Data sources: MBTA Youth Pass pilot program application data; MBTA pre-pilot AFC data; MBTA Youth Pass pilot AFC data

Note: The pre-pilot and Youth Pass average monthly trip estimates do not include any trips that were paid for in cash, because these cannot be tracked on the AFC system.

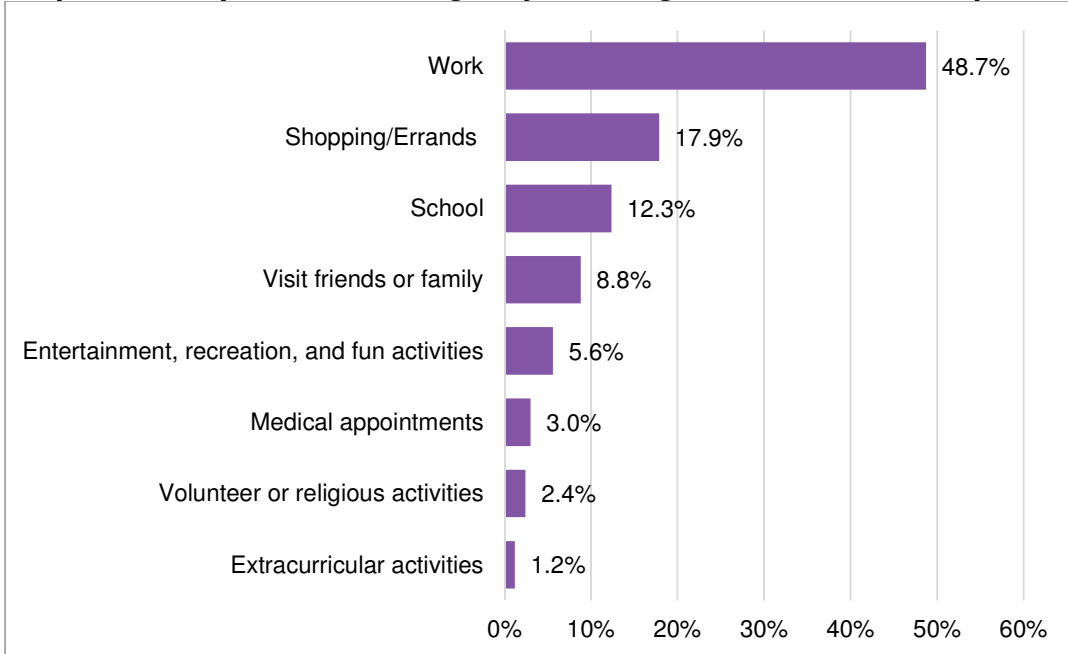
Participants who are enrolled in school made the largest increase in average monthly unlinked trips in a typical summer month, when the pre-pilot data and Youth Pass pilot program data are compared. In an average summer month, in-school participants made an additional 26 unlinked trips, or an increase of 79 percent, once they obtained a Youth Pass. However, participants who are not enrolled in school also made a significant increase in trips, making an additional 21 trips per month, on average.

2.4 Trip Purpose and Potential Foregone Trips

The MBTA conducted monthly surveys of Youth Pass participants to measure the impact of the program on their travel behavior. Each month, participants were asked questions about all of the trips they took on the day prior to the day they received the survey. Participants were asked to describe the purposes of these trips and how they would have made the trips (or whether they would have made them) if they did not have a Youth Pass. As with the other data in this report, the survey results were divided into two groups: those surveyed during the “summer” months of July and August, and those surveyed during the rest of the year (school months). The results of these surveys are displayed in Figures 2-4 through 2-7. It should be noted that since respondents were asked about the previous day, the trips in question nearly all took place from Sunday through Thursday. This is because youth would have taken these surveys at municipal partner offices, which are typically only open Monday through Friday.

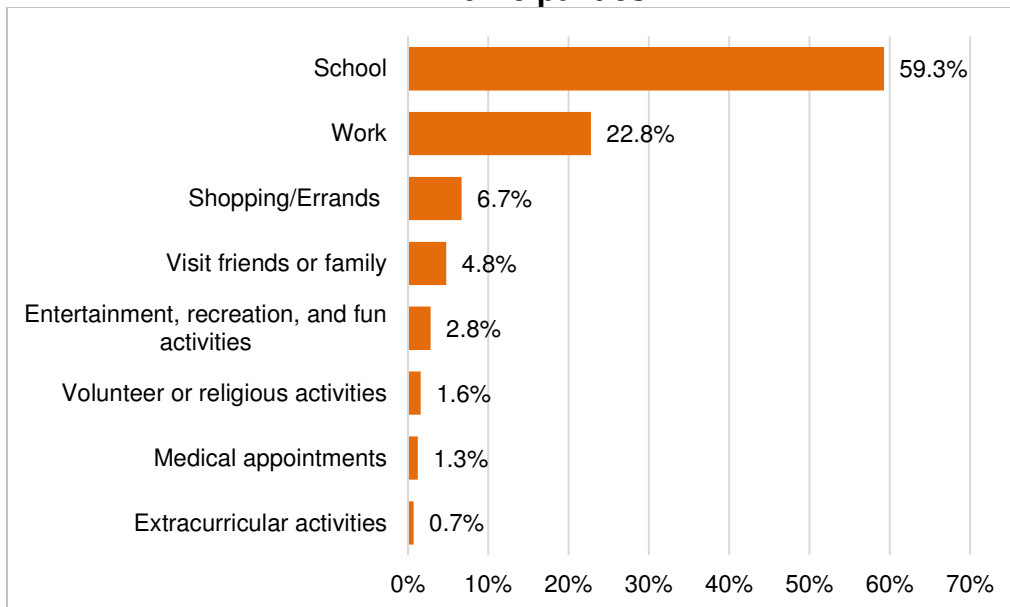
Figures 2-4 and 2-5 describe the purposes of trips taken during the summer and during the school year.

FIGURE 2-4
Purpose of Trips Taken during July and August 2015, All Municipalities



Data source: MBTA Youth Pass Pilot program July and August monthly surveys. n = 1158 trips surveyed.

FIGURE 2-5
Purpose of Trips Taken during All School-Year Months, 2015-16, All Municipalities



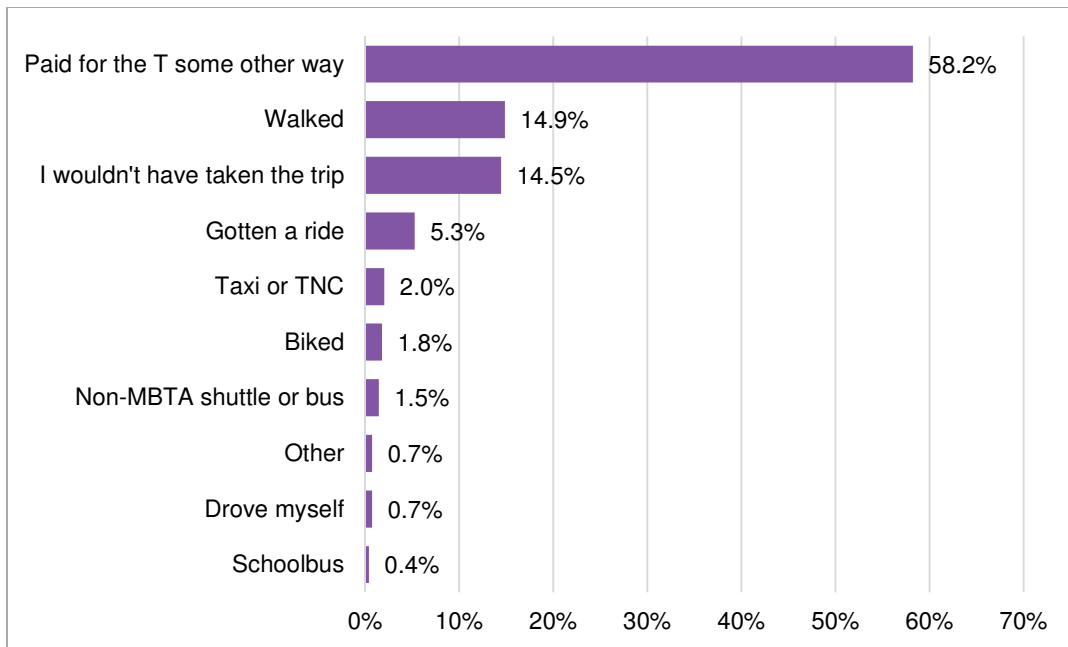
Data source: MBTA Youth Pass Pilot program school year monthly surveys. n = 4,629 trips surveyed.

Note: Data was collected through April 15, 2016, to include trips made during the month of March.

As Figures 2-4 and 2-5 show, the vast majority of trips among participants were either to or from work or school, depending on the season. These two categories combined accounted for 61 percent of the trips in the summer, and 82 percent of the reported trips during the school year. The Shopping/Errands category accounted for the next largest portion of trips.

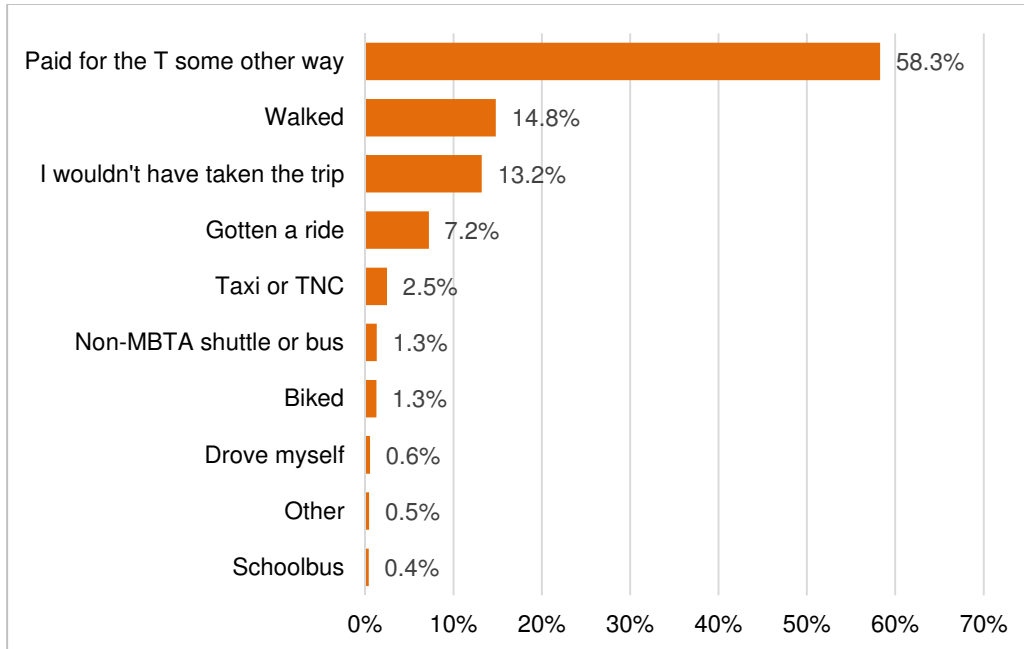
Figures 2-6 and 2-7 describe how Youth Pass participants would have otherwise made their Youth Pass trips during summer and school year months, respectively.

FIGURE 2-6
Participants’ Responses to the Question
“Without a Youth Pass, how would you have made the trip?”
(All Municipalities, July and August 2015)



Data source: MBTA Youth Pass Pilot program July and August monthly surveys. n = 1,231 trips surveyed.

FIGURE 2-7
Participant Responses to the Question
“Without a Youth Pass, how would you have made the trip?”
(All Municipalities, School Months)



Data source: MBTA Youth Pass Pilot program school year monthly surveys. n = 4,705 trips surveyed.

Note: Data was collected through April 15, 2016, to include trips made during the month of March

The majority of participants responded that they would have paid to ride the MBTA system another way if they did not have a Youth Pass (approximately 58 percent respondents during both summer and school year groups, as shown in Figures 2-6 and 2-7). Approximately 15 percent of respondents said they would have walked if they did not have the Youth Pass; this was the case for both summer and school-year months. Finally, 14.5 percent of respondents in the summer and just over 13 percent during the school year responded that they wouldn't have made the trip in question at all without a Youth Pass.

In surveys administered between July 2015 and April 2016, participants responded that they would have foregone 13 to 14 percent of their reported trips if they did not have a Youth Pass. Conversely, they would have found another way to make approximately 87 percent of those trips, primarily by paying another way to ride the transit system. Although the surveys did not ask the reason why participants would forego making trips, it is likely because of their cost. Table 2-12 shows the percent of trips that survey respondents *would not* have taken, by type of trip. The highest category is school trips, followed by shopping/errands trips, and work trips.

TABLE 2-12
Trips Survey Respondents Would Not Have Taken without a Youth Pass

Trip Purpose	Percent of Trips Foregone without Youth Pass
Entertainment, recreation, and fun activities	11%
Extracurricular activities (sports, music, tutoring) or trips for your job (but not to it)	1%
Medical appointments	2%
School	24%
Shopping/Errands (for yourself or your family)	21%
Visit friends or family	14%
Volunteer or religious activities	2%
Work	17%
N/A	8%

Data source: MBTA Youth Pass Pilot program monthly surveys July 2015-April 2016.

These results indicate that the Youth Pass is increasing young people’s mobility. As expected, transit usage increases with a reduced-fare pass. The first nine months of Youth Pass data show a 30 percent average increase in the number of trips for all participants during school months, and a 60 percent average increase in trips during the summer months. The survey results show that without a Youth Pass nearly 42 percent of trips would not have been taken on the MBTA, and 13 percent of trips would not have been taken at all.

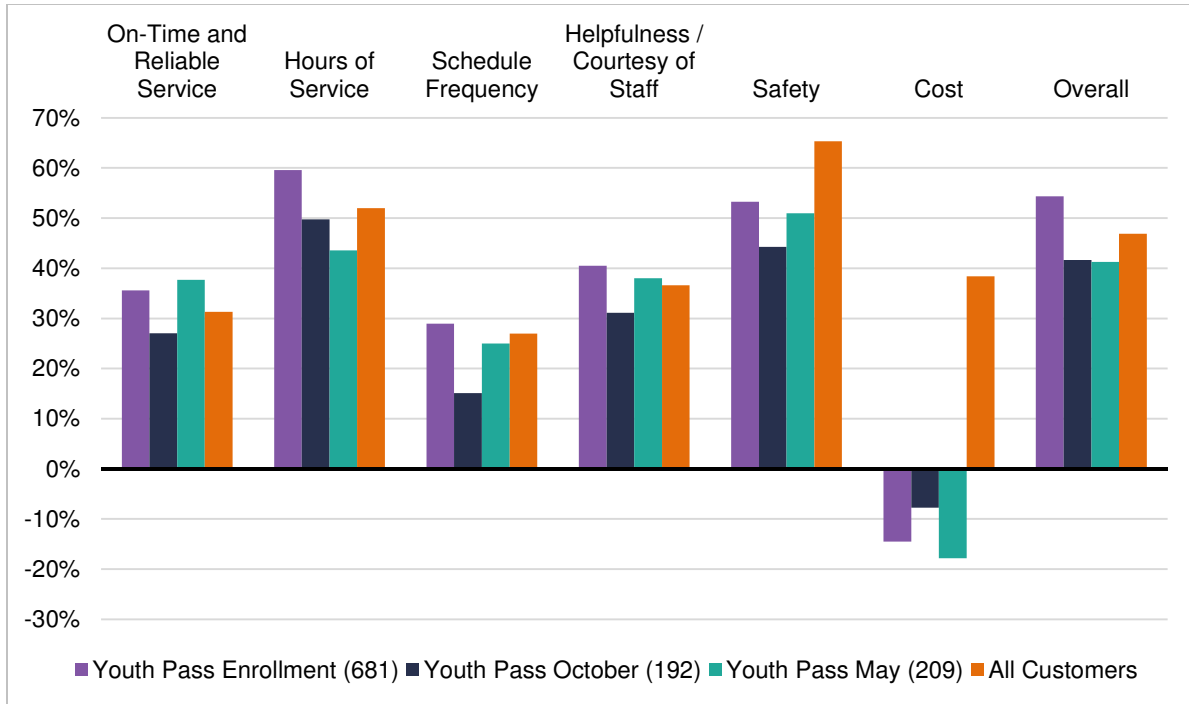
2.5 Youth Riders’ Attitudes about the MBTA and Public Transit

One objective of the Youth Pass Pilot research is to determine whether or not the availability of the Youth Pass changes participants’ attitudes towards the MBTA and public transit. To gather information on this, the MBTA surveyed Youth Pass participants regarding their level of satisfaction with the MBTA, both overall and in specific categories. Participants were asked to complete these surveys when they enrolled in the pilot program (the month may vary by participant), in October 2015, and then at the end of the program in May 2016. The questions in these surveys matched those that were asked of all MBTA riders during a system-wide customer satisfaction survey from earlier in 2015.

