

North Central Texas Council of Government (NCTCOG)

2008 FWTA/DCTA Origin and Destination Survey *Final Report*

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Executive Summary

In the Fall of 2008, the North Central Texas Council of Governments (NCTCOG), with consultant support, conducted an Origin and Destination (O/D) Survey of the Fort Worth Transportation Authority (FWTA) and Denton County Transportation Authority (DCTA) riders. The self-administered surveys were conducted among riders of all fixed-route bus service. Data collection was performed from October 27 through November 24, 2008. A total of 2,885 fully weighted surveys (2,625 for FWTA and 260 for DCTA), as included in the final data files, were collected. In addition to the O/D on-board study, non-response follow-up, park-and-ride and transfer center counts, and wait time studies were also conducted. The study involved designing the survey instrument; developing a sampling plan; collecting, processing, and geocoding the collected data; weighting and expanding the data; analyzing the data; and reporting the results (including comparing the data to 2007 ACS data where possible). This report documents these tasks.

Key Findings

The objectives of the 2008 Origin and Destination survey analysis were two-fold: (1) examine the demographics, and (2) examine the travel behavior characteristics of FWTA and DCTA transit riders. The survey data used for this analysis was appropriately weighted and expanded to represent the unlinked trips made by FWTA and DCTA transit riders. Some important findings from the analysis of the FWTA riders are summarized below:

- About half of all transit riders (48%) have a valid driver's license.
- Fifty-eight percent of riders are employed.
- Riders are primarily (66%) 25 to 54 years of age.
- The majority of trips made by riders originate or end at home or work; 42% of riders make home-based work trips using transit, while 43% make home-based non-work trips.
- Walking is the dominant access and egress mode for all riders, on average 90%.
- Nearly two-thirds (64%) of riders make at least one transfer to complete their one-way trip.

Findings from DCTA were significantly different in many areas as compared to FWTA. This is due to the transit system being dominated by the UNT campus shuttle system, which primarily serves younger riders. Some important findings from the analysis of the DCTA riders are summarized below:

- Over three-quarters (86%) of all transit riders have a valid driver's license.
- Forty-nine percent of DCTA riders are employed.
- Riders are primarily (82%) 18 to 24 years of age.
- The majority of trips (68%) made by riders were home to non-work trips.
- Walking is the dominant access and egress mode for all riders, on average 91%.
- Only 12.5% of riders make at least one transfer to complete their one-way trip.

The overall response rate for this study is 18%. FWTA routes performed at a 20% response rate while DCTA routes performed at an 11% response rate. This low response rate was due to the very low response rate for the UNT Shuttle routes (8%), while the non-shuttle routes performed at the highest level of the three sub-groups (37%).

1. Introduction

The North Central Texas Council of Governments (NCTCOG), with consultant support, conducted an Origin and Destination survey of the Fort Worth Transportation Authority (FWTA) and Denton County Transportation Authority (DCTA) riders in the Fall of 2008. These surveys provide information about transit passenger demographics and trip details. The 2008 O/D survey was a system-wide study to include appropriate level of sampling to reflect all services, including the new, expanded, and revised routes.

The self-administered surveys were conducted among riders of fixed-route bus services for both FWTA and DCTA. Data collection was conducted on weekdays (Monday through Friday) from October 27 through November 24, 2008. A total number of 2,885 fully weighted surveys (2,625 for FWTA and 260 for DCTA) valid surveys, as included in the final data files, were collected.

The main objective of this study is to provide updated commuter travel information to NCTCOG's Dallas-Forth Worth Regional Travel Model (DFWRTM). The DFWRTM is the travel demand model for the Dallas- Forth Worth area and is responsible for making transit forecasts based on travel demand patterns identified in this study. In addition, this data will be used for transit agencies evaluation projects and applications for FTA New Starts funding.

This data will also be used to implement additional commuter rail in the area. For FWTA, the commuter rail design is located in the Southwest to Northeast corridor between Grapevine, Fort Worth, and DFW Airport. DCTA is in the final design phase of RailDCTA that will provide service from Denton Southeast to Carrollton.

This report summarizes the survey methods, 2008 Origin and Destination survey findings, and comparative analysis results of 2007 ACS when available. Chapter 2 provides a description of the sampling approach, survey instrument and procedures, project challenges and solutions, and weighting and expansion methodology. Chapter 3 provides detailed information containing analysis of demographics by agency, FWTA and DCTA. Chapter 4 examines trip purpose by agency, FWTA and DCTA. Chapter 5 provides further analysis by service type.

Appendix A includes the English and Spanish survey instruments for both FWTA and DCTA. Appendix B provides the overall population statistics for Tarrant and Denton Counties from the 2007 American Community Survey (ACS). Appendix C presents the distribution of weighted boardings by route and service type.

2. Survey Methods

Sampling Plan

A total of 41 Fort Worth Transportation Authority (FWTA) routes and 21 Denton County Transportation Authority (DCTA) routes were sampled on weekdays covering all fixed-route bus service: Local, Circulator, Express, and Regional Commuter service. A sampling plan was designed to be statistically significant at the route level and to provide a sample size adequate for analysis of weekday bus service. The sampling plan goal was to collect 2,270 valid surveys for the FWTA routes and 651 valid surveys for the DCTA routes. The survey data collection resulted in 2,625 valid surveys from the FWTA routes and 360 valid surveys from the DCTA routes.

The NCTCOG on-board survey used a standard two-stage sampling approach that consisted of sampling passengers and sampling bus trips. Every passenger over the age of 16 (determined by visual estimation), who boarded the sampled bus, received a survey. If the surveyor was not able to determine whether a rider's age was over 16 by direct observation (which is the standard procedure), the surveyor asked the boarding passenger if they were over 16 years old.

Approach to Sampling Bus Trips

The NCTCOG consultant on this survey study, NuStats, prepared a plan to sample weekday bus trips that was statistically significant at the system and route levels. In addition, the statistical accuracy level was tiered to allow for a lower standard error level for the most productive lines, mid-level standard error level for mid-ridership level lines, and the highest standard error level for lines that do not carry enough daily riders to obtain a larger sample size and, therefore, a lower standard error level. The proposed sample plan was based on three main factors:

- First, the plan ensured that the sample adequately met data needs at the global level.
- Second, the plan ensured the collection of adequate samples at the various times of day. Times of the day (TOD) are defined as AM Peak (6:30 a.m.– 8:59 a.m.), Mid-day (9:00 a.m.– 2:59 p.m.), PM Peak (3:00 p.m.– 6:29 p.m.), and Evening/Early Morning (6:30 p.m.– 6:29 a.m.).
- Third, the plan ensured that NCTCOG staff would have the ability to segment the sample on key variables, such as route, day of the week, time of day, and direction.

The sample plan was based on the average daily ridership from October 2007. The overall sampling criteria are listed in Table 2-1, followed by individual route goals in Table 2-2 (FWTA) and Table 2-3 (DCTA).

Table 2-1: Standard Error for 95 % Confidence Level – FWTA and DCTA

System	Proposed Sample Size	SE for 95% CI
DCTA	651	± 3.8%
FWTA	2,270	± 2.1%
Total	2,921	± 1.8%

Table 2-2: Sample Targets by Route – FFTA System

System		Proposed Sample Size	SE for 95% CI
1	Hemphill/North Main	3,095	310
2	E. Lancaster/CampBowie	5,468	547
3	Riverside/TCC	1,022	102
4	East Rosedale	1,414	141
5	Evans Avenue	845	85
6	8th Avenue/McCart	1,145	115
7	University	334	33
9	Ramey/Vickery	255	26
10	Bailey/ (formerly Montgomery)	179	18
11	Sylvania/Riverside	216	22
12	Greenway	56	6
13	Sundance Shuttle	87	8
14	Riverside	564	56
16	Montgomery/Rosedale	57	6
17	Central	105	11
21	Boca Raton	881	88
22	Meadowbrook	582	58
23	Mercantile	44	5
24	Berry Street	446	45
25	Crosstown	2,263	226
26	Las Vegas Trail	552	55
27	Como	214	21
29	TCU Shuttle	425	42
30	Centerport Circular	255	26
32	Bryant Irvin	201	20
40	Bridgewood	56	6
46	Jacksboro Highway	356	36
60	Eastside Express	150	15
61	Normandale Express	108	11
62	Summerfield Express	24	3
65	South Park and Ride Express	140	14
66	Candleridge/Altamesa	60	6
67	North Arlington	170	17
68	South Arlington	389	39
69	Alliance Express	249	25
72	James Hemphill	123	12
110	Bell Express	58	6
993	Expanco Special	30	3
994	Lighthouse for the Blind	10	1
995	Cullent Street Workshop	14	1
996	Day Labor	25	2
TOTAL		22,567	2,270

Table 2-3: Sample Targets by Route – DCTA System

DCTA Non-UNT Routes	Daily Ridership	Sample Target
1	57	6
2	115	12
3	104	10
4	44	4
5	95	10
6	88	9
7	98	10
8	94	9
20	56	6
21	54	5
22	12	2
Route 101 Forward	131	13
Route 101 Reverse	78	8
Route 102 Forward	95	10
Route 102 Reverse	33	3
SUBTOTAL	1,154	117
DCTA UNT Shuttle Routes	Daily Ridership	Sample Target
UNT Shuttle: Mean Green - 51	1,425	71
UNT Shuttle: North Texan – 52	2,199	110
UNT Shuttle: Centre Place - 53	997	50
UNT Shuttle: Eagle Point – 54	1,298	65
UNT Shuttle: Research Park - 55	852	43
UNT Shuttle: Bernard Street - 56	1,870	94
UNT Shuttle: Colorado Express -57	1,436	72
UNT Shuttle: Sam Bass - 60	580	29
SUBTOTAL	10,657	534
OVERALL TOTAL	11,811	651

Bus Trip Selection

The number of sampled bus trips was calculated by assuming an average response rate of 20% (depending on service type and service period) of typical rider loads by trip. Thus, a route that had an average load of 500 riders and made 10 trips a day was determined to have an average rider load of 50 riders per trip. Assuming the route had a sample goal of 50 valid surveys, it was determined that five bus trips would need to be sampled to meet the requirements at an estimated 20% response rate ($500/10 = 50 \times .20 = 10$; $50/10 = 5$). The number of trips sampled was rounded up to the nearest whole number for trip selection purposes if a decimal arose in the calculation. It should be noted that Express routes were sampled with an expected response rate of 40%, so the number of trips needed for these types of routes were calculated using 40% rather than 20%.

Bus trips were clustered by block for the purpose of efficient use of surveyor labor. The use of clusters had the further advantage of de facto stratification by direction (i.e., most runs consist of bus trips alternately traveling inbound, outbound, etc.), as well as stratification by time of day, and also by route if multiple routes were contained in a block.

Surveyor Assignments

The final sampling task was the uploading of sampled bus trips to a Web-based field management system to create surveyor assignment sheets. The selected clusters of trips were drawn based on the following parameters to produce surveyor assignments:

- Consecutive trips within the same block/run,
- The cluster of trips starting and ending at the same location,
- Trips within the cluster were unique to the cluster.

Surveyor assignment sheets were printed from the web-based management system and included the organized bus trips to be sampled, along with necessary information for getting to and from the assignment. The assignment sheets were also bar-coded to link them to the field management system. A sample assignment sheet is presented in Figure 2-1.