Figure 2-8 shows the net satisfaction for each category across three groups: Youth Pass participants at the time of pilot program enrollment, Youth Pass participants in October 2015 and May 2016, and all MBTA customers from the system-wide customer satisfaction survey. The MBTA determined the net satisfaction rating for each category

by subtracting the percentage of respondents answering below neutral satisfaction (1, 2, or 3) from the percentage answering better than neutral satisfaction (5, 6, or 7).

FIGURE 2-8
Net Satisfaction with Various Aspects of MBTA Service



Data sources: MBTA Youth Pass Pilot enrollment surveys; MBTA Youth Pass pilot October 2015 and May 2016 monthly surveys; MBTA 2015 System-wide Customer Satisfaction Survey

Youth Pass enrollees tended to have an equal or more favorable opinion of the MBTA than respondents to the 2015 system-wide customer satisfaction survey, except in the “cost” and “safety” categories. Youth Pass participants were slightly less satisfied with safety on the MBTA than all passengers, but the vast majority still responded positively. When asked to rate their satisfaction with the MBTA’s cost, Youth Pass participants’ responses differed somewhat from the survey of all passengers. In fact, the majority of Youth Pass participants rated their satisfaction with the MBTA’s cost as negative, which was the only net negative response for both the Youth Pass enrollment and Youth Pass October and May survey groups.

In general, satisfaction with the MBTA decreased slightly among Youth Pass participants between the enrollment survey group and the October and May survey groups, with the exception of the “cost” category. It is important to note that the two surveys do not provide a perfect comparison, as not everyone who took the first survey remained in the program long enough to participate in the second or third survey, or even completed the requirements to obtain a Youth Pass. It is possible that as their use

of the MBTA services increases, Youth Pass participant satisfaction with the MBTA will decrease. This effect appeared in the 2015 system-wide customer satisfaction survey, with regular users expressing less satisfaction than people who use the system less frequently.

Youth Pass respondents' satisfaction with the MBTA's cost improved for the mid-point survey, but then decreased again for the final survey. This could be because of the way the question was asked. Respondents were not told to assume that the Youth Pass Pilot would continue past June 30, 2016 when answering the second and third survey, so some respondents could have answered this question thinking that the program would be ending.

Chapter 3—Pilot Impacts on the MBTA

This chapter describes estimates of the impacts the Youth Pass pilot may have on MBTA revenues and service.

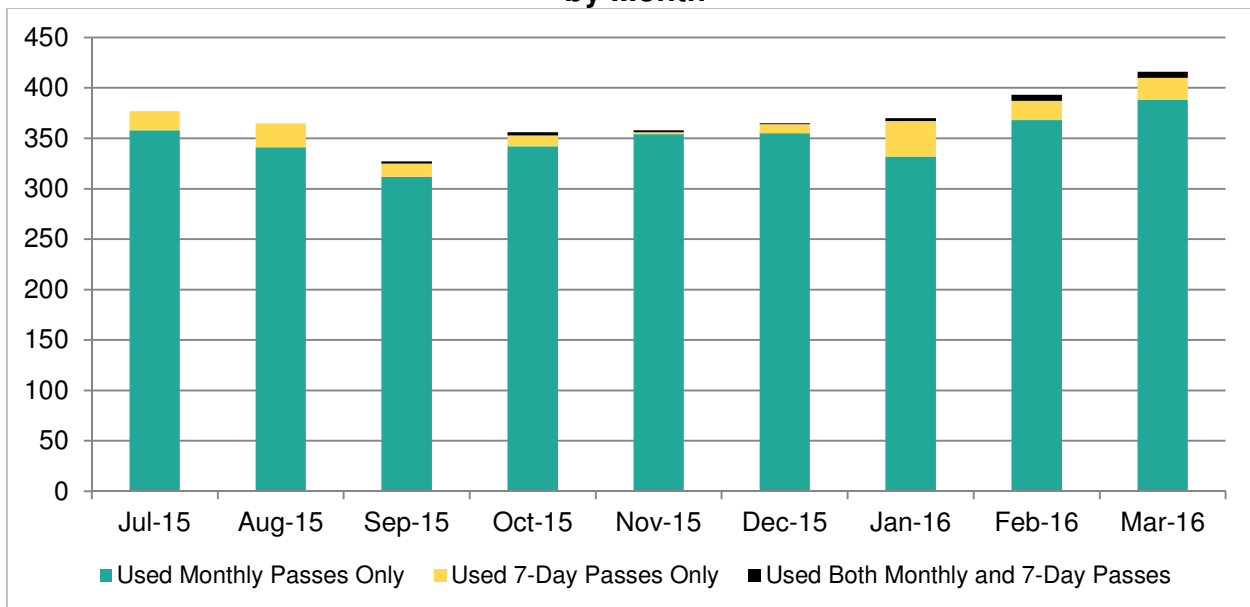
3.1 Impacts on MBTA Fare Revenues

Youth Pass Use Profile

During each month of the pilot, participants could purchase a monthly Youth Pass for \$26. Chelsea, Malden, and Somerville also offered 7-day Youth Passes throughout the pilot, while Boston began to sell these passes in January. The 7-day Youth Passes cost \$7 each.

As mentioned in Chapter 2, CTPS identified 770 individuals who used youth passes through March 2016, according to the MBTA’s AFC data for Youth Pass participants. CTPS analyzed the behavior of 762 of these individuals.⁸ Figure 3-1 shows the number of individuals who purchased each type of Youth Pass product during each month.

FIGURE 3-1
Active Participants Who Purchased 7-Day or Monthly Youth Passes, by Month



Data source: MBTA Youth Pass Pilot AFC Data

Note: The number of individuals who purchased 7-Day passes in July includes one person who purchased a 7-Day pass in June only.

⁸ Eight of these 770 youth were identified as being age 12, based on their reported date of birth, or their applications had incomplete or conflicting school enrollment data.

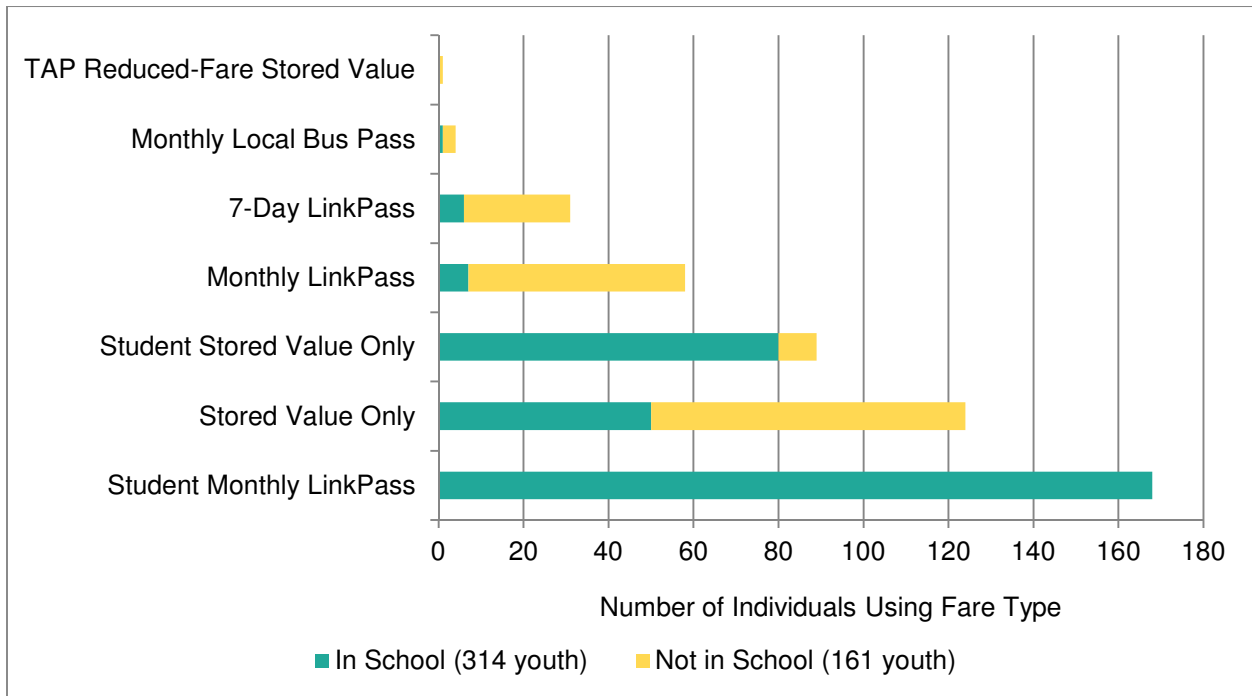
During each month of the pilot, the majority of youth that were “active,” or using at least one Youth Pass product to pay for their trips, used a monthly Youth Pass only. During most months of the pilot, fewer than seven percent of active participants used one or more 7-day Youth Passes to pay for their trips. In January 2016, Boston began offering the 7-day pass, but even during that month, only about 10 percent of all active participants used this type of pass. Of the youth who used a 7-day pass during a given month, the majority only purchased one or two passes during the month.

Estimated Youth Pass Revenues

Pre-Pilot Fare Data

Chapter 2 describes the processes that CTPS used to develop samples of pre-pilot data to represent youth travel behavior during the school year or the summer. Figure 3-2 shows the types of fare media that youth in the School pre-pilot data sample used to make trips on the MBTA system.

**FIGURE 3-2
Fare Types Used By Pre-Pilot Participants (School Period)**



Data source: MBTA pre-pilot AFC data

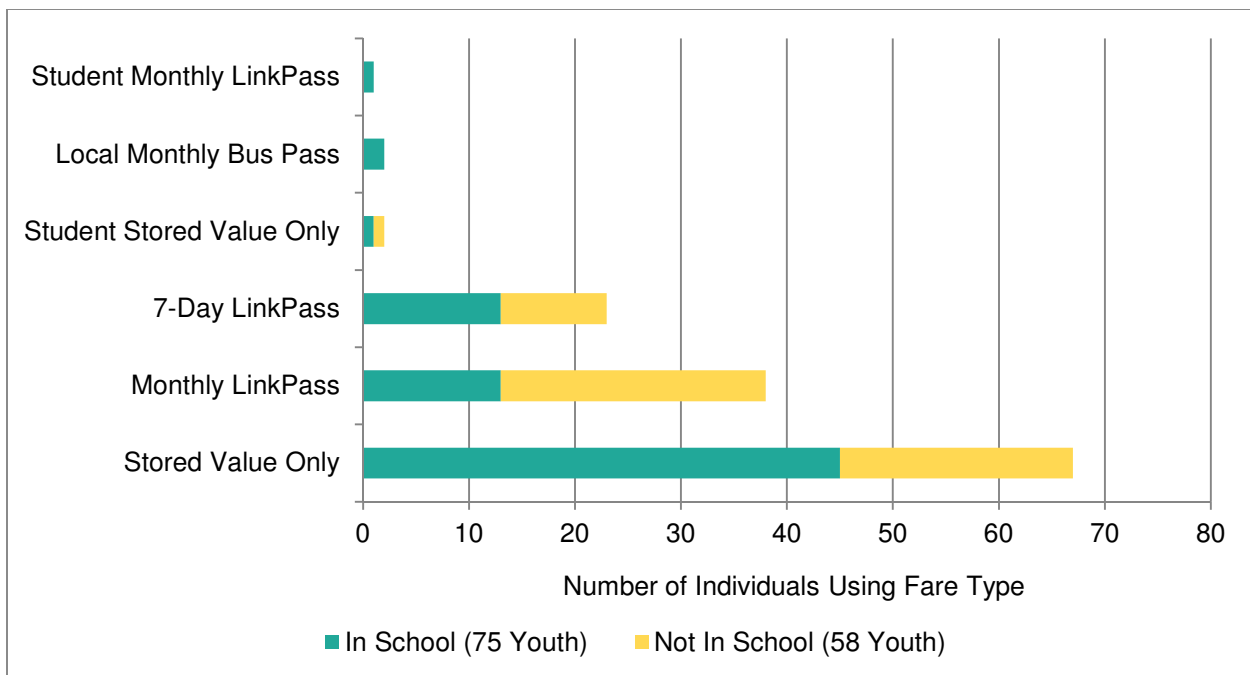
Notes: Participants may have used more than one fare type during their 30-day pre-pilot data collection period. Stored-value fare types include both trip and transfer fares. Information about fares paid in cash is unknown. Two youth in the “Not in School” group and one in the “In School” group used multiple types of passes; these results are not shown. Three youth in the “In School” group paid for trips with a combination of full-price and student fares, only; these results are not shown.

TAP = Transportation Access Pass.

Based on the data shown in Figure 3-2, of pre-pilot participants who provided data during the School period, slightly more than half of students used Student Monthly LinkPasses, while about 25 percent only paid for trips using their student stored-value purse on their CharlieCard, which enables them to obtain a reduced fare. Only a few used another type of pass (Monthly LinkPass, 7-day LinkPass, or a monthly Local Bus pass). Among youth not-enrolled in school, the largest number of participants paid for their trips using stored-value only, though approximately 32 percent used a monthly LinkPass, and approximately 16 percent used a 7-day LinkPass.

Figure 3-3 shows the types of fare media that youth in the Summer pre-pilot data sample used to ride the MBTA system.

FIGURE 3-3
Fare Types Used By Pre-Pilot Participants (Summer Period)



Data source: MBTA pre-pilot AFC data

Notes: Participants may have used more than one fare type during their 30-day pre-pilot data collection period. Stored Value fare types may include both trip and transfer fares. Information about fares paid in cash is unknown. One person was excluded from the “In School” category because they only paid for Express Bus trips during their pre-data month, which would not be covered by a LinkPass.

Figure 3-3 shows that, of pre-pilot participants who provided data during the Summer period, about 62 percent of students paid for trips using only their stored-value purse (either at standard or reduced-price fares). Approximately 17 percent of students made trips using monthly LinkPasses, while another 17 percent made trips using 7-day LinkPasses. Among youth not enrolled in school, approximately 43 percent paid for trips

using a monthly LinkPass, while another 40 percent paid for trips using their Charlie Card stored-value purse only.

Estimated Youth Pass Revenues

To estimate the net Youth Pass revenues for the first nine months of the pilot program, CTPS followed these steps:

- **Step 1:** CTPS identified each month in the pilot program as either a Summer month (July and August 2015) or a School month (September 2015 through March 2016).
- **Step 2:** CTPS identified the share of youth pass participants in each month who reported being enrolled in school, based on their Youth Pass application data.
- **Step 3:** CTPS estimated the total expenditures each Youth Pass participant made during months when they were “active,” or using a Youth Pass to pay for trips. These estimated total expenditures include the cost of Youth Passes (monthly and/or 7-day), and the cost of any stored-value trips. CTPS assumed that youth participants had purchased one monthly Youth Pass if they had made any monthly Youth Pass trips, and estimated the number of 7-day passes purchased based on the time periods during which 7-day Youth Pass trips were made, as shown in the Youth Pass pilot AFC data. As discussed in Chapter 2, on average, youth using Youth Passes during a given month made one stored-value trip or fewer; but in some cases youth may have paid single-ride or transfer fares before they could renew their monthly or 7-day youth pass. Including these trips makes it possible to provide a more comprehensive picture of trip-making behavior for a given month.

Table 3-1 shows the outputs of steps 1 through 3.

TABLE 3-1
Youth Pass Participant Spending,
by Month and School Enrollment Category

Pilot-Program Month	Month Type	Total Participants	Estimated MBTA Revenues during Youth Pass Pilot Program
July 2015	Summer	377	\$9,590
August 2015	Summer	365	\$9,390
September 2015	School	327	\$8,460
October 2015	School	356	\$9,440
November 2015	School	358	\$9,520
December 2015	School	365	\$9,700
January 2016	School	370	\$9,610
February 2016	School	393	\$10,410
March 2016	School	416	\$11,030
Total			\$87,150

Data source: MBTA Youth Pass pilot AFC Data

Notes: These amounts exclude one 7-day pass purchased in June 2015, which was only used on June 30, 2015. Amounts are rounded to the nearest \$10.

- Step 4:** CTPS estimated the average cost a participant would have paid per month to ride the MBTA local bus or rapid transit system if they did not have a Youth Pass, depending on the time of year and the participant's school-enrollment category. CTPS used the pre-pilot data sets to develop these estimates. The average monthly cost for each participant is based on the estimated number and types of passes that the individual purchased and the cost of any trips paid for using stored-value. CTPS assumed that youth participants had purchased a certain type of monthly pass if they had had paid for any trips during the month using that pass-type, and estimated the number of 7-day passes purchased based on the time periods during which 7-day Youth Pass trips were made, as shown in the pre-pilot AFC data. Table 3-2 shows the average monthly expenditure values for each school-enrollment and time-period category.

TABLE 3-2
Average Monthly Pre-Pilot Spending,
by Month and School Enrollment Category

Category	Average Monthly Expenditure: Summer Pre-Pilot Data Group	Average Monthly Expenditure: School Pre-Pilot Data Group
Enrolled in School	\$42.00	\$26.50
Not Enrolled in School	\$52.50	\$50.00

Data source: MBTA pre-pilot AFC data

Note: Amounts are rounded to the nearest \$0.50.

- **Step 5:** For each month, CTPS multiplied the appropriate average monthly pre-pilot expenditure amount by the number of participants in the “enrolled-in-school” and “not-enrolled-in-school” categories, and summed the two categories together to get a total pre-pilot spending amount for each month. This amount will serve as an estimate of the revenue the MBTA would have earned if these youth did not have access to Youth Passes.
- **Step 6:** CTPS subtracted the total monthly foregone revenues from the Youth Pass program revenues for each month, to determine the net revenues per month. For the first nine months of the pilot program. CTPS estimates that participants in the program spent approximately \$87,200 between July 2015 and March 2016. The net revenue loss for the program for these nine months, based on the methodology described above, is about \$38,200.

TABLE 3-3
Estimated Net MBTA Foregone Revenue during the Youth Pass Pilot Program

Pilot-Program Month	Month Type	Total Participants	Estimated MBTA Revenues during Youth Pass Pilot Program	Estimated Foregone MBTA Revenues	Estimated Net MBTA Revenues
July 2015	Summer	377	\$9,580	\$16,570	(\$6,990)
August 2015	Summer	365	\$9,400	\$13,540	(\$4,150)
September 2015	School	327	\$8,470	\$11,630	(\$3,170)
October 2015	School	356	\$9,440	\$12,680	(\$3,250)
November 2015	School	358	\$9,520	\$13,090	(\$3,570)
December 2015	School	365	\$9,690	\$13,370	(\$3,680)
January 2016	School	370	\$9,610	\$13,820	(\$4,200)
February 2016	School	393	\$10,410	\$14,870	(\$4,460)
March 2016	School	416	\$11,030	\$15,760	(\$4,720)
Total			\$87,150	\$125,330	(\$38,180)

Data sources: MBTA pre-pilot AFC data, MBTA Youth Pass pilot AFC data
 Note: Amounts have been rounded to the nearest \$10. The differences in the net revenues column may not be exact due to rounding.

To estimate the net revenue for a full year of the pilot program at the current participation rate, CTPS applied the number of Youth Pass users that were estimated to be active in March 2016 (416) to the remaining three months of the school year, with the same shares of youth enrolled in school and not enrolled in school. CTPS also assumed the March 2016 Youth Pass revenue amount (approximately \$11,030) and the March foregone revenue amount (approximately \$15,760) for the three remaining months. Using this approach, CTPS estimated that a full year of the pilot would generate approximately \$120,200 in revenue (Youth Pass sales plus other stored value), and a net revenue loss of approximately \$52,400 as shown in Table 3-5.

TABLE 3-5
Estimated Net Youth Pass Pilot Program Revenues
(July 2015 – June 2016)

Pilot Program Month	Youth Pass Revenues	Estimated Foregone Revenues	Net Revenues
July 2015 – March 2016	\$87,150	\$125,330	(\$38,180)
April 2016 – June 2016 (projection)	\$33,090	\$47,270	(\$14,170)
Total	\$120,240	\$172,600	(\$52,350)

Data sources: MBTA pre-pilot AFC data, MBTA Youth Pass pilot AFC data
 Note: Amounts are rounded to the nearest \$10. The differences in the net revenues column may not be exact due to rounding.

When the cost of program administration by MBTA staff is included (an estimated \$200,000), the net loss of the pilot is approximately \$252,400.

3.2 Impacts on MBTA Service

Chapter 2 describes the estimated number of unlinked trips that Youth Pass participants made based on several characteristics or circumstances:

- Whether the participants were enrolled in school, or not enrolled in school
- Whether the participants were making trips before or after they had access to a Youth Pass
- Whether the trip was taking place during a school or summer month

This section looks more closely at the magnitude of additional unlinked trips per weekday, and at the magnitude of unlinked trips being made during the AM and PM peak periods, in particular. According to the MBTA’s current Service Delivery Policy (2010), the AM peak period takes place between 7:00 AM and 8:59 AM, while the PM peak period takes place between 4:00 PM and 6:30 PM. CTPS also looked at participants’ trips on different parts of the MBTA system (bus, rapid transit, light-rail, or Silver Line) during a given weekday.

To estimate the net change in the number of trips on the MBTA local bus and rail system on a weekday, CTPS completed the following steps:

- **Step 1:** CTPS identified each month in the pilot program as either a Summer month (July and August 2015) or a School month (September 2015 through March 2016).

- **Step 2:** CTPS identified the share of youth pass participants in each month who reported being enrolled in school, based on their Youth Pass application data.
- **Step 3:** CTPS estimated the trips per weekday made by youth using Youth Passes, by calculating the total number of trips made by active Youth Pass participants on weekdays during each month of the program. CTPS then divided these trip values by the number of weekdays during each month (excluding holidays) to determine the estimated number of trips per day, during each time period.
- **Step 4:** CTPS estimated the trips per weekday that youth may have made before they had access to a youth pass by using the pre-pilot AFC data. To estimate the total number of trips made by pre-pilot participants during a summer month, CTPS calculated the average numbers of weekday trips per month made by participants (both those enrolled in school, and not enrolled in school) during the Summer time period. These were multiplied by the number of each type of Youth Pass participant (school-enrolled, and not-school-enrolled) during each Summer month. This process was repeated for school months, using data from pre-pilot participants in the School category.
- **Step 5:** CTPS estimated the additional trips per weekday made by youth using Youth Passes by subtracting the results of step 4 from the results of step 3.

A summary of the results of steps 1 through 5 are shown in Table 3-6.

TABLE 3-6
Estimated Weekday Trips by Youth Pass Participants, by Service Period
(July 2015 – March 2016)

Month Type	Range of Trips per Weekday (from Pre-Pilot Data)	Range of Trips per Weekday (Youth Pass Participants)	Range Estimated Net Additional Trips Per Weekday	Average Estimated Net Additional Trips Per Weekday
Summer	490 – 500	800 – 900	+310 – +400	+350
School	600 – 740	770 – 950	+110 – +230	+180

Data sources: MBTA Youth Pass pilot AFC data

Note: Amounts are rounded to the nearest 10 trips.

During summer months, an estimated average 350 trips were added to the MBTA bus and rapid transit system each weekday. During school months, an estimated average 180 trips were added to the MBTA bus and rapid transit system each weekday.

Meanwhile, there were approximately 1.2 million weekday boardings on the MBTA bus and rapid transit systems in fiscal year (FY) 2013. The net growth in trips on the bus and rapid transit system from the Youth Pass pilot program is very small by comparison.⁹

AM and PM Peak Period Trip Share Changes

Table 3-7 shows changes in the share of weekday unlinked trips that youth made during the AM peak period, the PM peak period, and during non-peak periods, once they had a Youth Pass, compared to the share they made during these periods before they had a Youth Pass. These shares have been calculated for both summer (July and August 2015) and school (September 2015 to March 2016) months. To provide a pre-pilot comparison to the Youth Pass pilot shares in each period, CTPS calculated the share of weekday trips made by the Summer group of pre-pilot participants, and the School group of pre-pilot participants made in each period, respectively. This table shows the change in the share of peak period trips between the pre-pilot and Youth Pass AFC data sets in terms of both percentage points and percentage change.

TABLE 3-7
Change in Service-Period Trip Share
between Pre-Pilot and Youth Pass Data

Month Type And Service Period	Pre-Pilot Data	Youth Pass Data	Change in Percentage Points	Percentage Change
School: AM-Peak-Period Share	14.7%	14.7%	(Less than 0.1%)	(Less than 0.1%)
School: PM-Peak-Period Share	17.4%	19.8%	+2.4	+13.6%
School: Non-Peak-Period Share	67.9%	65.5%	(2.4)	(3.5%)
Summer: AM-Peak-Period Share	13.7%	15.7%	+1.9	+13.9%
Summer: PM-Peak-Period Share	21.8%	21.6%	(0.2)	(1.0%)
Summer: Non-Peak-Period Share	64.5%	62.8%	(1.7)	(2.6%)

Data sources: MBTA Youth Pass pilot AFC data, MBTA pre-pilot AFC Data

⁹ Source: Massachusetts Bay Transportation Authority. 2014. Ridership and Service Statistics: Fourteenth Edition.
<http://www.mbta.com/uploadedfiles/documents/2014%20BLUEBOOK%2014th%20Edition.pdf>.
Accessed May 24, 2015.

As shown in Table 3-7, Youth pass participants make approximately 15 percent of their trips during the AM peak period and about 20 percent during the PM peak period during school months. During summer months, these percentages rise to 16 percent and 21 percent, respectively. When comparing the Youth Pass pilot and pre-pilot data, CTPS estimates that Youth Pass participants make more of their trips during the PM Peak period during School months than before the pilot. Meanwhile, during summer months, Youth Pass participants make more of their trips during the AM peak period than they did prior to the pilot.

Table 3-8 combines the information in Tables 3-6 and 3-7 to show the approximate number of additional weekday trips taking place during the AM and PM peak periods. As shown below, there are fewer than 100 additional trips in either the AM or PM peak on an average weekday, regardless of the time of year.

TABLE 3-8
Estimated Additional Trips by Youth Pass Participants, by Service Period
(July 2015 – March 2016)

Month Type	Range of Additional AM Peak Trips Per Weekday	Average Additional AM Peak Trips Per Weekday	Range of Additional PM Peak Trips Per Weekday	Average Additional PM Peak Trips Per Weekday
Summer	60 – 70	65	70 – 80	75
School	20 – 30	27	40 – 60	52

Data source: MBTA Youth Pass pilot AFC data

Note: Ranges are rounded to the nearest 10 trips.

AM and PM Peak Period Trip Shares by Bus and Rapid Transit Line

Table 3-9 shows the change in AM peak period, PM peak period, and non-peak trip share for the local bus network as a whole, each rapid transit line, and the Silver Line during school months (September 2015 – March 2016). CTPS compared this trip-making activity to that which occurred prior to the Youth Pass pilot, using data from the School group of pre-pilot participants. The highlighted cells show an increase in trip share from the pre-pilot data set to the Youth Pass data set.

TABLE 3-9
Change in Peak-Period Trip Share
for Bus Network and Rapid Transit Lines
(Pre-Pilot and Youth Pass Pilot Data, School Month)

Service Period and Data Set	Bus: All Routes	Rapid Transit: Blue Line	Rapid Transit: Green Line	Rapid Transit: Orange Line	Rapid Transit: Red Line	Rapid Transit: Silver Line
AM-Peak-Period Share: Pre-Pilot	17.1%	17.8%	7.1%	10.9%	16.4%	18.6%
AM-Peak-Period Share: Youth Pass	16.7%	26.4%	6.8%	13.6%	14.6%	15.2%
PM-Peak-Period Share: Pre-Pilot	16.0%	10.1%	23.0%	19.0%	18.4%	13.4%
PM-Peak-Period Share: Youth Pass	20.5%	12.0%	20.1%	19.7%	19.1%	19.9%
Non-Peak-Period Share: Pre-Pilot	66.9%	72.1%	69.9%	70.1%	65.2%	68.0%
Non-Peak-Period Share: Youth Pass	62.8%	61.6%	73.1%	66.7%	66.3%	64.8%

Data sources: MBTA Youth Pass pilot AFC data, MBTA pre-pilot AFC Data

During school months, the share of trips made by Youth Pass participants increased during the AM-Peak period on bus routes and on the Blue and Orange lines. During the PM-Peak period, the share of trips made by Youth Pass participants increased on all bus routes, and the Blue, Orange, Red, and Silver lines. During non-peak periods, the share of trips made by Youth Pass participants increased on the Green and Red lines. The use of different MBTA rapid transit lines and the bus network is determined in part by the municipalities participating in the program, as Youth Pass participants will be making their home-based trips on the bus and rapid transit lines that serve their home communities.

Table 3-10 shows the change in AM Peak period, PM Peak period, and non-peak trip share for the local bus network as a whole, each rapid transit line, and the Silver Line during summer months (July and August 2015). CTPS compared this trip-making activity to that which occurred prior to the Youth Pass pilot, using data from the Summer group of pre-pilot participants. Highlighted cells show an increase from the value calculated from the pre-pilot data set to the value calculated for the Youth Pass pilot data set.

TABLE 3-10
Change in Peak-Period Trip Share
for Bus Network and Rapid Transit Lines
(Pre-Pilot and Youth Pass Pilot Data, Summer Month)

Service Period and Data Set	Bus: All Routes	Rapid Transit: Blue Line	Rapid Transit: Green Line	Rapid Transit: Orange Line	Rapid Transit: Red Line	Rapid Transit: Silver Line
AM-Peak-Period Share: Pre-Pilot	16.8%	24.6%	6.6%	11.3%	14.3%	7.8%
AM-Peak-Period Share: Youth Pass	18.3%	16.2%	6.3%	13.8%	17.6%	15.3%
PM-Peak-Period Share: Pre-Pilot	21.9%	13.7%	24.7%	21.9%	20.7%	24.1%
PM-Peak-Period Share: Youth Pass	21.2%	24.9%	27.0%	19.5%	22.3%	25.2%
Non-Peak-Period Share: Pre-Pilot	61.3%	61.7%	68.7%	66.8%	65.0%	68.1%
Non-Peak-Period Share: Youth Pass	60.6%	58.5%	66.7%	66.7%	60.2%	59.5%

Data sources: MBTA Youth Pass pilot AFC data, MBTA pre-pilot AFC Data

During summer months, the share of trips made by Youth Pass participants increased on bus routes and on the Orange, Red, and Silver lines during the AM Peak period. During the PM Peak period, the share of trips made by Youth Pass participants increased on the Blue, Green, Red and Silver lines. As mentioned previously, though there are changes in the share of trips Youth Pass participants made across modes and across service periods, the overall net impact of their trip-making activity is small.