Figure 2-1: Sample Assignment Sheet

NCTCOG OB ASSIGNMENT 📄

Assignment Number: 2006
 Route: FWT--22
 Please Report to: WALMART @ 2:37 PM

Returns to: WALMART @ 6:47 PM

Surveyor: _____
 Counter: _____
 Date: _____
 iPAQ: _____
 Bus Number: _____

Questionnaires Issued: _____ to _____
 and: _____ to _____
 Total Recommended: _____

TRIP #	ROUTE	BLOCK	PATTERN	DIRECTION	START TIME	START LOCATION	END TIME	END LOCATION	QUESTIONNAIRE START NUMBER
1	FWT--22	2261	67	INBOUND	2:47 PM	WALMART	3:15 PM	OAKLAND AND LANCASTER ARRIVE	
2	FWT--22	2261	67	OUTBOUND	3:19 PM	OAKLAND AND LANCASTER ARRIVE	3:47 PM	WALMART	
3	FWT--22	2261	67	INBOUND	3:47 PM	WALMART	4:15 PM	OAKLAND AND LANCASTER ARRIVE	
4	FWT--22	2261	67	OUTBOUND	4:19 PM	OAKLAND AND LANCASTER ARRIVE	4:47 PM	WALMART	
5	FWT--22	2261	67	INBOUND	4:47 PM	WALMART	5:15 PM	OAKLAND AND LANCASTER ARRIVE	
6	FWT--22	2261	67	OUTBOUND	5:19 PM	OAKLAND AND LANCASTER ARRIVE	5:47 PM	WALMART	
7	FWT--22	2261	67	INBOUND	5:47 PM	WALMART	6:15 PM	OAKLAND AND LANCASTER ARRIVE	
8	FWT--22	2261	67	OUTBOUND	6:19 PM	OAKLAND AND LANCASTER ARRIVE	6:47 PM	WALMART	

Comments

A. Was entire assignment completed?	Yes	No		Yes	No		Yes	No				
	<input type="checkbox"/>	<input type="checkbox"/>	If No...	<input type="checkbox"/>	<input type="checkbox"/>	Vehicle Breakdown?	<input type="checkbox"/>	<input type="checkbox"/>	Surveyor Illness?	<input type="checkbox"/>	<input type="checkbox"/>	Other
B. Standing passengers on all or part of trip?	<input type="checkbox"/>	<input type="checkbox"/>										
C. Other												

Survey Instrument

The survey instrument was designed as a self-completion survey with 17 self-coded questions. The set of data items is presented in Table 2.4. Prior to data collection, returned surveys were defined as “complete” and “usable” if applicable questions were answered up to and including the question regarding reasons for taking the routes listed in the route sequence question (Question 6B). These items were: home address, origin address, destination address, mode of access, mode of egress, trip purposes and trip path (see sample survey in Appendix A.)

Surveys were designed in a two-sided double letter-size format and printed on heavy card stock for easy distribution and completion. Each survey contained a business reply mail permit for off-bus completion and mail-back. The form was pre-printed with a unique serial number and bar-code, which linked each survey to distribution on a specific trip. Text on the survey invited passengers to register to win a monetary prize, of \$100, by providing their name, telephone number, and home address. This technique captured accurate information for home address, which for a majority of trips was either the trip origin or the trip destination. The survey was designed to obtain information in three major categories: O/D travel patterns, access and egress modes, and rider demographics. As noted in Table 2-4, some of the required data elements were captured by means other than a question on the survey. This approach had multiple benefits: (1) the survey was shorter to enhance response rates, and (2) data quality was improved by circumventing respondent-provided information. The survey was available in two languages, English and Spanish.

Table 2-4: Data Elements and Capture Method

Data Elements	Capture Method
Day of Travel	GPS-enhanced Palm device
Time of Travel	GPS-enhanced Palm device
Route	GPS-enhanced Palm device
Survey Language	Field Code by editor
Home Address	Survey
Origin Address	Survey
Destination Address	Survey
Bus Stop On	GPS-enhanced Palm device
Bus Stop Off	Imputed using information from other sources: Destination, Egress Mode, Distance, and GPS data on bus stops for the sampled trip
Trip Purpose	Survey
Access Mode	Survey
Egress Mode	Survey
Total Buses & Trains	Survey
Trip Path	Survey
Alighting Location	Survey
Method of Payment	Survey
Fare	Survey
Trip Length (in minutes)	Survey
Vehicle Availability	Survey

Data Elements	Capture Method
Household Size	Survey
Valid Drivers License	Survey
Employment Status	Survey
Passenger Age	Survey
Ethnicity	Survey
Household Income	Survey

Web Component

In an attempt to reach the traditionally difficult population of college campus shuttle riders, the DCTA UNT campus shuttle service utilized a Web-based collection platform. This population is difficult to reach due to their extremely short trips and, therefore, the lack of time to complete a standard on-board questionnaire. In an effort to combat this, surveyors distributed questionnaire cards on the vehicles directing the passengers to a project specific survey website, thus allowing each participant ample time to complete the questionnaire.

Survey Procedures

Overview

At each stop, two people boarded the bus and conducted the survey. One is a surveyor who distributes and collects surveys and another is a counter who collects ridership counts. Surveys were distributed by the surveyor to all boarding passengers over the age of 16. Concurrently, the counter counted each boarding and alighting passenger. The counters used a GPS-enhanced Palm device (see Figure 2-2).

Figure 2-2: GPS-Enhanced Palm Device for On-Board Counts



The Palm device recorded the location and time (arrival and departure) at each bus stop, and counters entered the number of passengers boarding and alighting. By entering the top survey number into the unit prior to arrival at a bus stop, this process linked a sequence of surveys directly to a bus stop (using FWTA and DCTA digitized bus stop list). The data were uploaded daily into a Web-based field

management system designed to manage surveyor assignments, provide progress reports and data summary tables, and monitor field staff performance.

Labor Recruitment and Training

Surveyors were required to have lived in the service area and were screened to ensure they had good work habits, were personable, honest, mature, and paid attention to details. Surveyors were trained to read and understand assignment sheets and were taught basic survey procedures, etiquette, and how to approach riders. The training included two hours of role-playing and intensive tutoring. Counters were trained in the use of the hand-held Palm devices, the ride count program, and on-board etiquette. Following completion of initial assignments, surveyor teams were required to return to the survey command center where supervisors verified the accuracy of the surveyors' work. Assignments were then handed out for the next day.

Survey Administration

The full survey was managed by an in-field survey team comprising 1) a field manager to oversee the entire field team, 2) a surveyor assistant to manage surveyors, and 3) a counter assistant to manage the counters and provide ridership count quality assurance for uploads/downloads to the Web-based field management system. Initial trainings were conducted on October 27 (DCTA) and November 3 (FWTA) 2008, prior to the start of data collection in each respective transit service area.

On-board data collection was conducted by teams that consisted of a surveyor and a counter. The surveyor handed out surveys, persuaded passengers to complete the surveys, assisted with questions, collected surveys, and distributed one free-ride ticket to each person who completed the survey. The counter entered the survey numbers into the hand-held unit to link surveys to a bus stop, counted the passengers boarding and alighting, ensured the unit had picked up accurate GPS location coordinates, collected surveys, and validated passenger loads after each stop. Daily surveyor assignments were distributed by the surveyor manager or by the assistants. See Figure 2-3 for a sample of the Web-based assignment screen.

Figure 2-3: Sample Assignment Management Screen

Assg #	Trip	Survey Method	Total # Trips	DOW	Route	Direction	TOD	Block	Start Time	End Time	Survey Instrument	Surveyor	Counter	Assign Date	iPAQ ID	Start Survey (Issued)	End Survey (Issued)	Done / Data downloaded
Edht	30	1	IQ	6	WK	FWT-.30	EAST LOOP	AM Peak	30	06:19	06:30	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	30	2	IQ	6	WK	FWT-.30	EAST LOOP	AM Peak	30	06:32	06:47	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	30	3	IQ	6	WK	FWT-.30	EAST LOOP	AM Peak	30	06:51	07:22	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	30	4	IQ	6	WK	FWT-.30	EAST LOOP	AM Peak	30	07:22	07:33	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	30	5	IQ	6	WK	FWT-.30	WEST LOOP	AM Peak	30	07:35	08:07	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	30	6	IQ	6	WK	FWT-.30	WEST LOOP	AM Peak	30	08:07	08:27	Steve Sibley	Talanie Jackson	11/19/08	30816	1026	1075	COMPLETE
Edht	31	1	IQ	6	WK	FWT-.30	WEST LOOP	PM Peak	31	15:35	16:11	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	31	2	IQ	6	WK	FWT-.30	WEST LOOP	PM Peak	31	16:13	16:29	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	31	3	IQ	6	WK	FWT-.30	EAST LOOP	PM Peak	31	16:30	17:04	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	31	4	IQ	6	WK	FWT-.30	EAST LOOP	PM Peak	31	17:05	17:16	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	31	5	IQ	6	WK	FWT-.30	EAST LOOP	PM Peak	31	17:21	17:46	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	31	6	IQ	6	WK	FWT-.30	EAST LOOP	PM Peak	31	17:47	18:07	Steve Sibley	Talanie Jackson	11/19/08	30816	5664	5700	COMPLETE
Edht	32	1	IQ	6	WK	FWT-.30	WEST LOOP	AM Peak	32	06:23	06:34	Yolanda Bailey	Robert Hall	11/24/08	30792	11129	11154	COMPLETE
Edht	32	2	IQ	6	WK	FWT-.30	WEST LOOP	AM Peak	32	06:39	06:39	Yolanda Bailey	Robert Hall	11/24/08	30792	11129	11154	COMPLETE
Edht	32	3	IQ	6	WK	FWT-.30	EAST LOOP	AM Peak	32	06:56	07:13	Yolanda Bailey	Robert Hall	11/24/08	30792	11129	11154	COMPLETE

As assignments were handed out, information was updated in the Web-based field management system. When surveyors and counters returned from an assignment, the surveyor manager or assistant checked the assignment results (i.e., quickly reviewed the surveys to spot any glaring performance issues) and downloaded the passenger count data from the Palm devices. Feedback and additional training were provided when errors were found in the data. If certain errors persisted, staff would be relieved of their services. The surveyor manager updated the assignment status in the Web-based field management system and then handed out the next assignment. Once the completed assignments were reviewed, the surveys went through the in-field editing process for inspection and coding prior to being sent to Austin, the location of NuStats’ headquarters, for scanning and verification.

In-Field Survey Editing

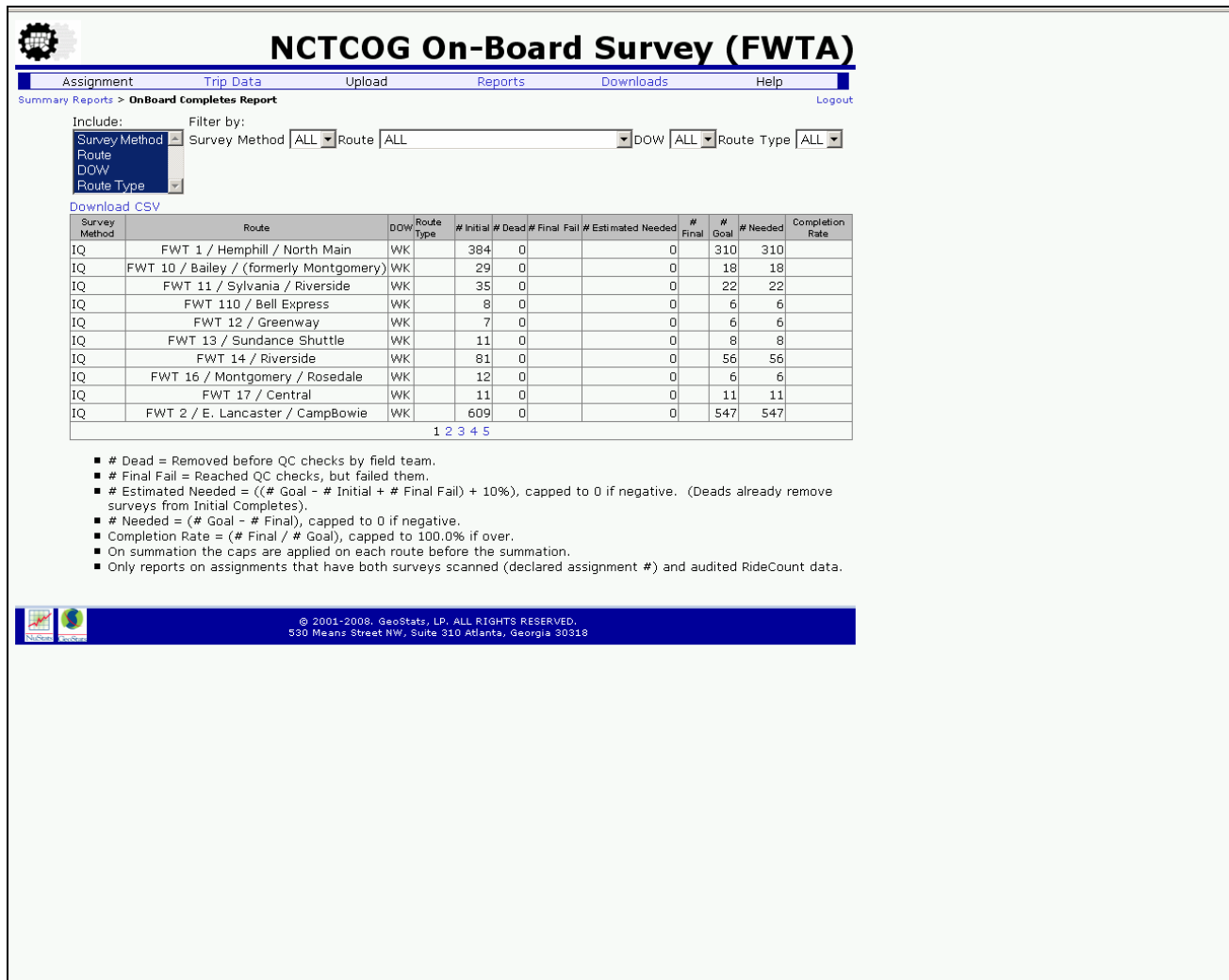
Following the surveyor check-in, completed surveys were presented to on-site data editors for editing and correction. Data editors were local residents who were familiar with the geography of the transit service area. Data editors reviewed each completed survey and used geographic resources to complete or correct address information. Because the origin and destination questions are the most difficult to collect, using these geographic resources to “clean” addresses provided a means to “save/salvage” as many surveys as possible. After each survey had been reviewed, the bar-codes were scanned on the survey using a procedure that identified the survey as a “complete.” This information was uploaded to the field management system as one data input for the status reports. “Complete” surveys were sent to Austin for scanning and verification. Data editors were also employed to call back riders who turned in

surveys that were less than complete. The phone number came from the survey and allowed for more partially filled out surveys to be converted to completed surveys.