3.3 Summary of Title VI Fare Equity Analysis

The Federal Transit Administration (FTA) requires that the MBTA conduct a fare equity analysis for any fare change that lasts longer than six months—as is the case for the Youth Pass Pilot program—to evaluate whether the fare changes would have a disparate impact based on race, color, or national origin, and whether low-income riders would bear a disproportionate burden or non-low-income riders would receive disproportionate benefits because of the changes. CTPS conducted a Title VI Fare Equity Analysis of the Youth Pass Pilot program using program data available through October 15, 2015, in order to meet these federal requirements and support continuation

of the pilot program beyond six months. This analysis is detailed in the Youth Pass Pilot Program: Title VI Fare Equity Analysis memorandum (December 15, 2015).

With respect to the analysis findings, the Youth Pass monthly and weekly fare products provide a benefit to eligible users because they provide access to the bus and rapid transit system at a significant discount compared to similar pass products. The monthly Youth Pass, which is priced the same as MBTA Student Monthly (\$26), represents a 65 percent discount compared to a full-price monthly LinkPass (\$75). When analyzing the effective per-trip costs for minority, low-income, and all Youth Pass participants, CTPS found that the two Youth Pass products (monthly and 7-day) result in no disparate benefit to non-minority youth in the program, and no disproportionate benefit to non-low-income youth in the program, according to the MBTA's Disparate Impact and Disproportionate Burden Policy.

3.4 Impacts on MBTA Service (Cash Handling, Conflicts with Employees, Fare Evasion)

In addition to the other topics discussed in this chapter, the Youth Pass Pilot was intended to examine whether the pass improved the MBTA's operations and riders' experiences on the system. The Youth Pass Working Group theorized that additional passes would:

- Reduce the amount of cash used on-board buses and above-ground trolleys, which slows boarding and increases dwell times
- Reduce the amount of fare evasion by pass-holders
- Improve interactions between MBTA staff and pilot participants

These impacts proved difficult to assess, but the preliminary data does suggest minor impacts, which are explained below.

First, it is likely that the Youth Pass decreased cash payment on-board vehicles for participants. While detailed data is not available on cash transactions as there was no way to track cash payments, youth who applied for the pass reported a high level of cash payment when compared to the population of all riders. Twenty-six percent of applicants reported that they pay for rides with cash at some point recently. While we do not know exactly how many trips were paid for with cash, this is significantly higher than the system-wide average cash payment rate of 2 percent. With a pass, participants would not use cash to board buses and other vehicles.

The MBTA also asked participants their opinions of the Youth Pass's impact on fare evasion and interactions between participants and MBTA employees. When asked if

they thought the Youth Pass reduces fare evasion, 75 percent of respondents said yes, while just 3 percent responded no (the remainder were not sure). When asked if the Youth Pass reduces conflicts between riders and employees, 59 percent believed that it did, while just 11 percent responded no. While this is subjective data, the perception is that the Youth Pass impacts both these issues positively.

Chapter 4—Pilot Administrative Feasibility

4.1 Pilot Administrative Procedures

Municipal Partnerships

The MBTA and the partner organizations worked together for six months to create the pilot program structure. Each partner signed a Memorandum of Understanding with the MBTA that specified each organization’s responsibilities. The MBTA wrote a Policy Handbook that detailed the rules of the program for the partners to use in implementation. After the program was launched, the MBTA and representatives of the partner municipalities held monthly meetings to check in on the administration of the program and resolve outstanding issues.

The municipal partners were free to develop their own administration procedures, so long as these procedures could be later audited, and the municipalities collected and verified the necessary paperwork. Some scanned the necessary documents and stored them in an online filing system, while others stored hard copies in folders. The MBTA provided the partners with a spreadsheet to track participants, their enrollment, and their payment status. For the means-tested participants, municipal partners were expected to collect documentation of their enrollment in a means-tested program. They also were expected to conduct a “second-step” verification of 10 percent of their means-tested participants. This was conducted via phone calls to the organizations or programs that participants claimed they were enrolled in; the “second-step” verification revealed no cases of fraud. Staff at the MBTA also reviewed the pass-usage data and found no evidence of suspicious usage (very high numbers of trips on one pass).

The MBTA conducted site visits of each municipal office to observe operations, ensure that partners followed proper procedure, and interview partner staff about their experiences administering the Youth Pass. This section details the results of these audits. Overall, the municipal partners seemed to follow the agreed-upon procedure. While there were some slight irregularities, there were no major problems in administration, nor did MBTA oversight reveal any major errors or cases of fraud. The major concerns expressed by the partners will be largely addressed by making the pass available on fare vending machines.

Municipal Partner Feedback

Partners generally believed the Youth Pass was an important program and wanted it to become permanent, but expressed concerns about the resources required to handle the program in its current design — particularly the handling of cash.

Major positive feedback from the partners included:

- General appreciation of the program by the youth participants. This showed partners that it was a valuable program for these participants and that their work was appreciated. Additionally, the program helped partner offices to fulfill their mission and connect face-to-face with youth constituents who may be difficult to reach via other methods.
- The RSTs provided by the MBTA to refill the cards were reliable and easy to use.
- Invoicing from the MBTA was smooth, and no major errors were reported by either the MBTA or municipal partners.

Negative feedback from the partners included:

- Partners reported that the workload was highly variable. For example, the workload was very high during the initial enrollment period, but there was little to do at mid-month times when few participants were coming in.
- The card printers used to print the Youth Passes were very slow (especially for the first printing of the day) and sometimes created duplicates.
- Participants often wished they could purchase passes online or with a credit or debit card rather than cash.

Finally, partners expressed concerns about having enough staff and other resources to administer the program if continued, especially if the enrollment were expanded. It was clear from partner comments that continuing to vend passes monthly via RSTs in municipal partner offices was not only infeasible for their staff, but also presented barriers to participants, which reduced the reach of the pass and could prevent a full program from meeting its goal of providing access to those who need it.

Most of the negative feedback is addressed by having the passes available on fare vending machines throughout the MBTA system, similar to the Student Pass change approved by the Fiscal and Management Control Board.

Those enrolled in school could purchase passes without ever needing to go to a separate office. Youth who are not enrolled in school would need to visit a partner office to be approved for the program and receive a Youth Pass card, but would not have to return to the office each month because they could re-load their passes at fare vending machines. The workload would still be variable, as most participants would likely enroll in September, but would be far lower overall. The cash handling for the partners would be eliminated as well.

4.2 Administrative Feasibility

The Youth Pass Pilot proposal included three questions about the administration of the program. First, what are the administrative costs of the pilot program to the MBTA?

The administrative cost of the pilot is currently estimated at approximately \$200,000, significantly less than the \$443,000 of administrative costs presented in the December 2014 proposal. This is mostly due to changes in the structure of the pilot's administration and low participation rates.

The pilot consumes staff resources to:

- Design the program with the partners and write the legal documents
- Train the partners to use the RST and card-printer machines
- Design and order the special cards, work with Scheidt & Bachmann (the MBTA's fare systems contractor) to make tariff changes, and deal with lost cards
- Design the data collection and survey components of the research aspect of the pilot
- Analyze the data from the pilot and oversee CTPS's work
- Meet with the partners monthly to address issues
- Make site visits to audit the partners

Some of those resources would not be necessary for a full program, but the MBTA would still supply the cards and card printers to partners, provide oversight and auditing of partners, and handle lost cards and other administrative issues. This would require a new staff position dedicated to overseeing the program and assisting with the changes to the Student Pass program.

The second question posed in the proposal is, "What are the administrative costs to the municipal partners, and is it sustainable?" The interviews with the partners revealed that the current model of the Youth Pass, with participants paying at the partner's offices, is not sustainable. The City of Boston reported that they cannot continue the program after the pilot is over under this model. However, the partners believe that the program could continue if the passes are sold on the fare vending machines.

The third question posed in the proposal is, "Does the pilot create a procedure that is audit proof, limits fraud, and replicable?" The pilot created a procedure that is auditable and limits fraud. This was in part due to the collaborative nature of the development of the program so that the partners and the MBTA were in agreement with the goals.

There will likely be some challenges with extending the program to other municipal partners who were not involved in the initial program design. The requirements for the means-testing, and procedures for storing documents and verifying eligibility will need to

be standardized. The MBTA will have to develop a new Memorandum of Understanding and policy handbook for the partners.

Chapter 5—Pilot Program Evaluation and Next Steps

5.1 Summary of Program Evaluation Findings

The Youth Pass Pilot was designed to meet the following five major goals.

Goal 1: Create affordable transit access for pilot participants

The pilot has accomplished this goal for the applicants who finished all of the steps to enroll in the pilot.

Goal 2: Provide the data required to assess the impact of a Youth Pass on the mobility of youth and their engagement in civic and community activities

The pilot has collected data, and the preliminary results indicate that the Youth Pass has increased access to a range of activities for participants.

Goal 3: Have a limited impact on the MBTA's revenue

The pilot is estimated to have a very limited impact on MBTA fare revenue.

Goal 4: Provide the data required to estimate the impact of a permanent Youth Pass program on MBTA fare revenue and service delivery

The pilot has generated data to assist in the estimates of a full Youth Pass, but these estimates still require assumptions outside the scope of the pilot data collection.

Goal 5: Assess whether municipal partners can distribute reduced fare MBTA passes in an audit-proof manner that minimizes the MBTA administrative burden

The pilot has demonstrated a proof of concept for a collaborative model of administering reduced fare MBTA products that is auditable and limits the MBTA administrative burden.

5.2 Program Evaluation Challenges and Limitations

The MBTA and CTPS encountered several challenges and limitations while conducting the pilot program evaluation:

- As discussed in Chapter 2, this report uses AFC data from the start of the program in July 2015 through March 2016, which was the last month of complete data available for the development of this report, to analyze Youth Pass usage. As a result, this report does not reflect information about Youth Pass purchases and use during the spring.
- The number of steps required to enroll and participate in the pilot has resulted in limited youth participation.

- As discussed in Section 2.3, most participants began providing their 30 days of pre-pilot trip data during May and June 2015, just before the start of the Youth Pass pilot program. This means that there is limited pre-pilot data that reflects the fall, winter, and spring months of the school year.
- The AFC data and resulting analyses may be missing some of the Youth Pass users. MBTA staff worked to match municipal records of Youth Pass participants to as many pass sales recorded in the RST data as possible, but it was still not possible to match some pass sales to Youth Pass pilot program participants.

5.3 Factors Affecting the Future of the Youth Pass

The Youth Pass pilot program has provided valuable insights into youth transportation needs and behavior. It has also provided an opportunity to evaluate how to most-effectively close gaps that may prevent youth from accessing reduced-price passes, including those available through the existing Student Pass program. To date, findings from the pilot program showed that Youth Pass participants made more trips than they did prior to the pilot program, expanding their ability to be active in their communities.

However, MBTA staff also found that cash-handling created a large burden for municipalities that were administering the program, and that it may be challenging for youth to purchase and renew Youth Passes if they have to continue to return to their municipal office.

The MBTA's most recent package of fare changes addresses some of these issues for both the Youth Pass and student fare products. On March 7, 2016, the MBTA's Fiscal Management and Control Board voted on a package of fare changes, effective July 1, 2016, that includes several relevant provisions:

- The cost of a Student Monthly LinkPass (valid 7 days per week) will increase from \$26 to \$30. The price of a monthly Youth Pass would equal the cost of a Student Monthly LinkPass, and so the cost of the Youth Pass, if implemented, would increase from \$26 to \$30.
- Students will be able to purchase Student Monthly LinkPasses 12 months of the year, instead of only 10 months.
- During the 2016–17 school year, the MBTA will pilot-test sales of Student Monthly LinkPasses on MBTA fare vending machines. This would make it possible to sell monthly Youth Passes on fare vending machines as well.

In sum, these elements of the fare change package increase the price of the monthly student passes, but they also expand access to the Student Monthly LinkPass, and potentially to the Youth Pass. Students with a Student CharlieCard will be able to access a reduced-price pass through the Student Pass program year round. This will address 73 percent of the demand in the Youth Pass pilot.

These changes would make it possible to limit the scope of the Youth Pass program so that it specifically targets 12–18-year-old youth who are not enrolled in middle school or high school and 19–21-year-old means-tested youth. Youth that are eligible for Youth Passes would also be able to purchase and renew their passes at any fare vending machine, as opposed to returning to their city or town partner office each month to do so.

5.4 Full Program Recommendations

The preliminary results of the Youth Pass pilot resulted in the following recommendations for changes to the program if the Youth Pass is implemented as a full program:

- Allow sales of the monthly pass on the MBTA fare vending machines to ease the administrative burden on the municipal partners
- Continue to have municipal partners verify eligibility and provide the photo ID cards with an annual expiration date
- Allow additional municipalities to opt-in to the program
- Continue to analyze the means-testing portion of the program for future extensibility

5.5 Youth Pass Program Scenario Evaluation

To assess the possible revenue and service impacts of a full Youth Pass program, this section explores two possible scenarios for continuing or expanding the Youth Pass program beyond the 12-month pilot period. This analysis assumes that a future Youth Pass program, and the Student Pass program, would have the following structural characteristics:

- Only the monthly Youth Pass will be available in a future Youth Pass program. The 7-Day Youth Pass offered during the pilot will be discontinued.
- Monthly Youth Passes and Student Monthly LinkPasses would each cost \$30.
- Middle and high school students would be able to obtain Student Monthly LinkPasses year round, by receiving the Student S-Card from their school.
- Both monthly Youth Passes and Student Monthly LinkPasses will be available for purchase on MBTA fare vending machines (FVMs), once youth have confirmed

their eligibility for either program. Once they have enrolled, youth in the Youth Pass program would not need to return to their municipal partner office each month to pay for their pass.

As discussed in Section 5.3, the MBTA fare change package effective July 1, 2016, addresses many barriers that limit student access to Student Monthly LinkPasses. This makes it possible to limit the scope of the Youth Pass program so that it specifically targets youth who may not be able to afford a monthly pass at the full price or obtain it through another program. As a result, these two scenarios have the following features in terms of program eligibility:

- Middle and high school students would no longer be eligible to obtain monthly passes through the Youth Pass program because they would be able to obtain Student Monthly LinkPasses year-round. Youth 12–18 years old, not enrolled in middle or high school would be eligible for the Youth Pass.
- Youth in the 19-to-21-year-old age range would need to demonstrate that they meet means testing requirements to be eligible for the Youth Pass program. For the purposes of this scenario analysis, youth would need to be identified as living in a low-income household.¹⁰ This is used as a proxy for meeting the eligibility screens of enrollment in a state or federal benefit program like MassHealth, SNAP and public housing.

The two scenarios described in this report represent a low number and high number of municipalities that might participate in the program. The “Few Towns” scenario only includes the municipalities that have been participating in the pilot program. The “Many Towns” scenario includes the 14 communities that were part of the original Metropolitan Transit Authority’s (MTA) service area when the MBTA was formed, plus three additional municipalities that receive supplemental school bus service from the MBTA (Lynn, Melrose, and Quincy).¹¹ Table 5-1 lists the municipalities that were included in each scenario. The Many Towns scenario is not based on any discussion with the additional 13 municipalities; it only serves to provide a potential “upper-bound” case for a full Youth Pass program.

¹⁰ The threshold for low income is based on the median household income for the full 175-town MBTA service area estimated from 2010-2014 American Community Survey (ACS) data, which is \$73,587. The low income threshold is 60 percent of the median household income value, or \$44,152.

¹¹ The 14 communities that were part of the original Metropolitan Transit Authority’s (MTA) service area when the MBTA was formed include Arlington, Belmont, Boston, Brookline, Cambridge, Chelsea, Everett, Malden, Medford, Milton, Newton, Revere, Somerville, and Watertown.

TABLE 5-1
Possible Future Youth Pass Scenarios

Scenario	Representative Participating Municipalities
“Few Towns” (Original pilot participants)	Boston, Chelsea, Malden, Somerville
“Many Towns”	Arlington, Belmont, Boston, Brookline, Cambridge, Chelsea, Everett, Lynn, Malden, Medford, Melrose, Milton, Newton, Quincy, Revere, Somerville, Watertown

The sections below describe the three components of the scenarios:

- The market of youth eligible and likely to participate in a Youth Pass program
- The estimated net revenues for the MBTA, based on market size and various levels of program participation
- The estimated impacts to MBTA service, based on market size and various levels of program participation

Youth Eligible for a Future Youth Pass Program

To estimate the number of youth that would be eligible and likely to participate in a Youth Pass program under each scenario, CTPS applied a sequence of steps designed to capture youth that met age, school enrollment, and income (if applicable) criteria; and live near and are likely to use transit. These steps are described below. Several of the data sources mentioned in each step are described in Appendix A: Data Sources. Additional details for a number of these steps are available in Appendix B: Scenario Evaluation Methodology Details.

- **Step 1: Estimate the population of eligible youths, based on age, income, and school enrollment characteristics.** Eligible youth include those that are:
 - Ages 12 to 18 years old and are not enrolled in middle or high school or college
 - Ages 12 to 18 years old, who are enrolled in college
 - Ages 19 to 21 years old, who live in low-income households and are not enrolled in middle or high school or college
 - Ages 19 to 21 years old, who live in low-income households and are enrolled in college

CTPS developed these estimates using data from the 2014 American Community Survey (ACS), including data from the five-year summary file and

the five-year Public Use Microdata Sample (PUMS). These estimates only include youth in households; they exclude youth living in group quarters, such as college dormitories. Table B-1 in Appendix B shows the estimates for eligible youth in this group.

- **Step 2: Estimate the population of eligible youths who live near transit**
CTPS conducted a geographic information systems (GIS) analysis to determine the portion of the youth population that is eligible for a Youth Pass that lives within one-quarter mile walking distance of an MBTA bus stop or one-half mile walking distance of an MBTA rapid transit station. Table B-2 in Appendix B shows these results.
- **Step 3: Estimate the population of eligible youths who live near transit that are likely to use transit**
CTPS used data from the 2010–11 Massachusetts Travel Survey (MTS)—a statewide survey of how people use the Commonwealth’s multimodal transportation system—to estimate the percentage of people, by age group, who live in the densely-populated areas of the 17 municipalities included in the two scenarios and are likely to use transit. Appendix A provides additional details about the MTS, while Appendix B describes how information from the MTS was used to determine the share of youth, by age group, who are likely to use transit. Using the MTS data, CTPS estimated that approximately 37 percent of the 12-to-18-year-old population living near transit, and approximately 55 percent of the 19-to-21-year-old population living near transit, reported at least one transit trip as part of their survey response.¹² As a result, CTPS assumes these shares of each population segment reflect those who are likely to use transit.

Table 5-2 summarizes the results of steps 1 through 3, and shows the estimated number of people in each scenario that would be eligible, and may wish to participate, in a future Youth Pass program.

¹² The estimate of 19-21 year olds who reported at least one transit trip as part of their MTS response reflects youth in this age group, regardless of income. This estimate does not specifically reflect the transit usage of 19-21 year olds in low-income households.

TABLE 5-2
Estimated Youth Population Eligible for a Youth Pass,
Who Lives Near Transit and Uses Transit

Category	Few Towns Scenario	Many Towns Scenario
Age 12-18, Not Enrolled in School	800	1,300
Age 12-18, In College	700	1,300
Age 19-21, Low-Income, Not Enrolled in School	2,300	3,500
Age 19-21, Low-Income, In College	4,500	6,100
Total	8,400	12,200

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010-11 Massachusetts Travel Survey.

Note: Values have been rounded to the nearest 100 people. Totals may not sum due to rounding. Population values reflect youth in households only.

The populations of youth in either age group that are enrolled in school vary in comparison to the population groups shown in Table 5-2. In the Few Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is about 17,800. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 500 people. Meanwhile, in the Many Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is approximately 32,900. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 700 people.

Estimating Future Youth Pass Program Revenues

After estimating the markets of youth who would be eligible and may wish to participate in a Youth Pass program, CTPS applied several assumptions to calculate MBTA revenues under each program scenario. These assumptions are shaped by the MBTA fare-change package described earlier in this chapter and by the findings from the pilot program, as described in Chapters 2 and 3.

- **Youth Pass Cost:** The Youth Pass will cost \$30, the same as a Student Monthly LinkPass, based on the new fares that will go into effect on July 1, 2016.
- **Passes on Fare Vending Machines (FVMs).** When reviewing the Youth Pass AFC data, CTPS noticed cases where participants were paying single-ride and

transfer fares for trips for short periods between using their Youth Passes. They may have been paying for trips this way as a stop-gap measure until they could return to their municipal partner office to renew their pass. With the availability of passes on fare vending machines, after enrolling, participating youth will be able to buy their passes on FVMs; this will eliminate their need to pay for “between-pass” trips. As a result, youth participating in the program would only pay the cost of the pass (\$30) each month.

- **Estimates of Monthly “Foregone” Revenues per person.** CTPS used pre-pilot AFC data to estimate the amount that pilot participants would spend during either a school year month or summer month if they were not in a Youth Pass program. These monthly expenditure values, when multiplied by the estimated number of participants in the program during a given month, provide a way to estimate the amount of revenue the MBTA would take in if the Youth Pass program did not exist. Details about how CTPS created these estimates are available in Appendix B.

Table 5-3 shows the estimated monthly foregone revenue amount for each type of month (school or summer). During a given year, summer months include July and August, while school year months include September through June.

TABLE 5-3
Estimated Foregone Revenue Amounts, by Month

Groups Represented	Month Type	Foregone Revenue Amount
12-18, not enrolled in school or enrolled in college	School	\$56.50
12-18, not enrolled in school or enrolled in college	Summer	\$59.00
19-21 and low income, not enrolled in school or enrolled in college	School	\$56.50
19-21 and low income, not enrolled in school or enrolled in college	Summer	\$60.50

Data source: CTPS pre-pilot AFC data.

Note: Values have been rounded to the nearest \$0.50

- **Ongoing Participation.** CTPS assumed that youth participating in a future Youth Pass program would participate all months of the year. In reality, individual participation in the program would likely fluctuate over time, with youth entering, remaining in, or exiting the program as they learn about it, participate in it, and determine whether it continues to meet their needs.
- **Adding in passes for GED/HiSET program enrollees that would not otherwise be eligible for a Youth Pass.** Currently, some youth who are not enrolled in school may still have access to Student Monthly LinkPasses, particularly if they participate in a General Educational Development (GED) / High School Equivalency (HiSET) testing program that purchases monthly passes on behalf of their students. In the future, youth in these programs will not be able to receive reduced-price passes through the Student Pass program; MBTA staff anticipates that these individuals would be able to obtain passes through a Youth Pass program. Many of these youth are already eligible for the Youth Pass program based on other criteria, but youth aged 19 to 21 who do not live in low-income households would not be eligible based on the other criteria. CTPS estimated the number of passes that may currently be sold to youth in this category through the Student Pass program, and added this number of passes to estimated Youth Pass sales during school or summer months. Appendix B provides additional details on how CTPS estimated the number of passes for GED/HiSET program enrollees for each scenario.

To calculate estimated Youth Pass program revenues and foregone revenues, CTPS completed the following steps for each of the four market categories of participants (12 to 18 years old and not in school; 12 to 18 years old and in college; 19 to 21 years old, low-income, and not enrolled in school; and 19 to 21 years old, low-income, and in college):

- **Step 1:** CTPS developed a range of possible program participation levels, ranging from 10 percent of the eligible market participating in the program, to 100 percent (full participation).

*Example: 1,000 youth in category at a 10 percent participation level
 $1,000 * 0.10 = 100$ potential participants*

- **Step 2:** CTPS estimated the pass sales for summer months by multiplying the number of expected participants at each participation level by two (2). Any Student Monthly LinkPasses that were expected to be sold to participants in GED programs during summer months were added to these total pass sales. This adjusted number of passes was multiplied by \$30 to determine the estimated program revenues for the summer.

*Example: 100 potential participants * 2 months = 200 passes.
Add 10 pass sales for GED program enrollees during summer = 210 passes.
210 passes * \$30 = \$6,300*

- **Step 3:** CTPS estimated the foregone revenues for summer months by multiplying the number of passes sold by the appropriate average foregone revenue amount for that market category. In this calculation, each pass represents one month of youth travel.

*Example: Summer monthly foregone revenue for category: \$59.00
210 passes * \$59.00 = \$12,390*

- **Step 4:** CTPS estimated the pass sales for school months by multiplying the number of expected participants at each participation level by ten (10). Any Student Monthly LinkPasses that were expected to be sold to participants in GED programs during school months were added to total pass sales. This adjusted number of passes was multiplied by \$30 to determine the estimated program revenues for the school year.

*Example: 100 potential participants * 10 months = 1,000 passes
Add 50 pass sales for GED program enrollees during the school year
= 1,050 passes
1,050 passes * \$30 = \$31,500*

- **Step 5:** CTPS estimated the foregone revenues for school year months by multiplying the number of passes sold by the appropriate average foregone revenue amount for that market category. In this calculation, each pass represents one month of youth travel.

*Example: School monthly foregone revenue for category: \$55.00
1,050 passes * \$55.00 = \$57,750*

- **Step 6:** CTPS summed the Youth Pass revenues for the full year, and summed the estimated foregone revenues for the full year. The foregone revenues were subtracted from the Youth Pass revenues to determine the net program revenues at each participation level.

*Example: Total Youth Pass revenues: \$6,300 + \$31,500 = \$37,800
Total foregone revenues: \$12,390 + \$57,750 = \$70,140
Total net revenue loss: \$70,140 - \$37,800 = \$32,340*

CTPS followed this process for all four market categories of participants in order to develop net revenue estimates for the Few Towns scenario. This process was then repeated to develop estimates for the Many Towns scenario.

Few Towns Scenario: Net Program Revenues

Table 5-4 summarizes the ranges of net Youth Pass Program revenues for the Few Towns scenario, which includes Boston, Chelsea, Malden, and Somerville. CTPS created these ranges by varying the percent of each market category that would be likely to participate in a Youth Pass program. Values were calculated for each market category at 10 percent and at 100 percent. These ranges are shown for each individual market category, and then in total.

Under the Few Towns Scenario, net revenue losses would range from \$271,000 (at 10 percent participation) to approximately \$2.7 million (at 100 percent participation) per year, assuming all market categories are included in the program.

**TABLE 5-4
Few Towns Scenario: Ranges of Estimated Net Program Revenues, by Category**

Market Category	Range of Estimated Participants	Range of Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
Age 12–18, Not Enrolled in School	100 – 800	1,000 – 9,500	\$29,000 – \$285,000	\$54,000 – \$540,000	(\$26,000 – \$255,000)
Age 12–18, In College	100 – 700	900 – 8,600	\$26,000 – \$259,000	\$49,000 – \$491,000	(\$23,000 – \$232,000)
Age 19–21, Low-Income, Not Enrolled in School	200 – 2,330	2,800 – 28,100	\$84,000 – \$843,000	\$160,000 – \$1,603,000	(\$76,000 – \$760,000)
Age 19–21, Low-Income, In College	500 - 4500	5,400 – 54,000	\$162,000 – \$1,621,000	\$308,000 – \$3,082,000	(\$146,000 – \$1,461,000)
Total	800 – 8,400	10,000 – 100,300	\$301,000 – \$3,009,000	\$572,000 – \$5,716,000	(\$271,000 – \$2,708,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Participants and pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

Table 5-5 shows the estimated net program revenues for all categories combined at various participation levels. To estimate the number of eligible youth who might choose to participate in a future Youth Pass program, CTPS calculated the pilot program application rate for eligible youth in the participating municipalities. To do so, CTPS first determined the total number of youth who applied to the Youth Pass pilot program that would meet the eligibility criteria of the Youth Pass program under the scenarios (12 to 18-year-old youth not enrolled in middle or high school; and 19 to 21-year-old youth not enrolled in middle or high school, that are also low-income). These values were then compared to the total eligible youth population in the four pilot municipalities that live near transit and are estimated to use transit.

Using this approach, CTPS determined that approximately 14 percent of eligible youth expressed interest in the program under current marketing conditions. As a result, CTPS has highlighted the 15 percent participation rate row in the table to indicate the expected level of participation in a future Youth Pass program. This percentage does not account for increased interest in the program in response to availability of Youth Passes on the fare vending machines or different methods to market the program.

TABLE 5-5
Few Towns Scenario: Estimated Net Program Revenues (All Categories) at Various Participation Levels

Market (All Categories) Participation Level	Age Category	Estimated Youth Passes Sold, Per Year ¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	12 to 18	1,800	\$54,000	\$103,000	(\$49,000)
	19 to 21	8,200	\$246,000	\$468,000	(\$222,000)
	All	10,000	\$301,000	\$572,000	(\$271,000)
15% participation	12 to 18	2,700	\$82,000	\$155,000	(\$73,000)
	19 to 21	12,300	\$370,000	\$703,000	(\$333,000)
	All	15,000	\$451,000	\$857,000	(\$406,000)
20% participation	12 to 18	3,600	\$109,000	\$206,000	(\$97,000)
	19 to 21	16,400	\$493,000	\$937,000	(\$444,000)
	All	20,100	\$602,000	\$1,143,000	(\$542,000)
30% participation	12 to 18	5,400	\$163,000	\$310,000	(\$146,000)
	19 to 21	24,600	\$739,000	\$1,405,000	(\$666,000)
	All	30,100	\$903,000	\$1,715,000	(\$812,000)
100% participation	12 to 18	18,100	\$544,000	\$1,032,000	(\$487,000)
	19 to 21	82,100	\$2,464,000	\$4,685,000	(\$2,220,000)
	All	100,300	\$3,009,000	\$5,716,000	(\$2,708,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010-11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21 year old youth in GED/HiSET programs.

At the 15 percent participation level, estimated net revenue losses are approximately \$73,000 for the 12-to-18-year-old group (including both youth not enrolled in school and in college), and \$333,000 for the 19-to-21-year-old group (including both youth not enrolled in school and in college). At the 15 percent participation level, the estimated net revenue loss for all categories is approximately \$406,000.

Appendix B includes four tables that provide the information shown in Table 5-5, but are specific to each of the four market categories.

Many Towns Scenario: Net Program Revenues

Table 5-6 summarizes the ranges of net Youth Pass Program revenues for the Many Towns scenario, which includes the 17 core-area communities listed in Table 5-1. CTPS created these ranges by varying the percent of each market category that would be likely to participate in a Youth Pass program from 10 percent to 100 percent. These ranges are shown for each individual market category, and in total.

**TABLE 5-6
Many Towns Scenario: Ranges of Estimated Net Program Revenues, by Category**

Market Category	Range of Estimated Participants	Range of Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
Age 12–18, Not Enrolled in School	100 – 1,300	1,500 – 15,400	\$46,000 – \$464,000	\$88,000 – \$878,000	(\$41,000 – \$415,000)
Age 12–18, In College	100 – 1,300	1,600 – 16,000	\$48,000 – \$481,000	\$91,000 – \$911,000	(\$43,000 – \$431,000)
Age 19–21, Low-Income, Not Enrolled in School	300 – 3,500	4,200 – 41,800	\$125,000 – \$1,253,000	\$238,000 – \$2,382,000	(\$113,000 – \$1,129,000)
Age 19–21, Low-Income, In College	600 – 6,100	7,300 – 73,300	\$220,000 – \$2,198,000	\$418,000 – \$4,178,000	(\$198,000 – \$1,980,000)
Total	1,200 – 12,200	14,700 – 146,500	\$440,000 – \$4,396,000	\$835,000 – \$8,350,000	(\$395,000 – \$3,955,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010-11 Massachusetts Travel Survey; CTPS pre-pilot AFC data. Note: Note: Participants and pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21 year old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

Under the Many Towns Scenario, net revenue losses would range from \$395,000 (at 10 percent participation) to approximately \$4 million (at 100 percent participation) per year, assuming all market categories are included in the program.