Status Reporting

The surveyor manager prepared status reports from the Web-based field management system. This automated application conducted consistency checks, flagged problem records, and cleaned and purged flagged records. The surveyor manager reviewed this information for accuracy in the status, response, and performance reports to the Web-based field management system. A sample report is shown in Figure 2-4.

Figure 2-4: Sample On-Board Completes Report



Pilot Study Results

A two prong pilot test was conducted prior to the full-scale data collection effort. This test aimed to introduce a new style of questionnaire that was more graphical in nature. It was hoped that this more graphical version would produce a higher response rate.

The first effort for testing the “standard” on-board questionnaires versus the more graphical questionnaire was to conduct cognitive interviews using FWTA passengers. These focus groups were conducted October 6th and 7th in Fort Worth using these two questionnaire types, located in Appendix X. A detailed report for the cognitive interviews was submitted to NCTCOG shortly after the interviews were completed.

In addition, NCTCOG employees boarded FWTA buses and distributed these questionnaires to passengers to determine if either version was more easily completed. Of the 29 “standard” on-board questionnaires distributed, 20 or 69%, were returned while of the 34 passengers who received the graphical version only 17, 50%, were returned.

Overall, there were not significant differences found between the two versions. Therefore, it was determined that inserting aspects of the more graphical questionnaire into the standard questionnaire would be the best way compromise between versions.

Non-Response Survey

Another component of the surveying process was the distribution of a non-response survey if passengers refused to participate in the on-board survey, or if they were not actively filling out the paper questionnaire. Both surveyors and counters administered the non-response survey based on observation. This data collection effort was conducted on 37 different routes and yielded 1,449 completed surveys. The questionnaire for the non-response survey is attached in Appendix H. The analysis of the non-response survey is addressed in Appendix I.

Park-and-Ride and Transfer Center Counts

In addition to the on-board data collection and the complimentary non-response follow-up study, park and ride and transfer center counts were conducted for both DCTA and FWTA. For FWTA, seven park-and-ride lots and six transfer centers (two locations are both park-and-ride and transfer centers) were surveyed along with the main DCTA transfer center and two DCTA park-and-ride lots. For all these locations, information was collected for each bus that entered the location. The arrival and departure time along with the number of passengers boarding and alighting by travel mode (transfer, walk, and drive) were captured along with the bus route and block number.

Wait Time Survey

For an additional study, wait times were captured for passengers on DART and TRE services. For each boarding passenger, on routes selected by NCTCOG (TRE; Blue and Red Light Rail; Express Routes 202, 204, and 206; and Local Routes 19, 21, 50, 52, 415, 428, and 553; refer to Table G-1 in Appendix G), data was collected between 6 a.m. and 8 p.m. For each boarding passenger, questions were asked regarding previous transfers, wait time for current transit vehicle, and trip purposes for both the origin and destination. A total of 2,025 interviews were collected in the effort (for an example of the paper questionnaire, see Appendix E). The detailed sampling process and the survey result analysis are addressed in Appendix F and Appendix G respectively.

Full-Scale Data Collection Challenges and Solutions

The data collection efforts were successful in almost all areas of the project. The lone exception was the Web-based data collection attempt for the UNT shuttle system previously discussed. It was hoped that this method would be able to improve response rates by using this different techniques to access these difficult to reach passengers. This new technique was developed in conjunction with NCTCOG, but unfortunately produced response rates that were lower than desired.

Response Rates

The response rate was calculated as follows. It is the number of valid surveys as a percent of the total number of adult boarding passengers. Overall, 16,206 adults boarded the surveyed routes. Approximately 9,158 surveys were handed out and 2,985 questionnaires were collected and weighted. The response rate for the study was 18%. Table 2-5 presents the response rates by service provider. For DCTA, UNT shuttle and DCTA non-shuttle bus routes are shown separately due to their differing methodologies (UNT Shuttle routes collected web-based data) and significant response rate differences (8% vs. 37%).

Table 2-5: Response Rates by Service Provider

Service Provider	Adult Boarding Passengers	Questionnaires Distributed	Weighted Questionnaires	Participation Rate (Qs distributed / # passengers)	Response Rate (Weighted Qs / # passengers)
FWTA	13,043	6,963	2,625	53%	20%
DCTA UNT Shuttles	2,760	1,991	212	72%	8%
DCTA non-shuttle routes	403	204	148	51%	37%
Overall	16,206	9,158	2,985	57%	18%

Data Weighting and Expansion

From a finite population sampling theory perspective, analytic weights are needed to develop estimates of population parameters and, more generally, to draw inferences about the population that was sampled. Without the use of analytic weights, population estimates are subject to biases of unknown (possibly large) magnitude.

In on-board surveys, the universe of trips operated by transit routes cannot be sampled. At the same time, all the riders who board the sampled routes cannot be surveyed due to non-response. All these factors lead to biases in the survey data. Consequently, sample weighting and expansion is critical to account and correct for these biases. In particular, sample weighting adjusts for non-response at the bus stop level and accounts for sampling trips at the route, time, and direction level (RTD). Sample expansion, on the other hand, expands the weighted sample to reflect the population ridership at the system-wide level. The next section describes the sample weighting procedure followed by the sample expansion procedure, calculation of the final analytic weights, and calculation of linked trip factor that translates boardings (i.e., unlinked trips) to linked trips.

Sample Weighting

Sample weighting is a critical consideration to account and correct for biases in the survey data. As a simple example, one route may have 1,000 passengers per day, and another, 100 passengers. If 50 surveys were collected on each route, the percentage collected would be 5 and 50%, respectively. Without weighting, the data collected on the route with 100 passengers would be over-represented in the results. Thus, weighting balances these differences and aligns the weighted sample to the known distribution of population ridership.

The sample weighting process includes calculation of two weights: (1) Response factor that corrects for non-response at the bus stop level, and (2) Vehicle factor that corrects for sampling trips at the route, time of day, and direction (RTD) level. The Boarding factor, or weight, is the product of the response factor and vehicle factor. Each of these factors is discussed below in detail.

Response Factor

Response factor adjusts for non-response associated with boarding passengers that do not return usable surveys¹ at each bus stop where a passenger boards. In order to capture all the non-responding boarding passengers, the Response factor is calculated at the bus stop level.

In an ideal world, the Consultant would expect to get completed surveys from every bus stop where one or more adult passengers boarded the bus. However, because of the complexity of the data collection process and non-response issues, the Consultant was faced with three scenarios that had implications on the calculation of the bus stop response factor for weighting. These include (1) no completed surveys at bus stops where at least one adult boarded the bus (response issue), (2) fewer adult boardings than the number of completed surveys collected at the bus stop (counter error), and (3) unidentified bus stops.

Bus Stops with Non-Zero Boardings and Zero Completes

Of the 25,067 bus stops along surveyed routes (i.e., sampled trips in which a passenger boarded at a stop), 11,137 bus stops have non-zero boardings and zero completes. The Consultant applied a bus stop grouping methodology to these 11,137 bus stops. This bus stop grouping method was applied to the unique trips that include these bus stops of interest. Specifically, based on the sequence of the bus stops in the unique trip and the distance between bus stops, the bus stops of interest (with non-zero boardings and zero completes) were grouped with either the subsequent or the previous stop. In particular, the bus stop of interest was grouped with the closest bus stop. However, if the previous and the subsequent stops have zero boardings and zero completes, the bus stop of interest was grouped with the second previous and subsequent stop, and so on.

Bus Stops with Fewer Boardings than Completes

Of the 9,338 bus stops on surveyed routes for FWTa and of the 1,819 bus stops on surveyed routes for DCTA, the number of bus stops that had no zero boardings and no zero completes were 4,529 and 463, respectively. Among them, 3,086 FWTa bus stops had no zero boardings, but zero completes, and 209 FWTa bus stops had no zero boardings, but zero completes. In addition, 105 FWTa bus stops had fewer boardings than completes, while 19 DCTA bus stops had fewer boardings than completes. These stops were addressed in the following way: based on the sequence of the bus stops in the unique trip that includes these bus stops of interest, the Consultant grouped the bus stop of interest (with boardings less than completes) with the subsequent stops (i.e., bus stops in the direction of the trip). If a resolution was not reached by grouping with subsequent bus stops in the direction of the unique trip (i.e., total boardings were not equal to or greater than the completed surveys at the group level), the bus stop of interest was grouped with previous ungrouped bus stops (i.e., bus stops in the opposite direction of the trip). The regrouping was carried out until a resolution was reached (i.e., the boardings were at least equal to the total number of completed surveys at the group level). Following the application of this method (i.e., after grouping the bus stop of interest with all other bus stops in the unique trip), if the total boardings were less than the total completed surveys at the group level, a response factor of 1 was assigned to all the bus stops in the unique trip.

Following the grouping of the bus stops of interest using the aforementioned methodology, the bus stop response factor was calculated (see formula below for Bus Stop Response Factor).

$$\text{Response Factor} = \text{Total Adult Boardings}^2 \text{ by Bus Stop} / \text{Usable Surveys by Bus Stop}$$

¹ Each record in the database represents a usable survey (i.e., one that has passed all quality assurance procedures).

² Adult Boardings are defined as boardings made by individuals 16 or over 16 years of age that qualify them for taking the survey.

Vehicle Factor

Vehicle factor accounts for the non-surveyed trips at the RTD level. The times of days used in the weighting process are: AM Peak and PM Peak for Express routes; and AM Peak, Mid-day, PM Peak, and Evening for all other routes.

The total one-way trips and total sampled trips will be calculated for each RTD based on this population run cut file. For example, if Route 1 has a total of 11 trips in the AM Peak that are northbound, but only two were surveyed, its Vehicle factor is 11 divided by 2, or 5.5.

$$\text{Vehicle Factor} = \text{Total Trips per RTD} / \text{Sampled Trips per RTD}$$

Boarding Factor

Following the calculation of the three weighting factors, the Boarding factor is calculated by multiplying the Response and Vehicle factors.

$$\text{Boarding Factor} = \text{Response Factor} * \text{Vehicle Factor}$$

Sample Expansion

Sample expansion factors increase the weighted sample to the total boardings at the system-wide level. In particular, the survey data is expanded to represent 2008 average daily ridership at the route level. This information was provided by North Central Texas Council of Governments (NCTCOG). The calculation of the Expansion factor is described below.

Expansion Factor

The Expansion factor is calculated at the route level using the formula below. As an example, assume that the weighted sample ridership for Route 731 is 7,270 and the population average daily weekday ridership for this route is 7,742. This produces an Expansion factor of 1.06 (7,742 divided by 7,270).

$$\text{Expansion Factor} = \text{Population Average Daily Ridership} / \text{Ridership Weighted by Boarding Factors}$$

Expansion Weight

The final sample “weighing and expansion” weight is referred to as the Expansion weight. In particular, the Expansion weight is calculated by multiplying the Boarding factor (i.e., weighting factor) by the Expansion factor. Following the application of the Expansion weight, the weighted data represents the population boardings (i.e., unlinked trips).

$$\text{Expansion Weight} = \text{Boarding Factor} * \text{Expansion Factor}$$

Linked Trip Factor

Linked Trip factor translates boardings (i.e., unlinked trips) to linked trips. This factor accounts for the rider’s transfer before or after the surveyed bus. A rider who did not transfer during the completion of a one-way transit trip would carry a Linked Trip factor of 1.0. A rider who transferred from another route before boarding the surveyed bus, but did not intend to transfer again, would have a weight of 0.5, as would a rider who did not transfer before boarding the surveyed bus, but who intended to transfer in

order to get to the ultimate destination. A rider who transferred to and from the surveyed bus would have a weight of 0.333. The Linked Trip factor is calculated for every rider who completed the survey. This weight will be provided as a stand-alone weight. Following the application of this factor to the weighted data (i.e., data weighted by the Expansion weight), the information can be expressed as “linked” trips instead of individual boardings.