Table 5-7 shows the estimated net program revenues for all categories combined at various participation levels. As discussed in the Few Towns scenario section, CTPS determined that approximately 14 percent of eligible youth expressed interest in the program under current marketing conditions. As a result, CTPS has highlighted a 15 percent participation row in the table to indicate the expected level of participation in a future Youth Pass program.

TABLE 5-7
Many Towns Scenario: Estimated Net Program Revenues (All Categories) at Various Participation Levels

Market (All Categories) Participation Level	Age Category	Estimated Youth Passes Sold, Per Year ¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	12 to 18	3,100	\$94,000	\$179,000	(\$85,000)
	19 to 21	11,500	\$345,000	\$656,000	(\$311,000)
	All	14,700	\$440,000	\$835,000	(\$395,000)
15% participation	12 to 18	4,700	\$142,000	\$268,000	(\$127,000)
	19 to 21	17,300	\$518,000	\$984,000	(\$466,000)
	All	22,000	\$659,000	\$1,253,000	(\$593,000)
20% participation	12 to 18	6,300	\$189,000	\$358,000	(\$169,000)
	19 to 21	23,000	\$690,000	\$1,312,000	(\$622,000)
	All	29,300	\$879,000	\$1,670,000	(\$791,000)
30% participation	12 to 18	9,400	\$283,000	\$537,000	(\$254,000)
	19 to 21	34,500	\$1,035,000	\$1,968,000	(\$933,000)
	All	44,000	\$1,319,000	\$2,505,000	(\$1,186,000)
100% participation	12 to 18	31,500	\$945,000	\$1,790,000	(\$845,000)
	19 to 21	115,000	\$3,451,000	\$6,560,000	(\$3,109,000)
	All	146,500	\$4,396,000	\$8,350,000	(\$3,955,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010-11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21 year old youth in GED/HiSET programs.

At the 15 percent participation level, estimated net revenue losses are approximately \$127,000 for the 12-to-18-year-old group (including both youth not enrolled in school and in college), and \$466,000 for the 19-to-21-year-old group (including both youth not enrolled in school and in college). At the 15 percent participation level, the estimated net revenue loss for all categories is approximately \$593,000.

Appendix B includes four tables that provide the information shown in Table 5-7, but are specific to each of the four market categories.

Estimating Future Youth Pass Program Service Impacts

CTPS also estimated the additional number of unlinked weekday trips that may take place on the MBTA local bus and rapid transit system under the Few Towns and Many Towns Youth Pass program scenarios.¹³ Two sets of estimates were calculated for each scenario: one for additional weekday trips taking place during a summer month, and one for additional weekday trips taking place during a school-year month. To do this, CTPS used the estimated number of Youth Pass program participants to determine the number of passes that would be sold during a school-year or summer month.¹⁴ Each pass represents one month of youth travel. CTPS then applied several assumptions, which are determined by the MBTA fare-change package described earlier in this chapter, and by the findings from the pilot program.

- **Passes on Fare Vending Machines (FVMs).** When reviewing the Youth Pass AFC data, CTPS noticed cases where participants were paying single-ride and transfer fares for trips for short periods between using their Youth Passes. After enrolling in the Youth Pass program, participating youth will be able to buy their passes on FVMs, which will eliminate their need to make “between-pass” trips. Therefore, CTPS assumed that a monthly Youth Pass will cover all of a participant’s monthly trips on the local bus and rapid transit system.
- **Ongoing Participation.** CTPS assumed that youth participating in a future Youth Pass program would participate all months of the year.
- **Estimates of Weekday Trips per Month (Pre-Pilot Data).** CTPS used pre-pilot AFC data to estimate the number of unlinked weekday trips that youth made per month before they received a Youth Pass. These values are based on different samples of pre-pilot participants, which varied depending on:

¹³ An unlinked trip is an individual trip on any single transit vehicle; a single journey, often composed of many unlinked trips on multiple vehicles, is a “linked” trip. These estimates of unlinked trips are based on the number of times people tapped their CharlieCard to interact with an AFC fare gate or fare box.

¹⁴ These pass estimates were later adjusted to include estimates of passes for 19-to-21-year old youth (not low income) in GED/HiSET programs that would be purchased in a given month.

- Whether the participants were enrolled in school
- Whether the participants lived in a low-income household
- Whether they provided their 30-days of pre-pilot data during school months (late May through June 2015, and September 2015 through March 2016), or during summer months (July and August 2015)

Appendix B includes details about how CTPS created these estimates.

AFC data for taps against MBTA fare gates or fare boxes includes a time stamp, which makes it possible to determine the day of the week and the time of day a trip was made. CTPS used this information to determine whether trips made on weekdays were made during the AM peak period (between 7:00 AM and 8:59 AM), the PM peak period (between 4:00 PM and 6:30 PM), or during non-peak times. In addition to calculating an average number of weekday trips pre-pilot participants made per month, CTPS could also estimate the average number of weekday trips participants made during each service period, as shown in Table B-15 in Appendix B.

- **Estimates of Weekday Trips per Month (Youth Pass Data).** CTPS also used AFC data from Youth Pass participants to estimate the number of unlinked weekday trips that youth made per month with a Youth Pass. These values were calculated using a process similar to the one used to develop the pre-pilot values. CTPS created samples of Youth Pass participants based on whether or not they were enrolled in school, and whether or not they lived in low-income households. Only participants who used monthly Youth Passes were included in these samples, because only the monthly Youth Pass will be offered under these scenarios. CTPS estimated average weekday trips per month (by service period and overall) using per-person averages calculated over school months, and over summer months. These values are shown in Table B-16 in Appendix B.

Using these assumptions, CTPS calculated the net unlinked trips that would be added to the MBTA local bus and rapid transit system each weekday, depending on service period and month type, for the Few Towns and Many Towns scenarios. CTPS completed the following steps for each of the four market categories of participants (12 to 18 years old, not in school; 12 to 18 years old, in college; 19 to 21 years old, low income, and not enrolled in school; 19 to 21 years old, low income, and in college):

- **Step 1:** Using pre-pilot and Youth Pass estimates of net weekday trips per month (by service period), CTPS calculated the net number of additional trips a Youth Pass participant would make per month during each of these periods. Table 5-8 shows these values.

TABLE 5-8
Estimated Average Net Weekday Trips per Month, by Service Period

Groups Represented	Month Type	AM-Peak Period	Non-Peak Period	PM-Peak Period	Total
12–18, not-enrolled-in-school or enrolled-in-college	School	3	13	5	21
12–18, not-enrolled-in-school or enrolled-in-college	Summer	3	14	2	19
19–21 and low-income, not-enrolled-in-school or enrolled-in-college	School	3	14	5	22
19–21 and low-income, not-enrolled-in-school or enrolled-in-college	Summer	3	14	3	19

Data source: MBTA Youth Pass pilot AFC data, MBTA pre-pilot AFC data

- **Step 2:** As in the net revenue calculations, CTPS developed a range of possible program participation levels, ranging from 10 percent of the eligible market participating in the program, to 100 percent (full participation).
- **Step 3:** CTPS used the estimated number of Youth Pass program participants in each market category to determine the number of passes that would be sold during a summer month, including any passes for 19-to-21-year-old youth (not low-income) in GED/HiSET programs. As mentioned above, each pass represents one month of youth travel. CTPS then multiplied the number of passes in each market category by net weekday trip values for that category, as shown in Table 5-8.

*Example: 100 potential participants * 1 month = 100 passes.*

Add 2 pass sales for GED program enrollees during a summer = 102 passes.

*102 passes * 3 additional AM Peak weekday trips per month = 306 additional AM Peak weekday trips per month.*

- **Step 4:** CTPS divided the number of additional weekday trips per summer month, for each service period, by 20.75, which is the average number of weekdays per month when accounting for holidays. This makes it possible to determine the net additional trips in that service period on a given weekday during a summer month.

Example: 306 additional AM Peak weekday trips per month / 20.75 = 15 additional AM Peak trips per weekday.

- **Step 5:** CTPS repeated the process outlined in step 3, using data on participants, passes, and net additional weekday trips, to estimate the additional weekday trips per month (by service period) during a school year month.
- **Step 6:** CTPS repeated the process outlined in Step 4 to determine the net additional trips in that service period on a given weekday during a school year month.

Few Towns Scenario: Net Additional Weekday Trips

Tables 5-9 and 5-10 summarize the ranges of net additional weekday trips, by service period, that may be made on the MBTA local bus and rapid transit system for the Few Towns Youth Pass program scenario. Table 5-9 provides this information for a summer month, while Table 5-10 provides this information for a school year month. CTPS created these ranges by varying the percent of each market category that would be likely to participate in a Youth Pass program. Values were calculated for each market category at 10 percent and at 100 percent. These ranges are shown for each individual market category, and then in total. The columns for the peak periods are highlighted in each table.

TABLE 5-9
Few Towns Scenario: Ranges of Additional Weekday Trips per Service Period
(Summer Month)

Market Category	Range of Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
Age 12–18, Not-Enrolled-in-School	100 – 800	10 - 100	50 - 520	10 – 90	70 – 710
Age 12–18, In-College	100 – 700	10 – 90	50 – 470	10 – 80	70 – 650
Age 19–21, Low-Income, Not-Enrolled-in-School	240 – 2,300	30 – 290	160 – 1,580	30 – 300	220 – 2,170
Age 19–21, Low-Income, In-College	500 – 4,500	60 – 560	300 – 3,030	60 – 580	420 – 4,170
Total	800 – 8,400	100 – 1,030	560 – 5,600	110 – 1,060	770 – 7,700

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

TABLE 5-10
Few Towns Scenario: Ranges of Additional Weekday Trips per Service Period
(School Month)

Market Category	Range of Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
Age 12–18, Not-Enrolled-in-School	100 – 800	10 – 130	50 – 500	20 – 180	80 - 800
Age 12–18, In-College	100 – 700	10 – 110	50 – 460	20 – 160	70 – 730
Age 19–21, Low-Income, Not-Enrolled-in-School	230 – 2,300	40 – 380	160 – 1,570	50 – 530	250 – 2,500
Age 19–21, Low-Income, In-College	500 – 4,500	70 – 730	300 – 3,010	100 – 1,010	480 – 4,760
Total	800 – 8,400	130 – 1,340	550 – 5,540	190 – 1,890	880 – 8,760

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

These tables show that under the Few Towns scenario, the additional trips that may be made during the AM peak period range from around 100 trips (at the 10 percent participation level) to around 1,340 trips (at the 100 percent participation level), depending on the month type. During the PM peak period, estimated additional trips range from around 110 trips (at the 10 percent participation level) to nearly 1,900 trips (at the 100 percent participation level), depending on the month type. These estimates show that participants would likely make more peak-period trips during school months

compared to summer months. Overall, additional weekday trips, regardless of service period, range from 770 (at the 10 percent participation level) to approximately 8,800 (at the 100 percent participation level). As mentioned in Chapter 3, there were approximately 1.2 million weekday boardings on the MBTA bus and rapid transit systems in fiscal year (FY) 2013. This projected net growth in trips on the bus and rapid transit system is very small by comparison, and would likely be dispersed throughout the bus and rapid transit networks.

Tables 5-11 and 5-12 show the estimated additional weekday trips for all categories combined at various participation levels. CTPS has highlighted a 15 percent participation-rate row in the table to indicate the expected level of participation in a future Youth Pass program, based on pilot conditions.

**TABLE 5-11
Few Towns Scenario: Estimated Additional Weekday Trips at Various
Participation Levels (Summer Month)**

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
10% participation	800	100	560	110	770
15% participation	1,300	160	840	160	1,150
20% participation	1,700	210	1,120	210	1,540
30% participation	2,500	310	1,680	320	2,310
100% participation	8,400	1,030	5,600	1,060	7,700

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants

TABLE 5-12
Few Towns Scenario: Estimated Additional Weekday Trips at Various Participation Levels (School Month)

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
10% participation	800	130	550	190	880
15% participation	1,300	200	830	280	1,310
20% participation	1,700	270	1,110	380	1,750
30% participation	2,500	400	1,660	570	2,630
100% participation	8,400	1,340	5,540	1,880	8,760

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants

Tables 5-11 and 5-12 show that, at the 15 percent participation level, CTPS estimates that Youth Pass program participants would add 160 trips to the MBTA local bus and rapid transit system during the AM and PM peak periods during summer months. During school months, they would add approximately 200 trips during the AM peak on a given weekday, and approximately 300 trips during the PM peak.

Many Towns Scenario: Net Additional Weekday Trips

Tables 5-13 and 5-14 summarize the ranges of net additional weekday trips, by service period that may be made on the MBTA local bus and rapid transit system for the Many Towns Youth Pass program scenario. Table 5-13 provides this information for a summer month, while Table 5-14 provides this information for a school-year month. CTPS created these ranges by varying the percent of each market category that would be likely to participate in a Youth Pass program. Values were calculated for each market category at 10 percent and at 100 percent. These ranges are shown for each individual market category, and then in total. The columns for the peak periods are highlighted in each table.

TABLE 5-13
Many Towns Scenario: Ranges of Additional Weekday Trips per Service Period
(Summer Month)

Market Category	Range of Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
Age 12–18, Not-Enrolled-in-School	100 – 1,300	20 – 160	90 – 850	20 – 150	120 – 1,160
Age 12–18, In-College	100 – 1,300	20 – 170	90 – 170	20 – 160	120 – 1200
Age 19–21, Low-Income, Not-Enrolled-in-School	300 – 3,500	40 – 430	230 – 2,340	50 – 450	320 – 3,220
Age 19–21, Low-Income, In-College	600 – 6,100	80 – 760	410 – 4,110	80 – 790	570 – 5,650
Total	1,200 – 12,200	150 – 1,510	820 – 8,180	150 – 1,540	1,120 – 11,230

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

TABLE 5-14
Many Towns Scenario: Ranges of Additional Weekday Trips per Service Period
(School Month)

Market Category	Range of Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
Age 12–18, Not-Enrolled-in-School	100 – 1,300	20 – 200	80 – 820	30 – 290	130 – 1,310
Age 12–18, In-College	100 – 1,300	20 – 210	90 – 850	30 – 300	140 – 1,360
Age 19–21, Low-Income, Not-Enrolled-in-School	300 – 3,500	60 - 560	230 – 2,330	80 – 790	370 – 3,680
Age 19–21, Low-Income, In-College	600 – 6,100	100 – 990	410 – 4,090	140 – 1,380	650 – 6,450
Total	1,200 – 12,200	200 – 1,960	810 – 8,070	280 – 2,760	1,280 – 12,790

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants.

These tables show that under the Many Towns scenario, the additional trips that may be made during the AM peak period range from around 150 trips (at the 10 percent participation level) to around 2,000 trips (at the 100 percent participation level), depending on the month type. During the PM peak period, estimated additional trips range from around 150 trips (at the 10 percent participation level) to nearly 2,800 trips (at the 100 percent participation level), depending on the month type. As with the Few Towns scenario, these estimates show that participants would likely make more peak-

period trips during school months compared to summer months. Overall, additional weekday trips, regardless of service period, range from 1,120 (at the 10 percent participation level) to approximately 12,800 (at the 100 percent participation level). The Many Towns scenario reflects about a 45 percent increase in average weekday trips compared to the Few Towns scenario. However, this growth would likely be dispersed throughout the bus and rapid transit networks and is still small compared to total weekday boardings for the local bus and rapid transit system as a whole.

Tables 5-15 and 5-16 show the estimated additional weekday trips for all categories combined at various participation levels. CTPS has highlighted a 15 percent participation row in the table to indicate the expected level of participation in a future Youth Pass program, based on pilot conditions.