Based on the methodology outlined in this section, the survey data was appropriately weighted and expanded to be representative of all the unlinked trips, i.e., individual boardings.

3. Survey Data Analysis by Agency

This chapter provides detailed information on the demographics and travel behavior characteristics of FWTA and DCTA transit riders and concludes with a summary of key findings. The survey data used for analysis was appropriately weighted and expanded to be representative of all the unlinked trips, i.e., individual boardings.

FWTA

Demographics

This section describes the demographics of FWTA transit riders including household size, household income, vehicle ownership, vehicle availability, employment status, student status, age, and valid driver's license status. It should be noted that the statistics vary depending on type of transit service, i.e., Local or Express bus service, and have been discussed in detail in Chapter 4.

In addition, this section compares the demographic characteristics of FWTA transit riders with the general population residing in the Tarrant County.³ Specifically, the 2008 FWTA/DCTA origin and destination survey data were compared with 2007 American Community Survey data that includes all residents of Tarrant County (refer to Appendix B). It should be noted that the comparative analysis was limited to those variables that were available from the 2007 ACS data.

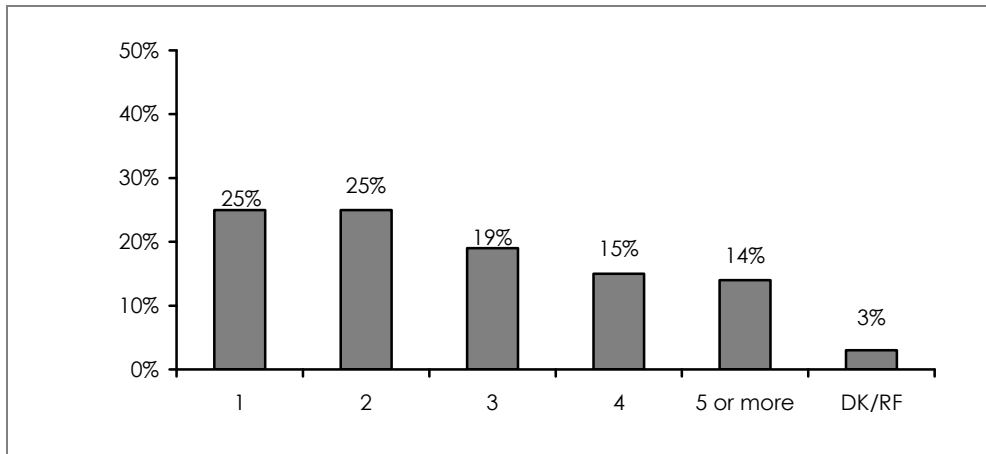
Household Size

The household size results (Figure 3-1) indicate that 80% of riders have a household size of four or fewer individuals. In particular, about 50% of riders live in one- or two-person households, while 34% live in three- or four- person households. Of the remaining, 14% have a household size of five or more individuals.

Compared to the general population, transit riders are more likely to live in smaller households (as indicated by comparison of 2008 FWTA/DCTA origin and destination survey data with 2007 ACS data). Specifically, the general population statistics indicate that 25% of the households are single-person households, 31% are two-person households, while 43% are three or more person households (refer to Table B-1 in Appendix B).

³ It is important to note that due to the lack of adequate information on the general population in the transit service area, 2009 FWTA Transit Pattern Survey data were compared to the residents of Tarrant County.

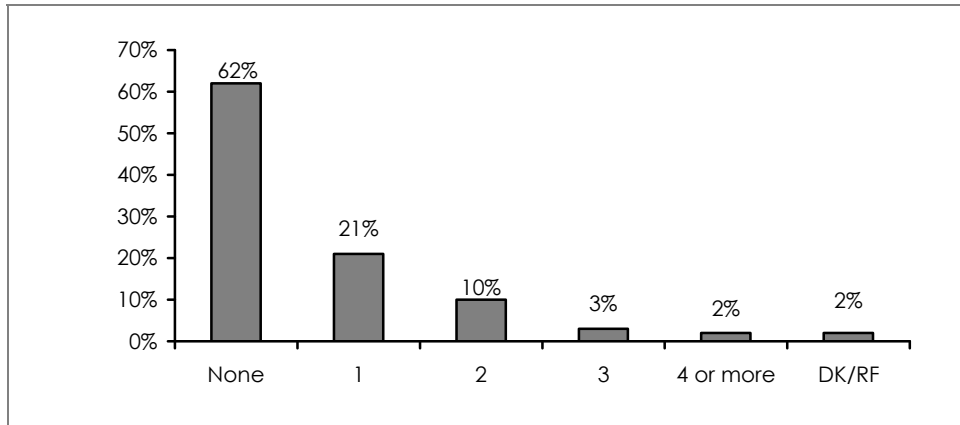
Figure 3-1: Distribution of Household Size



Vehicle Ownership

The vehicle ownership statistics (Figure 3-2) indicate that about 36% of rider households own at least one automobile, with 21% that own one vehicle, 10% that own two vehicles, and 5% that own three or more vehicles. More than half of riders (62%) are transit-dependent, i.e., they do not own any vehicles. Of these transit-dependent rider households that do not own any vehicles, 87% have an annual income of less than \$35,000.

Figure 3-2: Distribution of Vehicle Ownership



As expected, transit riders are more likely to be from zero-vehicle households when compared to the general population (refer to Table B-3 in Appendix B). Specifically, only 5% of households residing in Tarrant County do not own any vehicles. The remaining 95% households own at least one vehicle, with 34% that own one vehicle, 42% that own two vehicles, and 19% that own three or more vehicles.

Table 3-1 presents the cross-tabulation of vehicle ownership by household income. The table indicates that nearly 79% of riders from low-income households (with income less than \$10,000) are transit-dependent, i.e., they belong to households that do not own any vehicles. In addition, the table shows an increase in vehicle ownership as the household income of riders increases.

Table 3-1: Cross-Tabulation of Vehicle Ownership by Household Income

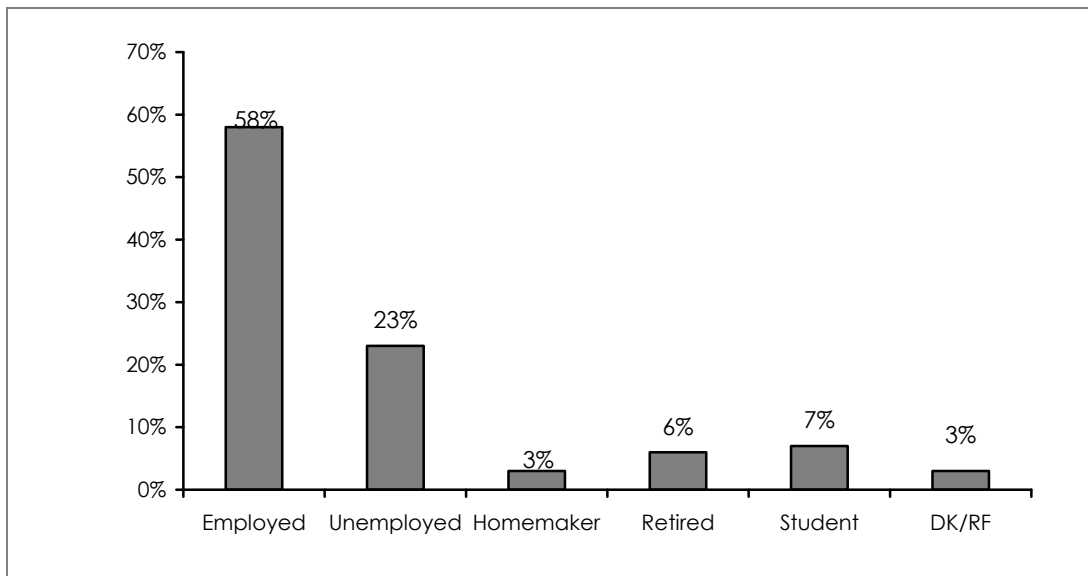
		Household Income							DK/RF
		Less than \$10,000	\$10,000 - \$14,999	\$15,000 - \$24,999	\$25,000 - \$34,999	\$35,000 - \$49,999	\$50,000 - \$74,999	\$75,000 or more	
Vehicle Ownership	None	79.1%	70.3%	67.0%	47.3%	27.5%	11.0%	6.9%	35.5%
	1	13.4%	17.1%	19.8%	28.0%	45.5%	43.7%	23.1%	27.3%
	2	5.2%	8.5%	7.4%	16.9%	21.7%	23.8%	37.0%	10.0%
	3	0.6%	3.2%	4.4%	2.7%	4.2%	16.9%	19.2%	0.7%
	4 or more	1.2%	0.2%	0.2%	3.0%	1.2%	2.0%	13.8%	4.1%
	DK/RF	0.5%	0.7%	1.2%	2.2%	0.0%	2.6%	0.0%	22.4%
Total		100%	100%	100%	100%	100%	100%	100%	100%

Employment Status

The survey data reveals that nearly 58% of riders are employed full-time or part-time (Figure 3-3). Further, 8% of riders are students while 3% of riders are homemakers.

Compared to the general population, transit riders are less likely to be employed. Specifically, 80% of the general population are employed, 1% unemployed, and 19% are not in the labor force (refer to Table B-4 in Appendix B; questions are not directly comparable between 2007 Origin and Destination survey and 2007 ACS survey).

Figure 3-3: Distribution of Employment Status

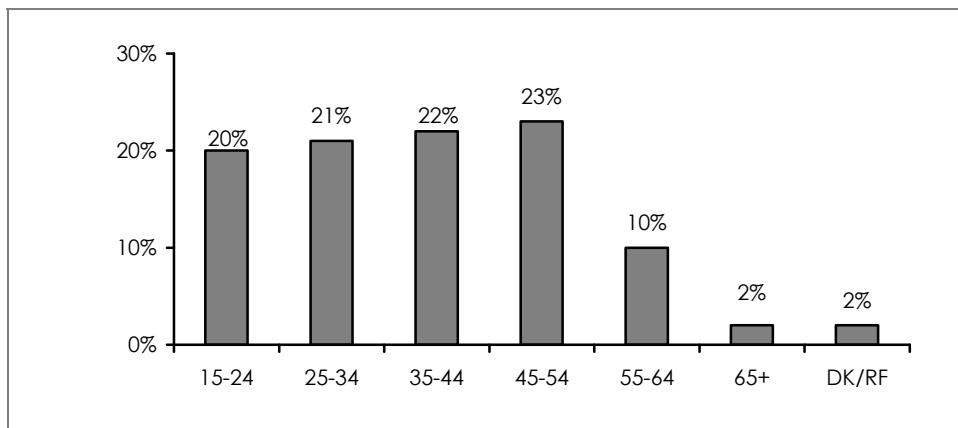


Age

Figure 3-4 provides the distribution of riders by age. The figure indicates that a majority of transit riders are between 25 to 54 years of age (66%). Young riders are the second largest group comprising about 20% of total riders. Older riders (i.e., 55 years or age or older) make up about 12% of riders.

Compared to the general population, transit riders are more likely to be 25 to 54 years of age. Specifically, individuals aged 25 to 54 years constitute 45% of the general population, as compared to 66% of the transit rider population (refer to Table B-5 in Appendix B).

Figure 3-4: Distribution of Age

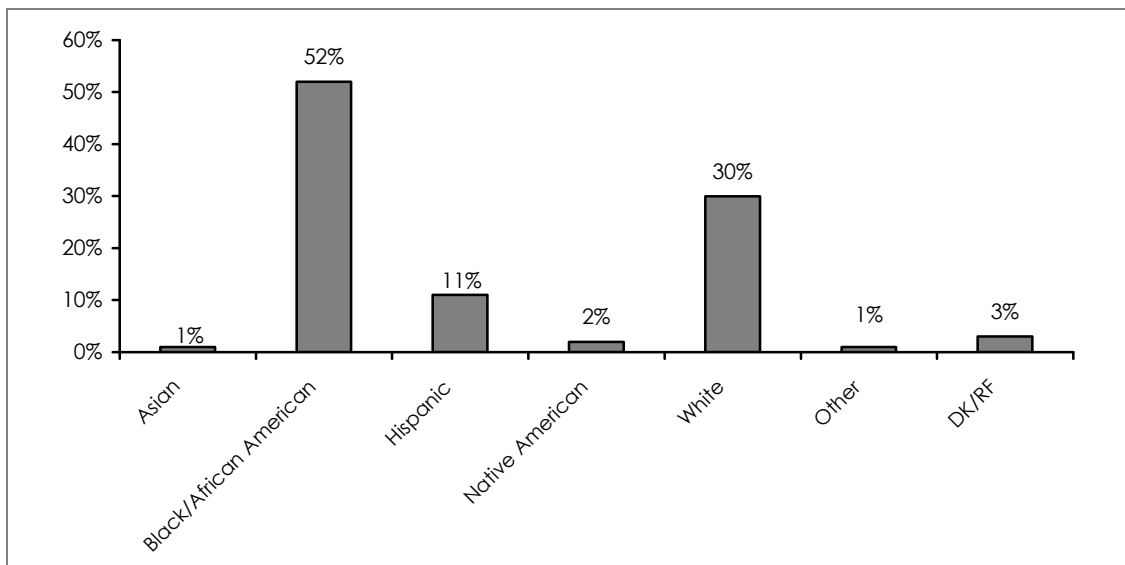


Ethnicity

Figure 3-5 provides the distribution of riders by ethnicity. The figure indicates that a majority of transit riders are African American (52%). White riders comprise 30% of all riders, followed by Hispanic (11%).

Compared to the general population, transit riders are more likely to be African American. African American constitutes only 14% of the general population as compared to 52% of the transit rider population (refer to Table B-6 in Appendix B). White population is less likely to be transit dependent.

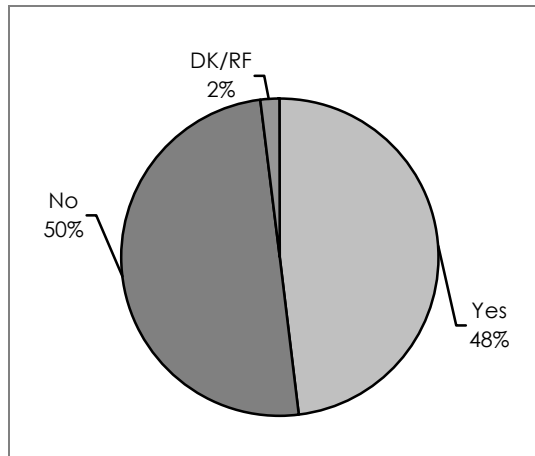
Figure 3-5: Distribution of Ethnicity



Valid Driver's License Status

Figure 3-6 provides the distribution of riders by possession of a valid driver's license. The figure indicates that 48% of riders have a valid driver's license.

Figure 3-6: Distribution of Valid Driver's License Status



Travel Characteristics

This section describes the trip-making characteristics of T-transit riders including trip origin, trip destination, trip purpose, access and egress mode characteristics, and fare for the surveyed one-way trip. It should be noted that the statistics vary depending on type of transit service, i.e., Local or Express bus service.

Trip Origin

The distribution of riders by trip origin indicates that the most common trip origins are home and work (Table 3-2). In particular, nearly 50% of riders have trips originating from home, while about 23% have trips originating from work. Other trip origins include college/university (4%), K-12 school (2%), shopping places (4%), social/recreational places (4%), medical appointment or hospital visit (6%), and restaurants (2%). About 5% of the trip origins fall in the “other” category. Overall, nearly three-fourths of the transit trips originate at home or work.

Table 3-2: Distribution of Trip Origin

Trip Origin	Average Weekday Ridership	Percent
Home	11659	49.9%
Work	5446	23.3%
College/University	809	3.5%
School (K-12)	412	1.8%
Shopping	1151	4.9%
Social/Recreational	950	4.1%
Medical Appointment/Hospital Visit	1465	6.3%
Restaurant	357	1.5%
Other	1133	4.8%
Total	23382	100%

Trip Destination

The distribution of riders by trip destination indicates that the most common trip destinations are home or work (Table 3-3). In particular, nearly 50% riders have trips ending at home, while 23% have trips ending at work. This is similar to the results obtained for trip origin. Other trip destinations are shopping places (5%), social/recreational places (4%), college/university (3%), places for medical appointment/hospital (6%), K-12 school (2%), and restaurants (2%). Remaining riders have their trips ending at other places.

Table 3-3: Distribution of Trip Destination

Trip Destination	Average Weekday Ridership	Percent
Home	8342	35.7%
Work	6484	27.7%
College/University	946	4.0%
School (K-12)	688	2.9%
Shopping	1790	7.7%
Social/Recreational	1430	6.1%
Medical Appointment/Hospital Visit	2037	8.7%
Restaurant	237	1.0%
Other	1429	6.1%
Total	23382	100%

Trip Purpose

Trip purpose is an important trip-making characteristic. One way of defining trip purpose is based on the origin and destination of trips. In particular, trips defined by origin and destination can be classified into (1) Home-based Work trips, (2) Home-based Non-Work trips, and (3) Non Home-based trips. Table 3-4 presents the distribution of riders by trip purpose.

The table indicates that 43% of riders make home-based work trips, while 42% make home-based non-work trips. This finding indicates that a significant proportion of transit trips are for commuting purposes. About 15% of riders make non-home-based trips, with 7% non-home-based work trips, and 8% non-home-based other trips.

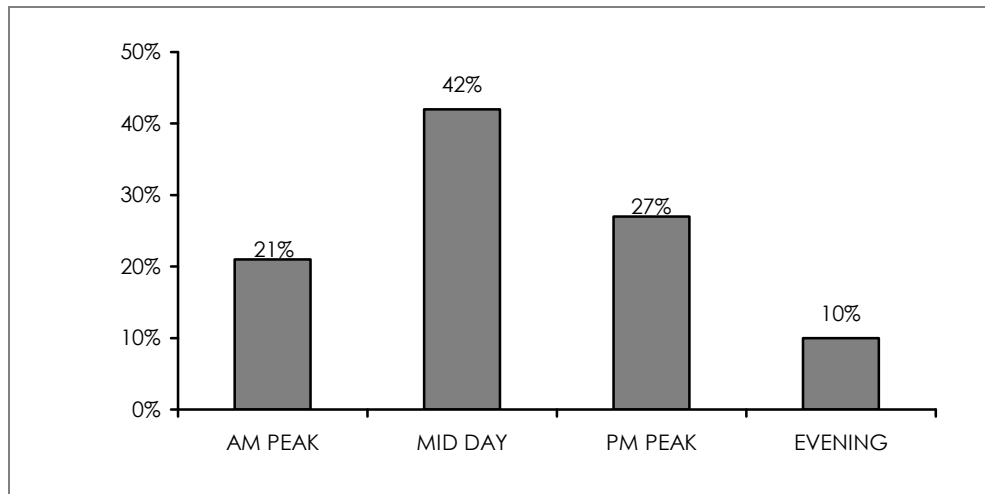
Table 3-4: Distribution of Trip Purpose

Trip Purpose	Average Weekday Ridership	Percent
HBNW (Home to Non-Work, Non-Work to Home)	9,851	42.13%
HBW (Home to Work, Work to Home)	10,150	43.41%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	1,790	7.66%
NHW (Work to Non-Home, Non-Home to Work)	1,591	6.81%
Total	23,382	100.00%

Time of Day

The distribution of riders by time of day indicates that close to half of the riders make their trip during Mid-day (42%), while about one-fourth make their trip during the PM Peak period (Figure 3-7). Remaining riders make their trip during the AM Peak period (21%) and Evening (10%).

Figure 3-7: Distribution by Time of Day



A distribution of trip purpose by time of day indicates that majority of riders (90%) are based from/to home. More than a half of riders use transit to commute from home to work or work to home in AM Peak and PM Peak periods. Seventy-three percent of evening riders use transit for home-based work trips.

Table 3-5: Distribution of Trip Purpose by Time of Day

Trip Purpose	Time of Day				
	AM Peak	Mid-day	PM Peak	Evening	Total
HBNW (Home to Non-Work, Non-Work to Home)	37.9%	52.3%	37.1%	21.7%	42.1%
HBW (Home to Work, Work to Home)	55.6%	27.6%	47.6%	73.3%	43.4%
NHNW (Non-Home/Non-Work to Non-Home/Non-Work)	3.4%	11.5%	7.2%	1.8%	7.7%
NHW (Work to Non-Home, Non-Home to Work)	3.1%	8.6%	8.1%	3.2%	6.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Access and Egress Mode

Figures 3-8 and 3-9 present the access mode and egress mode characteristics respectively. Statistics indicate that walk is the most dominant mode of access and egress. Nearly 90% of riders walk to access transit. Similarly, about 91% of riders walk to their final destination after they egress transit. In addition to walk, the commonly used access and egress modes include riding as a passenger (i.e., getting dropped off/picked up) and as a driver (drove alone). Overall, walk is the dominant mode of access and egress irrespective of the time period (Tables 3-6 and 3-7).

Figure 3-8: Distribution by Access Mode

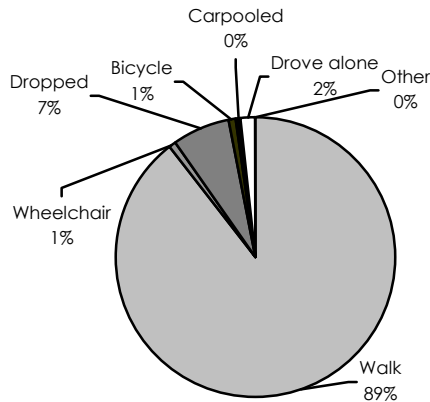


Figure 3-9: Distribution by Egress Mode

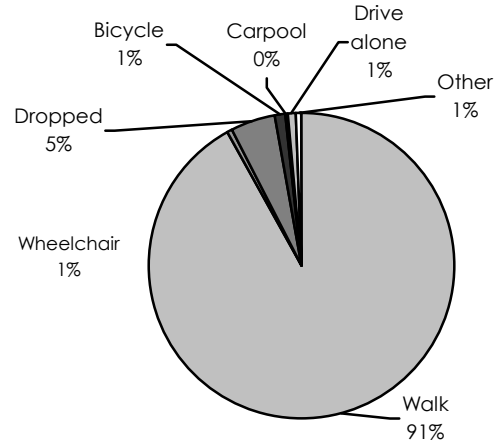


Table 3-6: Distribution of Access Mode by Time of Day

Access Mode	Time of Day				
	AM Peak	Mid-day	PM Peak	Evening	Total
Walk	82.77%	90.23%	92.00%	92.18%	89.30%
Wheelchair	0.60%	1.24%	0.24%	0.44%	0.76%
Dropped	7.74%	6.63%	6.61%	6.35%	6.83%
Bicycle	1.60%	1.24%	0.24%	0.00%	0.93%
Carpool	0.70%	0.41%	0.08%	0.04%	0.35%
Drive alone	6.45%	0.12%	0.70%	0.98%	1.71%
Other	0.14%	0.12%	0.14%	0.00%	0.12%
Total	100%	100%	100%	100%	100%

Table 3-7: Distribution of Egress Mode by Time of day

Egress Mode	Time of Day				
	AM Peak	Mid-day	PM Peak	Evening	Total
Walk	92.47%	93.18%	87.91%	95.87%	91.86%
Wheelchair	0.60%	1.29%	0.21%	0.00%	0.73%
Dropped	4.37%	3.19%	7.40%	4.13%	4.67%
Bicycle	1.44%	1.32%	0.55%	0.00%	1.01%
Carpool	0.34%	0.19%	0.00%	0.00%	0.15%
Drive alone	0.26%	0.17%	2.96%	0.00%	0.93%
Other	0.52%	0.64%	0.98%	0.00%	0.65%
Total	100%	100%	100%	100%	100%

As expected, the vast majority of the riders walk to access transit and egress transit (89%) (Table 3-8). The next common combination of access and egress mode used by riders are accessing the bus stop by being dropped off with walk egress (5%), walk to access the bus stop with being dropped off egress mode (3%), and driving access and walk egress (2%).