TABLE 5-15
Many Towns Scenario: Estimated Additional Weekday Trips at Various Participation Levels (Summer Month)

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Month¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
10% participation	1,200	150	820	150	1,120
15% participation	1,800	230	1,230	230	1,680
20% participation	2,400	300	1,630	310	2,250
30% participation	3,700	450	2,450	460	3,370
100% participation	12,200	1,510	8,180	1,540	11,230

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants

TABLE 5-16
Many Towns Scenario: Estimated Additional Weekday Trips at Various Participation Levels (School Month)

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Additional AM Peak Period Trips	Additional Non-Peak Period Trips	Additional PM Peak Period Trips	Additional Trips (All Periods)
10% participation	1,200	200	810	280	1,280
15% participation	1,800	290	1,210	410	1,920
20% participation	2,400	390	1,610	550	2,560
30% participation	3,700	590	2,420	830	3,840
100% participation	12,200	1,960	8,070	2,750	12,780

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; MBTA pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Additional trips, by service period, have been rounded to the nearest 10 trips. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs that are not accounted for in the estimated range of participants

Tables 5-15 and 5-16 show that at the 15 percent participation level, CTPS estimates that Youth Pass program participants would add 230 trips to the MBTA local bus and rapid transit system during the AM and PM peak periods during summer months. During school months, they would make approximately 290 trips during the AM peak on a given weekday, and approximately 410 trips during the PM peak.

5.6 Conclusions

The Youth Pass Pilot has increased transit access for primarily low-income and minority youth, allowing them access to recreational opportunities, work, school, and medical appointments they would not have had otherwise. The collaborative partnership with municipalities has yielded an auditable reduced-fare program with limited administrative impact for the MBTA. A key finding of the pilot is that 73 percent of the applicants were eligible for an existing MBTA reduced-fare pass, but they are unable to access it due to their school not offering it or the limitations on summer months. These problems were addressed when the MBTA Fiscal and Management Control Board voted to sell the Student Pass on the fare vending machines and make it available year round.

This decision leaves youth 12–18 years old and not in middle or high school and 19–21 year olds who meet the means-tested eligibility criteria without access to the reduced fare when the Youth Pass pilot ends. CTPS and the MBTA used data from the pilot to calculate the cost in lost fare revenue from extending the pilot to these groups and the impact on service from the additional trips they would make. The estimates for the full program range widely based on assumptions of municipal opt in and participation rates by eligible youth.

Using an estimate of 15 percent market participation, the cost of the program in annual lost fare revenue ranges from \$406,000 if the four existing partner cities continue to participate to \$593,000 if all 17 MBTA core municipalities join the program. The estimated cost at a more conservative estimate of 30 percent participation would range from \$812,000 to \$1,186,000. The impact on service of the additional trips is expected to be minimal.

Appendices

A. DATA SOURCES

Youth Pass Application, Enrollment Survey, and Monthly Survey Data

Youth who were interested in participating in the pilot program filled out an online application, as mentioned in Chapter 1. They were asked to identify their date of birth, home zip code, age group (13 to 18 years old or 19 to 21 years old), race and ethnicity, household income, and whether they were enrolled in middle or high-school.¹⁵ Applicants who were 19 to 21 years old were asked to identify whether they were enrolled in a jobs program, a benefit program (such as the Special Supplemental Nutrition program for Women, Infants, and Children (WIC) or MassHealth), or a General Education Development (GED) or other adult education program; municipal partners used this information to help municipalities determine whether these applicants met means-testing requirements. The application survey also included questions about the number of trips applicants take on the MBTA bus or rapid transit system during the school year and summer, as well as questions about how applicants currently pay MBTA fares.

All applicants, regardless of whether they were ultimately enrolled in the program, were issued a participant number. The MBTA and CTPS used these participant numbers to identify automated fare collection (AFC) system transactions made by specific individuals (without needing their CharlieCard serial numbers or their personal information), and to link this data with the participants age, household income, school-and program-enrollment, and other information included in the application survey. This information enabled the MBTA and CTPS to make comparisons between sub-groups within the overall Youth Pass population, such as between students and youth not enrolled in school.

Youth who were accepted into the Youth Pass pilot program were asked to complete additional surveys, both during the enrollment process and on a monthly basis throughout the pilot. The enrollment survey requested that participants provide information about the purposes of the trips they make on the transit system and the other modes of transportation they regularly use. It also asked participants to indicate their level of satisfaction with various aspects of MBTA service, such as safety, cost, reliability, and interactions with MBTA staff. The monthly surveys included questions about the number and purposes of the trips participants took on the transit system the day before they received the survey, as well as questions about whether and how they might have made those trips if they did not have access to a Youth Pass.

¹⁵ While youth younger than 13 were permitted to sign up for the program, data they submitted online was not included in the analyses in this report. CTPS identified whether applicants were younger than 13 by calculating their age using the date of birth they reported on the online application form.

Interviews and Audit of Partner Agencies

The MBTA conducted an audit of each partner agency to ensure they were following the procedures for the program as detailed in the MOU and Policy Handbook. The MBTA also asked staff at the partner agencies a series of qualitative questions about the administration of the program.

MBTA Data

Automated-Fare-Collection-System Data (AFC Data)

The MBTA's automated fare collection (AFC) system records information about the date, time, and location at which a rider made a transaction at a fare gate or fare box, along with information about the price of the trip and the fare product that was used to pay for the trip. The MBTA and CTPS used two sets of AFC data from the Youth Pass Pilot program:

- Transaction data generated by the fare cards enrollees used prior to the beginning of the pilot ("pre-pilot data")
- Transaction data generated by Youth Passes

Pre-Pilot AFC Data

When Youth Pass applicants enrolled in the pilot program, municipal partners provided them with a blank CharlieCard and requested that they sign a release allowing MBTA staff to access AFC data associated with the card. This allowed MBTA staff to track a participant's interactions with the AFC system for 30 days prior to that participant receiving and using a Youth Pass. This information enabled the MBTA and CTPS to analyze whether participants' travel behavior changed after they obtained a Youth Pass. To preserve anonymity, the MBTA used the Youth Pass participant numbers generated during the application process to identify individual participants, while the participant's personal information (name, email address, etc.) was kept confidential.

Youth Pass AFC Data

After they provided 30 days of pre-pilot data, Youth Pass participants could return to municipal partner offices to purchase monthly or 7-day youth passes. These passes would be loaded onto their CharlieCard, which the MBTA could track through the AFC system. The Youth Pass AFC data set included the same general content as the pre-pilot AFC data set, and included participant numbers that could be linked to Youth Pass applications and surveys.

Retail Sales Terminal (RST) Data

The MBTA and CTPS also used transaction data from the retail sales terminals (RSTs) distributed to the four participating municipalities. This Retail Sales Terminal (RST) data identifies the date and time of pass purchases, the type and price of the pass that was purchased, and the serial number associated with the card or ticket on which the pass

was loaded. Using this serial number, CTPS could determine how many and what type of Youth Passes (monthly or 7-day) individuals purchased over time. Each RST also had a unique identifier, which made it possible to determine the number of passes sold in individual cities. Unlike the AFC data, however, it was not possible to link RST transaction data to information about the person who purchased the pass. This information was used to check findings from the AFC data, and to estimate whether there are Youth Pass pilot participants that may not be reflected in the AFC data.

Scenario Data Sets

2014 American Community Survey 5-Year Summary File

The American Community Survey (ACS) is an ongoing survey that provides data every year, and covers a broad range of topics about social, economic, demographic, and housing characteristics of the U.S. population.¹⁶ CTPS used the 2014 ACS 5-year summary file to obtain total population and age information for the municipalities included in each of the scenarios. The 5-year estimates from the ACS are referred to as “period” estimates, which represent data collected over a period of time. The advantage of these multi-year estimates is the increased statistical reliability of the data for less-populated areas and small population subgroups.

2014 ACS 5-Year Public Use Microdata Sample (PUMS) Data

Public Use Microdata Sample (PUMS) data contain a sample of actual responses to the ACS, as opposed to data that has already been tabulated for specific geographic areas.¹⁷ The geography associated with Public Use Microdata (PUM) is the Public Use Microdata Area (PUMA). A PUMA is a relatively large geographic area; each PUMA contains at least 100,000 residents. While the geography is large and imprecise, the Census Bureau provides extremely detailed American Community Survey (ACS) data that is not available for smaller geographies. A PUMA may contain more than one municipality, and a municipality can contain more than one PUMA. For example, PUMA 2700 encompasses Arlington, Belmont, Lexington, Watertown, and Waltham; Boston includes PUMAs 3301–3305.

CTPS used 2014 5-Year PUMS data to estimate Youth Pass eligible-populations in relevant municipalities based on school-enrollment and age characteristics, and based on the number of youth in low-income households.

¹⁶ Powell, Logan T. “American Community Survey 5-Year Data (2005-2009 to 2010-2014).” 2016. <http://www.census.gov/data/developers/data-sets/acs-survey-5-year-data.html>. Accessed May 31, 2016.

¹⁷ Source 1: U.S. Census Bureau, American Community Survey Office. American Community Survey 2010-2014 ACS 5-Year PUMS files Readme. 2016. http://www2.census.gov/programs-surveys/acs/tech_docs/pums/ACS2010_2014_PUMS_README.pdf. Accessed May 31, 2016. Source 2: American Community Survey. “Public Use Microdata Sample (PUMS) Documentation.” 2015. <https://www.census.gov/programs-surveys/acs/technical-documentation/pums.html>. Accessed May 31, 2016.

2010-2011 Massachusetts Travel Survey

CTPS determined the percentage of youths who live within walking distance of transit in the scenario study areas who might purchase a Youth Pass using the Massachusetts Travel Survey (MTS). The MTS was a large-scale, statewide survey that collected data on people's travel patterns. The survey was distributed to over 15,000 households between June 2010 and November 2011. From this survey, CTPS determined the percentage of the survey's respondents by age that lived within the study area who used transit on any of their trips, as they should be more likely to purchase a Youth Pass than those who did not use transit. The level of geography associated with the MTS for this analysis is the "ring"—two roughly concentric circles emanating from downtown Boston extending out to Route 128. CTPS used these rings because of their relationship to the study areas associated with the scenarios. Ring 0 and the dense portions of Ring 2 are included because they roughly overlap with people who live near transit in the 17 municipalities that are included in the two scenarios.

Data on Student Monthly LinkPass (M-7) sales to GED/Non-Middle or High School Programs

CTPS obtained MBTA data on sales of Student Monthly (M-7) LinkPasses to General Educational Development (GED) / High School Equivalency (HiSET), alternative education, and other programs outside of middle and high schools. This data was used in the scenarios discussed in Chapter 5 to develop estimates of the number of Youth Passes that may be sold to youth aged 19 to 21 and enrolled in GED/HiSET programs, who previously received passes through the Student Pass program.

B. SCENARIO EVALUATION METHODOLOGY DETAILS

This section provides some additional detail on the three steps used in the scenario evaluation process:

- The market of youth eligible and likely to participate in a Youth Pass program
- The estimated net revenues for the MBTA, based on market size and various levels of program participation
- The estimated impacts to MBTA service, based on market size and various levels of program participation

Youth Eligible for a Future Youth Pass Program

To estimate the number of youth that would be eligible and likely to participate in a Youth Pass program under each scenario, CTPS applied a sequence of steps designed to capture youth that met age, school-enrollment, and income (if applicable) criteria; and that live near and are likely to use transit. These steps are described below. Several of the data sources mentioned in each step are described in Appendix A: Data Sources.

- **Step 1: Estimate the population of eligible youths, based on age, income, and school-enrollment characteristics**

Eligible youth include those that are:

- Ages 12 to 18, who are not in middle or high school and are not enrolled in college
- Ages 12 to 18, who are enrolled in college
- Ages 19 to 21, who live in low-income households and are not enrolled in middle or high school or in college
- Ages 19 to 21, who live in low-income households and are enrolled in college

CTPS developed these estimates using data from the 2014 American Community Survey (ACS), including data from the five-year summary file and the five-year Public Use Microdata Sample (PUMS). The ACS Summary file provides information about the overall population in the relevant municipalities, while the PUMS data provides detailed information about large geographic areas, called Public Use Microdata Areas (PUMAs). Age, school-enrollment, and income factors were calculated using the PUMS data and then applied to the populations of each set of municipalities, depending on the overlap between these municipalities and particular PUMAs.

Table B-1 shows the population in each school-enrollment category for the Few Towns and Many Towns scenarios. These estimates only include youth in households; they exclude youth living in group quarters, such as college dormitories.

TABLE B-1
Estimated Youth Population Eligible for a Youth Pass, based on Age, School Enrollment and Income Characteristics

Category	Few Towns Scenario	Many Towns Scenario
Age 12–18, Not Enrolled in School	2,200	3,700
Age 12–18, In College	2,000	3,900
Age 19–21, Low Income, Not Enrolled in School	4,300	6,600
Age 19–21, Low Income, In College	8,300	11,800
Total	16,800	26,000

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS).

Note: Values have been rounded to the nearest 100 people. Totals may not sum due to rounding. Population values reflect youth in households only.

The populations of youth in either age group that are enrolled in school vary in comparison to the population groups shown in Table B-2. In the Few Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is about 49,000. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 900 people. Meanwhile, in the Many Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is approximately 97,900. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 1,300 people.

- Step 2: Estimate the population of eligible youths who live near transit**
 CTPS conducted a geographic information systems (GIS) analysis to determine the portion of the youth population that is eligible for a Youth Pass and lives within one-quarter mile walking distance of an MBTA bus stop or one-half mile walking distance of an MBTA rapid transit station. Table B-2 shows these results.

TABLE B-2
Estimated Youth Population Eligible for a Youth Pass,
Who Lives Near Transit

Category	Few Towns Scenario	Many Towns Scenario
Age 12–18, Not Enrolled in School	2,100	3,500
Age 12–18, In College	2,000	3,600
Age 19–21, Low-Income, Not Enrolled in School	4,300	6,300
Age 19–21, Low-Income, In College	8,200	11,200
Total	16,600	24,600

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis.

Note: Values have been rounded to the nearest 100 people. Population values reflect youth in households only.

The populations of youth in either age group that are enrolled in school vary in comparison to the population groups shown in Table B-3. In the Few Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is about 49,000. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 900 people. Meanwhile, in the Many Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is approximately 89,100. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 1,300 people.

- **Step 3: Estimate the population of eligible youths who live near transit that are likely to use transit**

CTPS used data from the 2010–11 Massachusetts Travel Survey (MTS)—a statewide survey of how people use the Commonwealth’s multimodal transportation system—to estimate the percentage of people, by age group, who live in the densely-populated areas of the 17 municipalities included in the two scenarios and are likely to use transit. Appendix A provides additional details about the MTS. Using the MTS data, CTPS estimated that approximately 37 percent of the 12-to-18-year-old population living near transit, and 55 percent of the 19-to-21-year-old population living near transit, reported at least one transit

trip as part of their survey response.¹⁸ As a result, CTPS assumes these shares of each population segment reflect those who are likely to use transit.

Table B-3 summarizes the results of steps 1 through 3, and shows the estimated number of people in each scenario that would be eligible, and may wish to participate, in a future Youth Pass program.

TABLE B-3
Estimated Youth Population Eligible for a Youth Pass,
Who Lives Near Transit and Uses Transit

Category	Few Towns Scenario	Many Towns Scenario
Age 12–18, Not Enrolled in School	800	1,300
Age 12–18, In College	700	1,300
Age 19–21, Low-Income, Not Enrolled in School	2,300	3,500
Age 19–21, Low-Income, In College	4,500	6,100
Total	8,400	12,200

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010-11 Massachusetts Travel Survey.

Note: Values have been rounded to the nearest 100 people. Totals may not sum due to rounding. Population values reflect youth in households only.

The populations of youth in either age group that are enrolled in school vary in comparison to the population groups shown in Table B-4. In the Few Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is about 17,800. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 500 people. Meanwhile, in the Many Towns scenario, the estimated 12-to-18-year-old population enrolled in middle or high school is approximately 32,900. The 19-to-21 year old population that is a) enrolled in middle or high school; and b) living in low income households is about 700 people.

¹⁸ The estimate of 19-21 year olds who reported at least one transit trip as part of their MTS response reflects youth in this age group, regardless of income. This estimate does not specifically reflect the transit usage of 19-21 year olds in low-income households.