Table 3-8: Cross-Tabulation of Access by Egress Mode

		Egress Mode							Total
		Walk	Wheelchair	Dropped	Bicycle	Carpool	Drive alone	Other	
Access Mode	Walk	2.94%	66.30%	19.83%	40.54%	96.77%	71.52%	89.31%	89.31%
	Wheelchair	97.06%	1.01%	0.00%	0.00%	0.00%	0.00%	0.75%	0.75%
	Dropped	0.00%	31.04%	10.97%	5.41%	0.00%	19.87%	6.84%	6.84%
	Bicycle	0.00%	0.18%	69.20%	0.00%	0.00%	0.00%	0.93%	0.93%
	Carpool	0.00%	0.09%	0.00%	54.05%	0.00%	0.00%	0.34%	0.34%
	Drive alone	0.00%	1.37%	0.00%	0.00%	3.23%	3.97%	1.71%	1.71%
	Other	0.00%	0.00%	0.00%	0.00%	0.00%	4.64%	0.12%	0.12%
Total		100%	100%	100%	100%	100%	100%	100%	100%

Number of Transfers

The survey results (Table 3-9) show that about 64% of riders make at least one transfer to complete their one-way trip, with 43% that make one transfer, 19% that make two transfers, and 2% that make three or more transfers. More than one-third of riders (36%) do not make any transfers to complete their one-way trip.

Table 3-9: Distribution of Number of Transfers

Number of Transfers	Average Weekday Ridership	Percent
Zero	8368	36%
One	10047	43%
Two	4446	19%
Three or More	522	2%
Total	23,382	100%

Fare

The survey results (Figure 3-10) indicate that among all types of the passes that were used to pay for the transit fare, 45% of transit riders paid the transit fare with a day pass. The next common method to pay transit fare was one-way ticket (19%) and monthly pass (15%).

Figure 3-10: Distribution of Methods of Paying Transit Fare

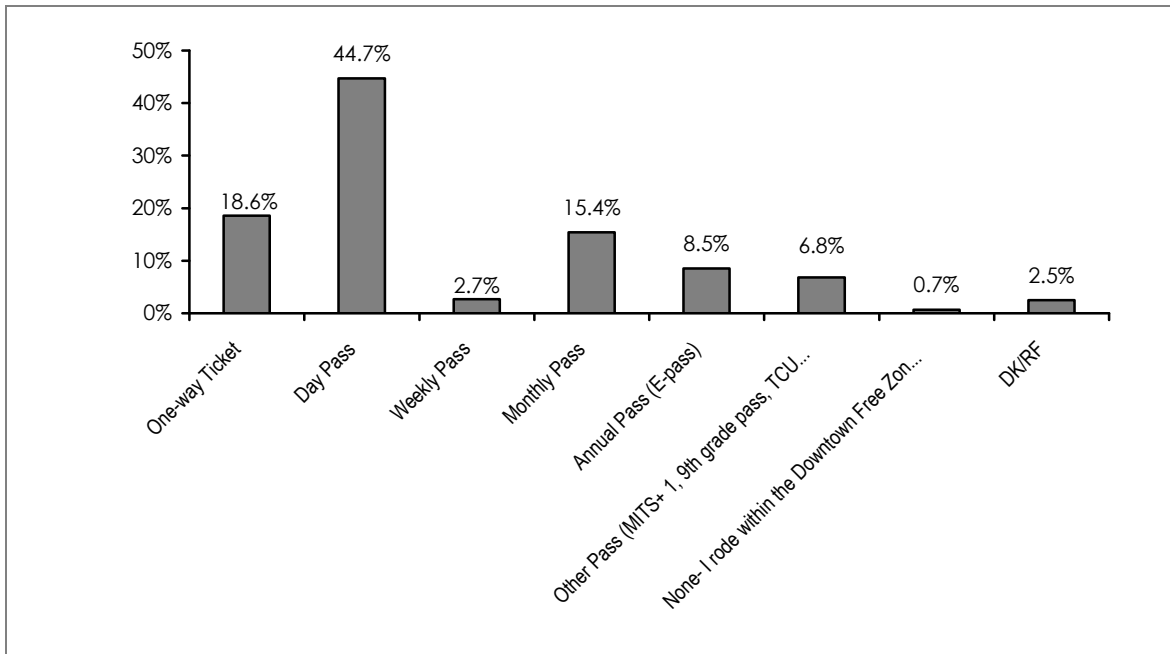
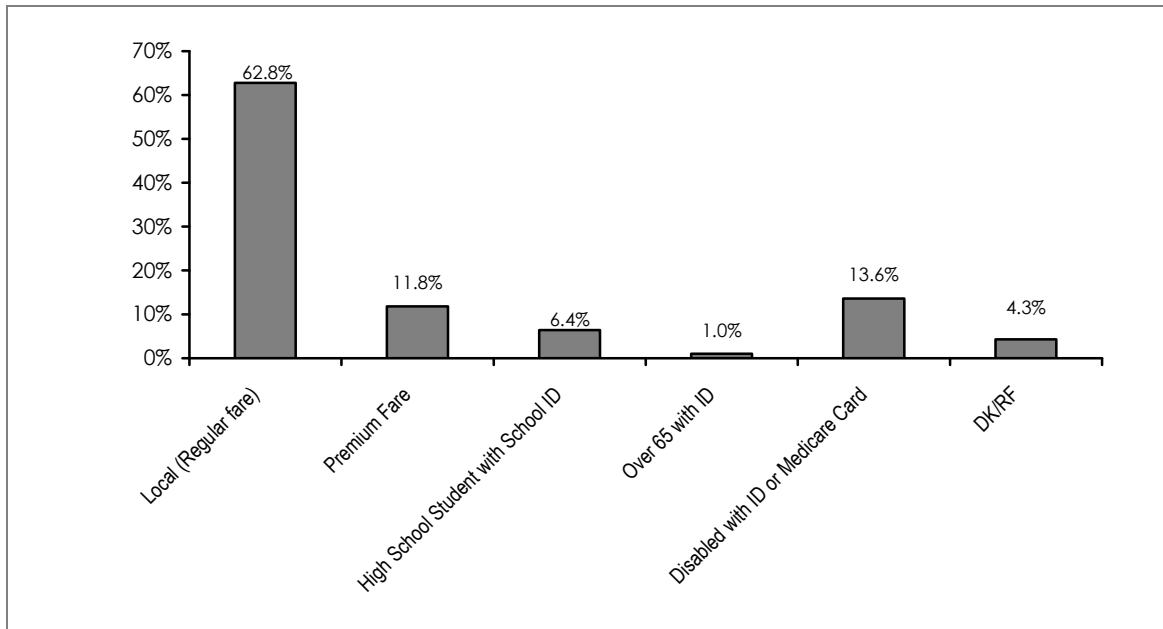


Figure 3-11: Distribution of Reduced Fare Type for Which a Respondent Is Qualified



Sixty-three percent of transit riders were reported not to be qualified with any type of reduced fare pass. Twelve percent of transit riders were qualified for a premium fare pass, and 14% of transit riders were qualified for a reduced fare pass for the disabled.

DCTA

Demographics

This section describes the demographics of DCTA transit riders including household size, household income, vehicle ownership, vehicle availability, employment status, student status, age, and valid driver's license status.

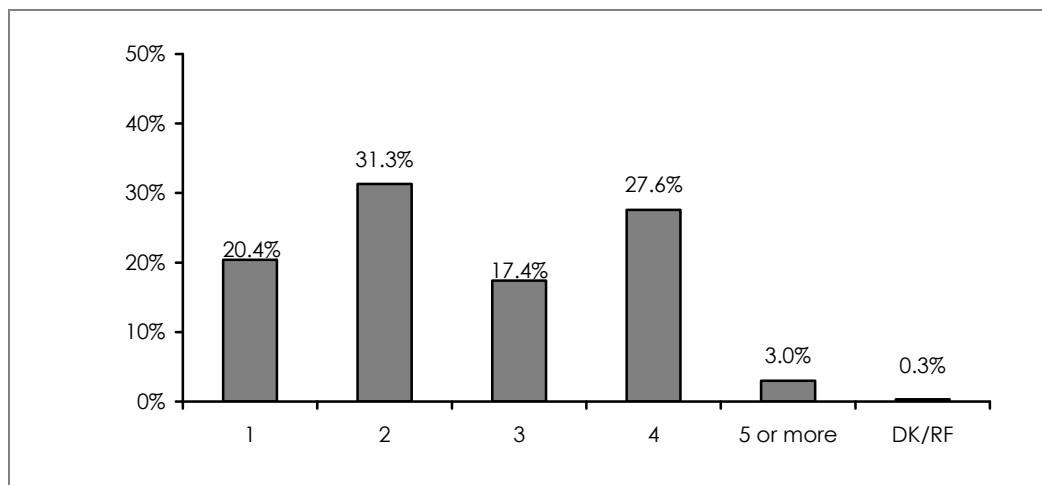
In addition, this section compares the demographic characteristics of DCTA transit riders with the general population residing in Denton County. Specifically, the 2009 DCTA transit pattern survey data were compared with 2007 American Community Survey data that includes all residents of Denton County (refer to Appendix B). It should be noted that the comparative analysis was limited to those variables that were available from the 2007 ACS data.

Household Size

The household size results (Figure 3-12) indicate that 97% of riders have a household size of four or fewer individuals. In particular, about 52% of riders live in one- or two-person households, while 45% live in three- or four-person households. Of the remaining, 3% have a household size of five or more individuals.

Compared to the general population, transit riders are more likely to live in smaller households (as indicated by comparison of 2009 FWTA/DCTA Travel Pattern Analysis data with 2007 ACS data). Specifically, the general population statistics indicate that 90% of households have four or fewer persons. It also indicates that 54% of the households are single or two-person households, 36% are three- or four-person households, while 10% are five- or more person households (refer to Table B-8 in Appendix B).

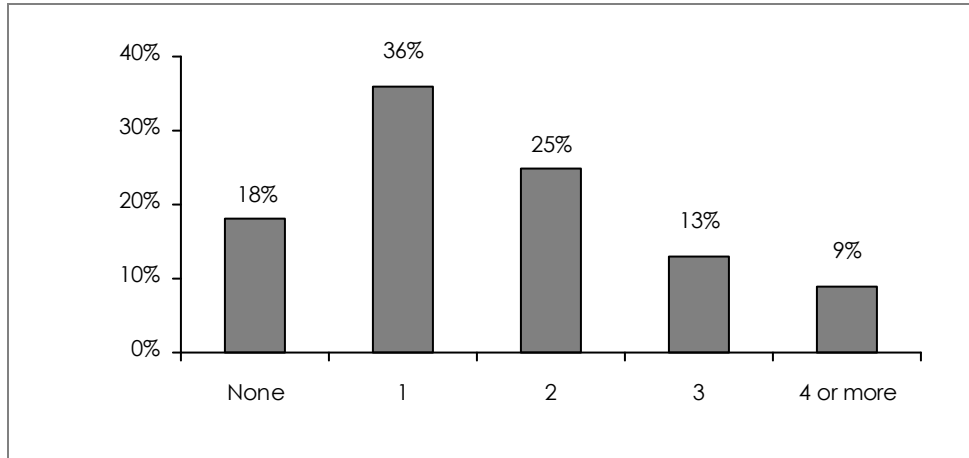
Figure 3-12: Distribution of Household Size



Vehicle Ownership

The vehicle ownership statistics (Figure 3-13) indicate that the vast majority of DCTA transit rider households (82%) own at least one automobile, with 36% that own one vehicle, 25% that own two vehicles, and 13% that own three or more vehicles. About one-fifth of transit rider households are transit-dependent, i.e., they do not own any vehicles. Of these transit-dependent rider households that do not own any vehicles or one vehicle, 46% have an annual income of less than \$25,000.

Figure 3-13: Distribution of Vehicle Ownership



As expected, transit riders are more likely to be from zero-vehicle households or households that own one vehicle only, compared to the general population (refer to Table B-10 in Appendix B). Specifically, only 3% of households in Denton County do not own any vehicles. The remaining 97% of households own at least one vehicle, with 28% that own one vehicle, 48% that own two vehicles, and 21% that own three or more vehicles.

Table 3-11 presents the cross-tabulation of vehicle ownership by household income. The table indicates that low-income households (with income less than \$25,000) tend to own fewer automobiles (none or one vehicle), with about 50% of low-income households with zero or one vehicle. The table shows an increase in vehicle ownership as the household income of riders increases.