Revenue Estimation Methodology

After estimating the markets of youth who would be eligible and may choose to participate in a Youth Pass program, CTPS applied several assumptions to calculate MBTA revenues under each program scenario. These assumptions are shaped by the MBTA fare-change package described earlier in this chapter, and by the findings from the pilot program, as described in Chapters 2 and 3.

- **Youth Pass Cost:** The Youth Pass will cost \$30, the same as a Student Monthly LinkPass, based on the new fares that will go into effect on July 1, 2016.
- **Passes on Fare Vending Machines (FVMs).** When reviewing the Youth Pass AFC data, CTPS noticed cases where participants were paying single-ride and transfer fares for trips for short periods between using their Youth Passes. They may have been paying for trips this way as a stop-gap measure until they could return to their municipal partner office to renew their pass. With the availability of passes on fare vending machines, after enrolling, participating youth will be able to buy their passes on FVMs; this will eliminate their need to pay for “between-pass” trips. As a result, youth participating in the program would only pay the cost of the pass (\$30) each month.
- **Estimates of Monthly “Foregone” Revenues per person.** CTPS used pre-pilot AFC data to estimate the amount that pilot participants would spend during either a school year month or summer month if they were not in a Youth Pass program. These monthly expenditure values, when multiplied by the estimated number of participants in the program during a given month, provide a way to estimate the amount of revenue the MBTA would take in if the Youth Pass program did not exist.

To create these estimates, CTPS examined the trips that pre-pilot participants made and whether they paid for these trips using particular types of passes or at particular stored-value rates, and applied fare and pass prices that will be in effect after July 1, 2016. CTPS then determined monthly expenditure values using samples of participants who were not enrolled in school and did not use Student Monthly LinkPasses or Student CharlieCards to pay for their trips. To reflect the spending of low-income participants who are not enrolled in middle or high school, CTPS created a separate set of monthly expenditure values using samples of low-income pre-pilot participants.¹⁹

¹⁹ Youth pass applicants reported their household income level on the Youth Pass application form. Youth who identified their household income as less than \$42,000 were flagged as being from low-income households, because at the start of the pilot program, the threshold used to identify low

Table B-4 shows the estimated monthly foregone revenue amount for each type of month (school or summer). During a given year, summer months include July and August, while school year months include September through June.

TABLE B-4
Estimated Foregone Revenue Amounts, by Month

Groups Represented	Month Type	Foregone Revenue Amount
12–18, not enrolled in school or enrolled in college	School	\$56.50
12–18, not enrolled in school or enrolled in college	Summer	\$59.00
19–21 and low-income, not enrolled in school or enrolled in college	School	\$56.50
19-21 and low-income, not enrolled in school or enrolled in college	Summer	\$60.50

Data source: CTPS pre-pilot AFC data.

Note: Values have been rounded to the nearest \$0.50

- **Ongoing Participation.** CTPS assumed that youth participating in a future Youth Pass program would participate all months of the year. In reality, individual participation in the program would likely fluctuate over time, with youth entering, remaining in, or exiting the program as they learn about it, participate in it, and determine whether it continues to meet their needs.
- **Adding in passes for GED/HiSET program enrollees that would not otherwise be eligible for a Youth Pass.** Currently, some youth who are not enrolled in school may still have access to Student Monthly Link Passes, particularly if they participate in a General Educational Development (GED) / High School Equivalency (HiSET) testing programs that purchases monthly

income households was 60 percent of the median 2011 household income in the MBTA 175 town service area, or \$41,636. Since the start of the pilot program, a new low income threshold of \$44,162 has been established using 2014 American Community Survey (ACS) data. As a result, the income threshold used to flag Youth Pass participants as low income, and the threshold to identify the low-income population that may participate in a future Youth Pass program are close, but do not match exactly.

passes on behalf of their students. In the future, youth in these programs will not be able to receive reduced-price passes through the Student Pass program; MBTA staff anticipates that these individuals would be able to obtain these passes through a Youth Pass program. Many of these youth are already eligible for the Youth Pass program based on other criteria, though youth aged 19 to 21 who do not live in low-income households would not be eligible based on the other criteria. CTPS estimated the number of passes that may currently be sold to youth in this category through the Student Pass program, and added this number of passes to estimated Youth Pass sales during school or summer months.

CTPS obtained MBTA data on sales of Student Monthly LinkPasses to GED/HiSET, alternative education, and other programs outside of middle and high schools, and attempted to identify GED/HiSET programs from this list based on internet research into the programs. CTPS used information on passes sold to these programs during summer 2015 and the 2015–16 academic year, through May 26. This may underestimate the number of passes that are sold to these programs, as they are currently able to purchase passes for a given academic year through June 15.

Of the estimated pass sales to GED/HiSET programs, CTPS assumed that approximately 50 percent are being sold to youth. This is based on a 1997 study, using data from the 1995 National Household Education Survey, which estimated that from a national survey, 16-to-24 year olds made up approximately 47 percent of those enrolled in GED or other high school completion programs.²⁰ This study did not contain information about the income levels of youth participating in GED/HiSET programs in the United States. In the absence of available information, CTPS assumed that 60 percent of these passes for GED/HiSET programs are being sold to youth who are not low-income. This assumption is based on the share of the youth population in Boston, Chelsea, Malden, and Somerville (where many of these programs are based), near transit, that is not enrolled in school and not low-income. Approximately 80 percent of these passes were expected to go to 19-to-21 year olds, as these make up about 80 percent of the share of youth who are not low-income and not enrolled in school. Tables B-5 and B-6 show estimates of passes sales during summer and school months, respectively.

TABLE B-5

²⁰ Kim, K., M.Collins, P. Stowe. Participation in Basic Skills Education: 1994-95. 1997. U.S. Department of Education National Center for Education Statistics. <http://nces.ed.gov/pubs97/97325.pdf>. Accessed June 1, 2016.

**Estimated Student Monthly LinkPass Sales to 19 to 21 Year Olds in
GED/HiSET Programs (Summer Months)**

	Total Summer M-7 passes sold	Total Passes expected to be sold to youth (50% of previous column)	Total Passes expected to be sold to youth who are not low- income (60% of previous column)	Total Passes expected to be sold to youth who are 19- 21 years old and not low-income (80% of previous column)
Few Towns	90	45	27	22
Many Towns	90	45	27	22

Data Source: MBTA data on Student Monthly LinkPass sales to GED/Non-Middle and High School Programs, as of May 26, 2016.

**TABLE B-6
Estimated Student Monthly LinkPass Sales to 19 to 21 Year Olds in
GED/HiSET Programs (School Months)**

	Total Summer M-7 passes sold	Total Passes expected to be sold to youth (50% of previous column)	Total Passes expected to be sold to youth who are not low income (60% of previous column)	Total Passes expected to be sold to youth who are 19-21 and not low income (80% of previous column)
Few Towns	288	144	86	69
Many Towns	438	219	131	105

Data Source: MBTA data on Student Monthly LinkPass sales to GED/Non-Middle and High School Programs, as of May 26, 2016.

In the net revenue calculations, the estimated number of GED pass programs is then adjusted to reflect a particular market participation level. For example, if 30 passes would be sold at full market participation, three (3) passes would be sold at 10 percent participation. Ultimately, this adjusted number of passes is added to the total count of passes that would be sold through the Youth Pass program

during either the summer or school year. CTPS has made the assumptions in the absence of more detailed data about the number and characteristics of people participating in GED/HiSET programs in the MBTA service area, and recommends that more detailed data on these programs be collected if the MBTA chooses to implement a permanent Youth Pass program.

Chapter 5 also provides information on estimated net revenues under the Few Towns and Many Towns Youth Pass program scenarios. Tables B-7 through B-10 provide detail on net revenues specific to each of the four market categories in the Few Towns scenario presented in Chapter 5.

TABLE B-7
Few Towns Scenario: Estimated Net Program Revenues (12 to 18 Years Old, Not-in-School Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	1,000	\$29,000	\$54,000	(\$26,000)
15% participation	1,400	\$43,000	\$81,000	(\$38,000)
20% participation	1,900	\$57,000	\$108,000	(\$51,000)
30% participation	2,900	\$86,000	\$162,000	(\$77,000)
100% participation	9,500	\$285,000	\$540,000	(\$255,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-8
Few Towns Scenario: Estimated Net Program Revenues (19 to 21 Years Old, Low-Income, Not-in-School Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	2,800	\$84,000	\$160,000	(\$76,000)
15% participation	4,200	\$126,000	\$240,000	(\$114,000)
20% participation	5,600	\$169,000	\$321,000	(\$152,000)
30% participation	8,400	\$253,000	\$481,000	(\$228,000)
100% participation	28,100	\$843,000	\$1,603,000	(\$760,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-9
Few Towns Scenario: Estimated Net Program Revenues (12 to 18 Years Old, In-College Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	860	\$26,000	\$48,000	(\$23,000)
15% participation	1,300	\$39,000	\$72,000	(\$35,000)
20% participation	1,700	\$52,000	\$96,000	(\$46,000)
30% participation	2,600	\$78,000	\$145,000	(\$70,000)
100% participation	8,600	\$259,000	\$482,000	(\$232,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-10
Few Towns Scenario: Estimated Net Program Revenues (19 to 21 Years Old, Low-Income, In-College Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	5,400	\$162,000	\$308,000	(\$146,000)
15% participation	8,100	\$243,000	\$462,000	(\$219,000)
20% participation	10,800	\$324,000	\$616,000	(\$292,000)
30% participation	16,200	\$486,000	\$925,000	(\$438,000)
100% participation	54,000	\$1,621,000	\$3,082,000	(\$1,461,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

Tables B-11 through B-14 provide detail on net revenues specific to each of the four market categories in the Many Towns scenario presented in Chapter 5.

TABLE B-11
Many Towns Scenario: Estimated Net Program Revenues (12 to 18 Years Old, Not-in-School Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	1,500	\$46,000	\$88,000	(\$41,000)
15% participation	2,300	\$70,000	\$132,000	(\$62,000)
20% participation	3,100	\$93,000	\$176,000	(\$83,000)
30% participation	4,600	\$139,000	\$264,000	(\$124,000)
100% participation	15,500	\$464,000	\$878,000	(\$415,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-12
Many Towns Scenario: Estimated Net Program Revenues (19 to 21 Years Old, Low-Income, Not-in-School Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	4,200	\$125,000	\$238,000	(\$113,000)
15% participation	6,300	\$188,000	\$357,000	(\$169,000)
20% participation	8,400	\$251,000	\$476,000	(\$226,000)
30% participation	12,500	\$376,000	\$715,000	(\$339,000)
100% participation	41,800	\$1,253,000	\$2,382,000	(\$1,129,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-13
Many Towns Scenario: Estimated Net Program Revenues (12 to 18 Years Old, In-College Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	1,600	\$48,000	\$91,000	(\$43,000)
15% participation	2,400	\$72,000	\$137,000	(\$65,000)
20% participation	3,200	\$96,000	\$182,000	(\$86,000)
30% participation	4,800	\$144,000	\$273,000	(\$129,000)
100% participation	16,000	\$481,000	\$911,000	(\$431,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

TABLE B-14
Many Towns Scenario: Estimated Net Program Revenues (19 to 21 Years Old, Low-Income, In-College Category) at Various Participation Levels

Market (All Categories) Participation Level	Estimated Youth Passes Sold, Per Year ¹	Total Annual Youth Pass Program Revenues	Total Annual Foregone Revenues	Total Net Program Revenues
10% participation	7,300	\$220,000	\$418,000	(\$198,000)
15% participation	11,000	\$330,000	\$627,000	(\$297,000)
20% participation	14,700	\$440,000	\$836,000	(\$396,000)
30% participation	22,000	\$659,000	\$1,253,000	(\$594,000)
100% participation	73,300	\$2,198,000	\$4,178,000	(\$1,980,000)

Data sources: 2014 American Community Survey (ACS) 5-Year Summary File; 2014 ACS 5-Year Public Use Microdata Sample (PUMS); CTPS GIS Analysis; 2010–11 Massachusetts Travel Survey; CTPS pre-pilot AFC data.

Note: Pass sales have been rounded to the nearest 100. Dollar values have been rounded to the nearest thousand. Totals may not sum due to rounding.

(1) The total annual pass sales have been adjusted to account for Youth Pass sales to 19-to-21-year-old youth in GED/HiSET programs.

Service Impacts Estimation Methodology

Chapter 5 describes the process CTPS followed to estimate the additional weekday trips that might be made under the Few Towns and Many Towns Youth Pass program scenarios, along with the results of that process. This appendix provides some additional detail on several assumptions that CTPS applied to make these calculations, particularly those related to estimates of weekday trips per month that were drawn from the pre-pilot and Youth Pass AFC data.

- **Estimates of Weekday Trips per Month (Pre-Pilot Data).** CTPS used pre-pilot AFC data to estimate the number of unlinked weekday trips that youth made per month before they received a Youth Pass. These values are based on samples of pre-pilot participants, which varied depending on:
 - Whether the participants were enrolled in school
 - Whether the participants lived in a low-income household

- Whether they provided their 30-days of pre-pilot data during school months (late May through June 2015, and September 2015 through March 2016), or during summer months (July and August 2015)

CTPS then determined an average number of unlinked trips per month for each sample, excluding any participants who used Student Monthly LinkPasses or Student CharlieCards to pay for their trips. To reflect the spending of low-income participants who are not enrolled in middle or high school, CTPS created a separate set of average monthly trip values using samples of low-income pre-pilot participants.²¹

AFC data for taps against MBTA fare gates or fare boxes includes a time stamp, which makes it possible to determine the day of the week and the time of day a trip was made. CTPS used this information to determine whether trips made on weekdays were made during the AM peak period (between 7:00 AM and 8:59 AM), the PM peak period (between 4:00 PM and 6:30 PM), or during non-peak times. In addition to calculating an average number of weekday trips pre-pilot participants made per month, CTPS could also estimate the average number of weekday trips participants made during each service period, as shown in Table B-15.

TABLE B-15
Pre-Pilot Data: Estimated Average Weekday Trips per Month, by Service Period

Groups Represented	Month Type	AM Peak Period	Non-Peak Period	PM Peak Period	Total
12–18, not-enrolled-in-school or enrolled-in-college	School	4	21	6	31
12–18, not-enrolled-in-school or enrolled-in-college	Summer	5	22	9	36
19–21 and low-income, not-enrolled-in-school or enrolled-in-college	School	5	21	6	32

²¹ For more information about how these participants were identified, see the section in Appendix B titled “Revenue Estimation Methodology.”

19–21 and low-income, not-enrolled-in-school or enrolled-in-college	Summer	5	22	9	36
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Data source: MBTA pre-pilot AFC data.

- Estimates of Weekday Trips per Month (Youth Pass Data).** CTPS also used AFC data from Youth Pass participants to estimate the number of unlinked weekday trips that youth made per month with a Youth Pass. These values were calculated using a process similar to the one used to develop the pre-pilot values. CTPS created samples of Youth Pass participants based on whether or not they were enrolled in school, and whether or not they lived in low-income households. Only participants who used monthly Youth Passes were included in these samples, because only the monthly Youth Pass will be offered under these scenarios. CTPS estimated average weekday trips per month (by service period and overall) using per-person averages calculated over school months, and over summer months. These values are shown in Table B-16.

TABLE B-16
Youth Pass Data: Average Estimated Weekday Trips per Month, by Service Period

Groups Represented	Month Type	AM Peak Period	Non-Peak Period	PM Peak Period	Total
12–18, not-enrolled-in-school or enrolled-in-college	School	8	34	10	53
12–18, not-enrolled-in-school or enrolled-in-college	Summer	7	36	11	55
19–21 and low-income, not-enrolled-in-school or enrolled-in-college	School	8	35	10	53
19–21 and low-income, not-enrolled-in-school or enrolled-in-college	Summer	8	36	11	55

Data source: MBTA Youth Pass pilot AFC data

Please see Chapter 5 for details on how CTPS applied these values to estimate the number of additional weekday trips, by service period, under the two Youth Pass program scenarios.