Table 3-10: Cross-Tabulation of Vehicle Ownership by Household Income

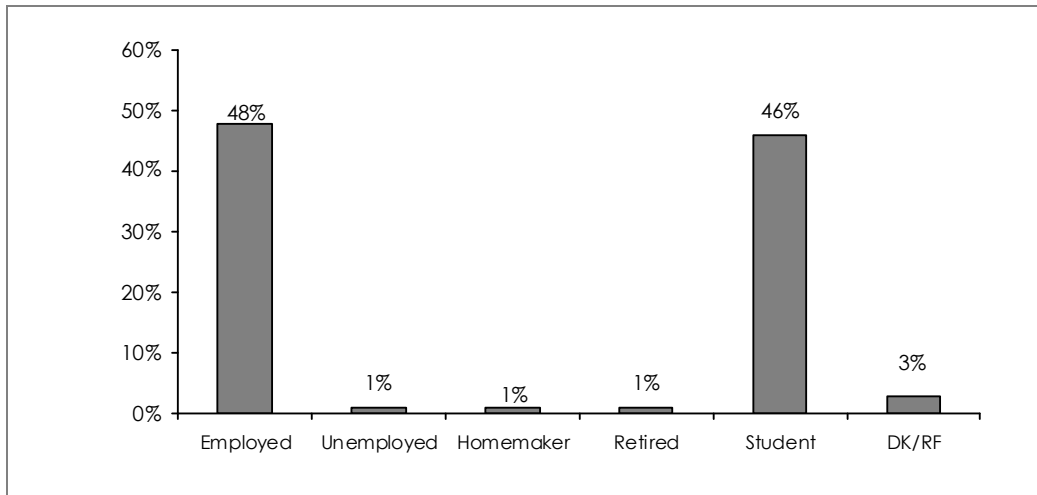
		Household Income							DK/RF
		Less than \$10,000	\$10,000 - \$14,999	\$15,000 - \$24,999	\$25,000 - \$34,999	\$35,000 - \$49,999	\$50,000 - \$74,999	\$75,000 or more	
Vehicle Ownership	None	24.84%	15.29%	28.53%	21.13%	7.73%	0.00%	0.00%	5.47%
	1	44.53%	38.93%	32.65%	48.45%	21.02%	14.01%	4.39%	24.77%
	2	11.37%	35.10%	13.63%	25.50%	24.55%	35.57%	48.12%	69.30%
	3	10.54%	7.11%	11.89%	4.37%	39.66%	36.13%	24.29%	0.46%
	4 or more	8.72%	3.57%	13.31%	0.55%	7.05%	14.29%	23.20%	0.00%
Total		100%	100%	100%	100%	100%	100%	100%	100%

Employment Status

The survey data reveals that nearly half of DCTA riders are employed full-time or part-time (Figure 3-14). It is notable that nearly half of DCTA riders are students (46%).

Compared to the general population, transit riders are less likely to be employed. Specifically, 81% of the general population is employed, while only 1% is unemployed. Thirteen percent are not in the labor force (refer to Table B-11 in Appendix B; questions are not directly comparable between 2009 FWTA/DCTA Travel Pattern Analysis and 2007 ACS survey).

Figure 3-14: Distribution of Employment Status

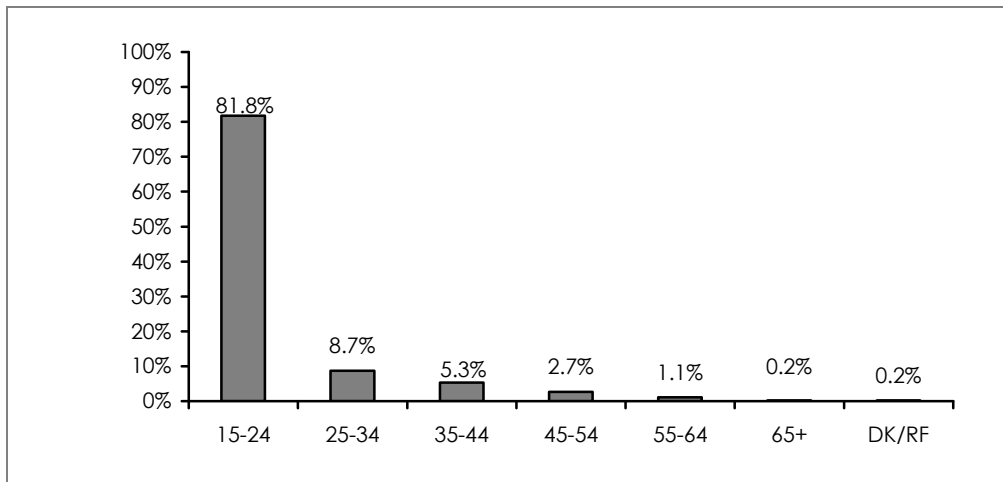


Age

Figure 3-15 provides the distribution of riders by age. The figure indicates that the vast majority of DCTA transit riders (82%) are between 15 to 24 years of age. Young student riders are the largest group of total riders. Riders aged 25 to 34 comprise about 9% of total riders. Older riders (i.e., 45 years or age or older) make up only 4% of riders.

Compared to the general population, transit riders are more likely to be 15 to 24 years of age. Specifically, individuals aged 18 to 54 years constitute 27% of the general population only, as compared to 82% of the transit rider population (refer to Table B-12 in Appendix B).

Figure 3-15: Distribution of Age

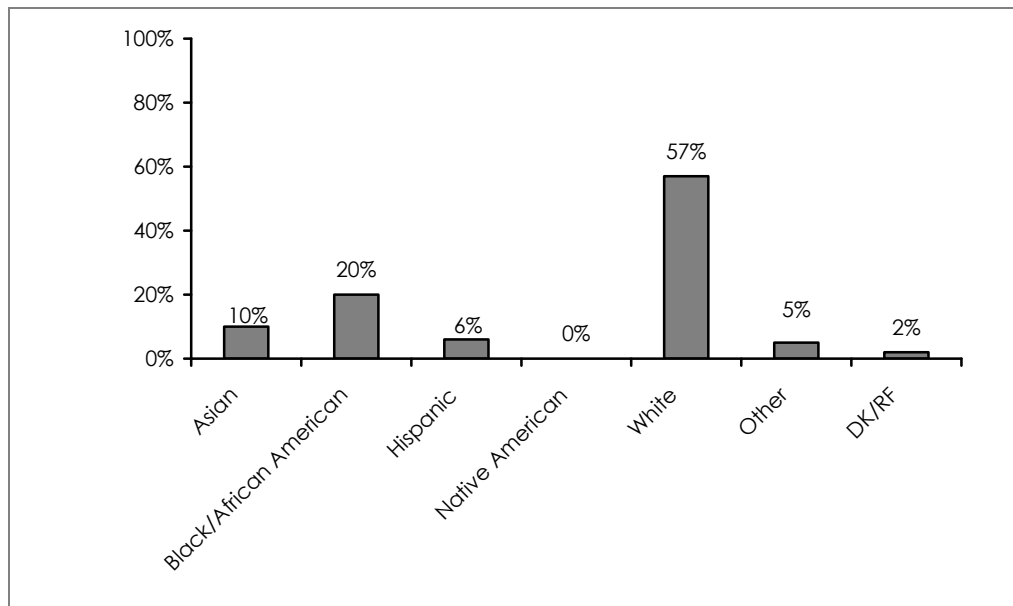


Ethnicity

Figure 3-16 presents the distribution of riders by ethnicity. A large portion of DCTA transit riders is white with 57% of total ridership. African American and Asians are more likely to be transit dependant as they comprise 30% of total ridership while they constitute 15% of the general population(refer to Table B-13 in Appendix B)..

Compared to the general population, transit riders are more likely to be 15 to 24 years of age. Specifically, individuals aged 18 to 54 years constitute 27% of the general population only, as compared to 82% of the transit rider population

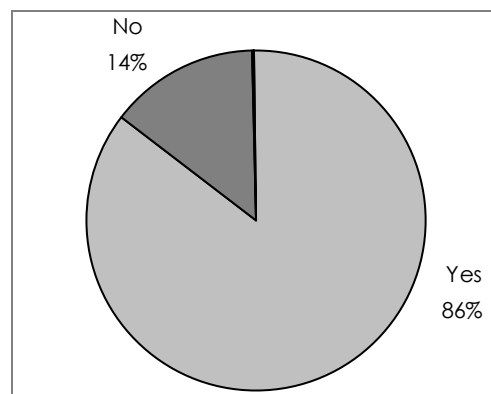
Figure 3-16: Distribution of Ethnicity



Valid Driver's License Status

Figure 3-17 provides the distribution of riders by possession of a valid driver's license. The figure indicates that a majority of DCTA transit riders have a valid driver's license (86%).

Figure 3-17: Distribution of Valid Driver's License Status



Travel Characteristics

This section describes the trip-making characteristics of DCTA transit riders including trip origin, trip destination, trip purpose, access and egress mode characteristics, and fare for the surveyed one-way trip.

Trip Origin

The distribution of riders by trip origin indicates that the most common trip origins are home and work (Table 3-11). In particular, about 42% of riders have trips originating from home, while about 45% have trips originating from college/university. A large portion of student riders is a notable difference between DCTA transit and FWTa transit. Other trip origins include work (6%) and shopping (1%).

Table 3-11: Distribution of Trip Origin

Trip Origin	Average Weekday Ridership	Percent
Home	5318	41.6%
Work	809	6.3%
College/University	5803	45.3%
School (K-12)	64	0.5%
Shopping	126	1.0%
Social/Recreational	78	0.6%
Medical Appointment/Hospital Visit	20	0.2%
Restaurant	15	0.1%
Other	563	4.4%
Total	23382	100%

Trip Destination

The distribution of riders by trip destination indicates that the most common trip destinations are home or college/university (Table 3-12). In particular, nearly 50% riders have trips ending at college/university, while 35% have trips ending at work. This is similar to the results obtained for trip origin. Other trip destinations are work (5%), shopping places (4%), and other places (6%).

Table 3-12: Distribution of Trip Destination

Trip Destination	Average Weekday Ridership	Percent
Home	4489	35.1%
Work	626	4.9%
College/University	6189	48.4%
School (K-12)	50	0.4%
Shopping	532	4.2%

Trip Destination	Average Weekday Ridership	Percent
Social/Recreational	97	0.8%
Medical Appointment/Hospital Visit	46	0.4%
Restaurant	0	0.0%
Other	766	6.0%
Total	23382	100%

Trip Purpose

Trip purpose is an important trip-making characteristic. One way of defining trip purpose is based on the origin and destination of trips. In particular, trips defined by origin and destination can be classified into (1) Home-based work trips (2) Home-based non-work trips, (3) Non home-based non-work trips, and (4) Non home-based work trips. Table 3-13 presents the distribution of riders by trip purpose.

The table indicates that a large portion of riders make home based non-work trips (68%) while only 9% of riders make home-based work trips. This finding indicates that a significant proportion of transit trips are for non-commuting purposes. About 23% of riders make non home-based trips, with 21% non-home-based non-work trips, and 2% non-home-based other trips.

As compared to the general population in Denton County, it is confirmed that transit is less likely to be used as a mean of transportation to work. Only 1 % of total population in Denton County uses transit for commuting purpose (Table B-14 in Appendix B).

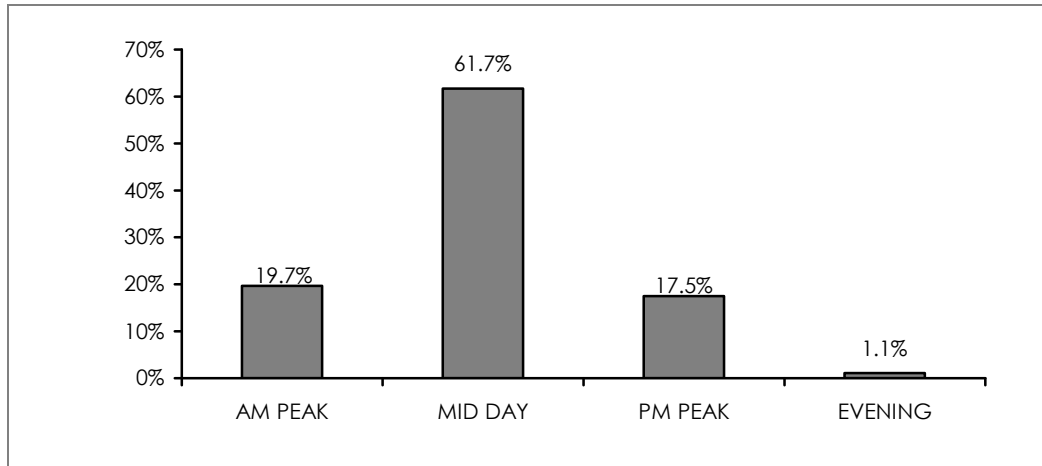
Table 3-13: Distribution of Trip Purpose

Trip Purpose	Average Weekday Ridership	Percent
HBNW (Home to Non-Work, Non-Work to Home)	8,706	68.0%
HBW (Home to Work, Work to Home)	1,102	8.6%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	2,696	21.1%
NHW (Work to Non-Home, Non-Home to Work)	292	2.3%
Total	12,796	100.0%

Time of Day

The distribution of riders by time of day indicates that a large percentage of riders (62%) make trips during Mid-day (42%), while about one-fifth make their trip during the AM Peak period, and a little less than one-fifth of riders make trips during PM Peak (Figure 3-18). Remaining riders make their trip during Evening period (1%).

Figure 3-18: Distribution by Time of Day



A distribution of trip purpose by time of day indicates that a majority of riders (77%) are based from/to home. Regardless of time of day, a majority of riders make home-based non-work trips. During PM Peak, more home-based work trips occur than any other time of day periods.

Table 3-14: Distribution of Trip Purpose by Time of Day

Trip Purpose	Time of Day				Total
	AM Peak	Mid-day	PM Peak	Evening	
HBNW (Home to Non-Work, Non-Work to Home)	68.10%	73.60%	47.70%	78.01%	68.04%
HBW (Home to Work, Work to Home)	10.17%	4.51%	21.26%	10.64%	8.62%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	21.73%	20.26%	23.76%	11.35%	21.06%
NHW (Work to Non-Home, Non-Home to Work)	0.00%	1.63%	7.28%	0.00%	2.28%
Total	100%	100%	100%	100%	100%

Access and Egress Mode

Figure 3-12 and 3-20 present the access mode and egress mode characteristics respectively. Statistics indicate that walk is the most dominant mode of access and egress. Nearly 91% of riders walk to access transit and walk to their final destination after they egress transit. In addition to walk, the commonly used access and egress modes include riding as a passenger (i.e., getting dropped off/picked up) and as a driver (drove alone).

Overall, walk is the dominant mode of access and egress irrespective of the time period (Table 3-15 and 3-16). It should be noted that this varies based on type of transit, e.g. express, local bus, or shuttle. The details will be addressed in Chapter 4.

Figure 3-19: Distribution by Access Mode

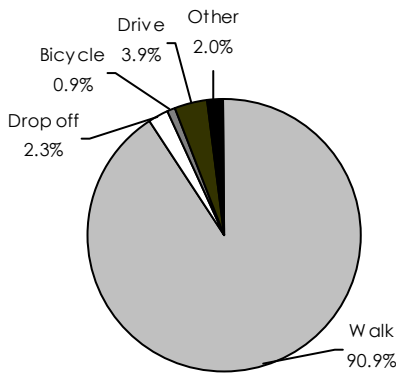


Figure 3-20: Distribution by Egress Mode

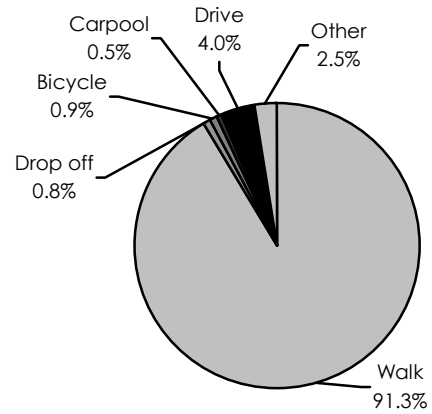


Table 3-15: Distribution of Access Mode by Time of Day

Access Mode	Time of Day				
	AM Peak	Mid-day	PM Peak	Evening	Total
Walk	92.65%	90.77%	89.33%	92.91%	90.91%
Wheelchair	0.00%	0.00%	0.00%	0.00%	0.00%
Dropped	0.72%	1.25%	7.68%	0.00%	2.26%
Bicycle	1.51%	0.52%	1.38%	7.09%	0.94%
Carpool	0.00%	0.00%	0.00%	0.00%	0.00%
Drive alone	2.78%	5.01%	1.43%	0.00%	3.89%
Other	2.34%	2.44%	0.18%	0.00%	2.00%
Total	100%	100%	100%	100%	100%

Table 3-16: Distribution of Egress Mode by Time of day

Egress Mode	Time of Day				
	AM Peak	Mid-day	PM Peak	Evening	Total
Walk	95.75%	96.07%	69.29%	92.91%	91.29%
Wheelchair	0.00%	0.00%	0.00%	0.00%	0.00%
Dropped	0.00%	0.70%	1.96%	0.00%	0.77%
Bicycle	1.51%	0.73%	0.63%	7.09%	0.94%
Carpool	1.63%	0.10%	0.63%	0.00%	0.49%
Drive alone	1.11%	1.70%	15.76%	0.00%	4.03%
Other	0.00%	0.70%	11.74%	0.00%	2.49%
Total	100%	100%	100%	100%	100%

As expected, the vast majority of the riders walk to access transit and egress transit (84%) (Table 3-17). The next common combination of access and egress mode used by riders are accessing the bus stop with walk and driving alone to the trip destination from last transit stop (4%), and driving to access the transit and walk egress for the trip destination (4%).

Table 3-17: Cross-Tabulation of Access by Egress Mode

		Egress Mode							Total
		Walk	Wheelchair	Dropped	Bicycle	Carpool	Drive alone	Other	
Access Mode	Walk	91.79%	42.42%	14.17%	100.00%	92.25%	98.74%	90.91%	91.79%
	Wheelchair	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Dropped	2.01%	54.55%	0.00%	0.00%	0.00%	0.00%	2.26%	2.01%
	Bicycle	0.12%	3.03%	85.83%	0.00%	0.00%	0.00%	0.94%	0.12%
	Carpool	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Drive alone	3.92%	0.00%	0.00%	0.00%	7.75%	0.00%	3.89%	3.92%
	Other	2.16%	0.00%	0.00%	0.00%	0.00%	1.26%	2.00%	2.16%
Total		91.3%	100%	100%	100%	100%	100%	100%	100%

Number of Transfers

The survey results (Table 3-18) indicate that the vast majority of DCTA transit riders make their one-way trip with zero transfers. Only about 13% of riders make one transfer to complete their one-way trip.

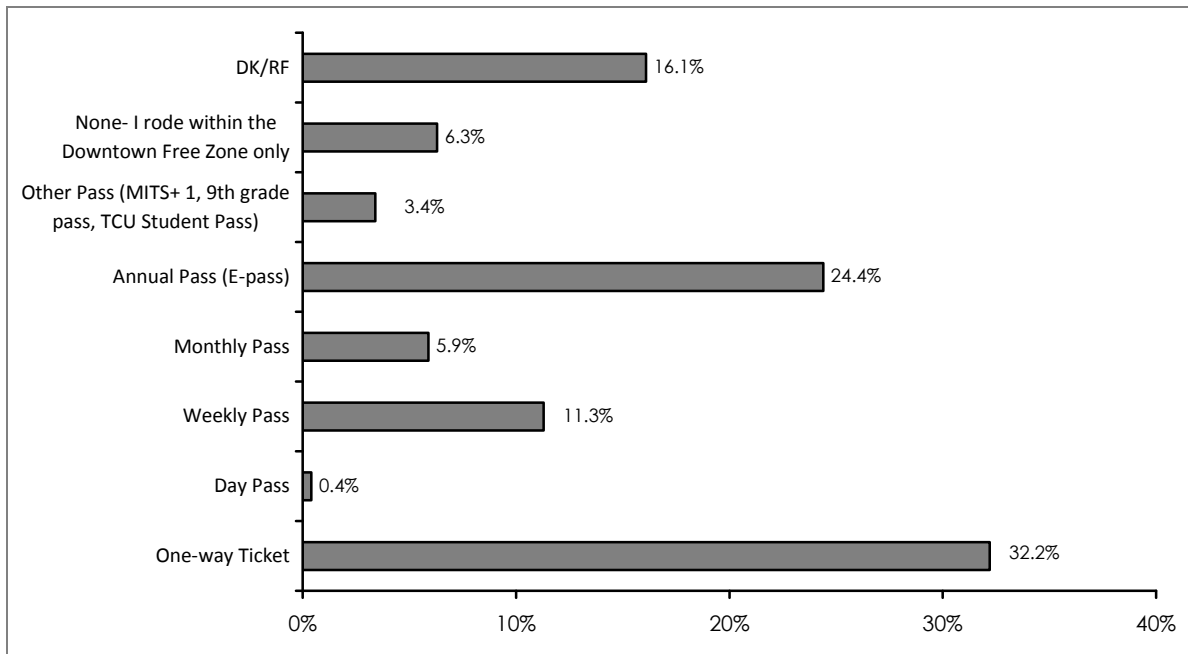
Table 3-18: Distribution of Number of Transfers

Number of Transfers	Average Weekday Ridership	Percent
Zero	11,198	87.5%
One	1,598	12.5%
Two	0	0.0%
Three or More	0	0.0%
Total	12,796	100%

Fare

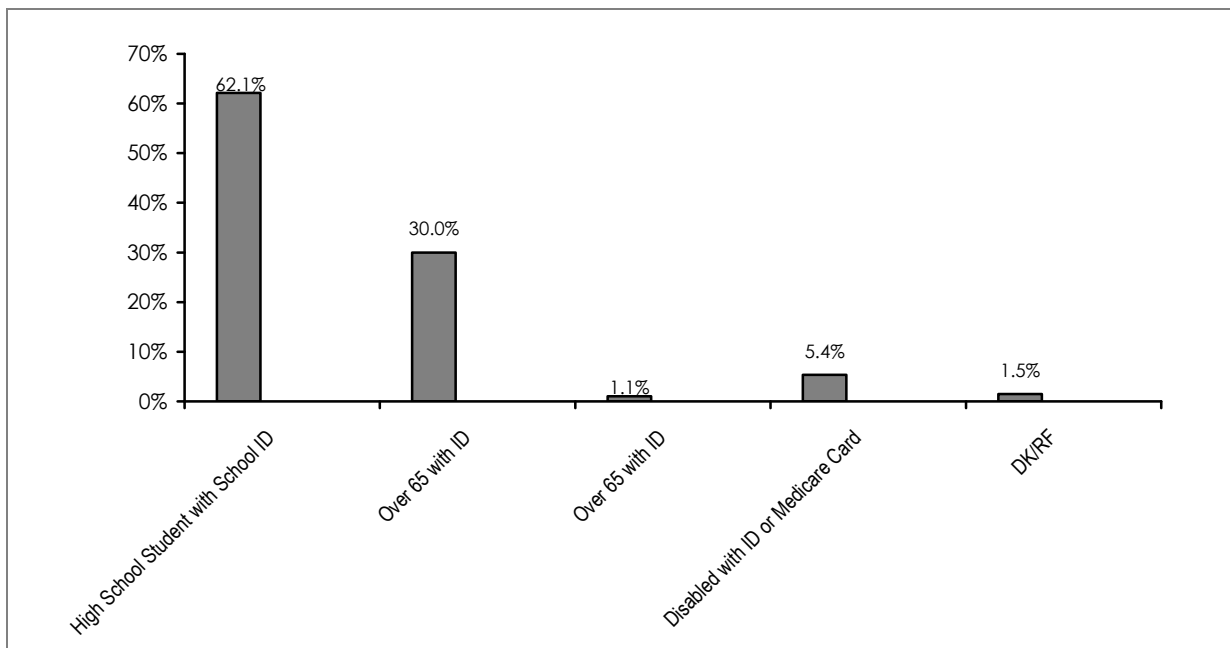
The survey results (Figure 3-21) indicate that 32% of riders purchased one-way ticket to pay for the transit fare. Twenty-four percent of riders used an annual pass (E-pass) to pay for the transit fare. The other common methods to pay the transit fare were by weekly pass (11%) and monthly pass (6%).

Figure 3-21: Distribution of Methods of Paying Transit Fare



Sixty-three percent of transit riders were reported not to be qualified with any type of reduced fare pass. Twelve percent of transit riders were qualified for premium fare pass, and 14% of transit riders were qualified for reduced fare pass for the disabled.

Figure 3-22: Distribution of Reduced Fare Type for Which a Respondent Is Qualified



4. Survey Data Analysis by Trip Purpose

FWTA – Home-Based Non-Work Trip HBNW (HBNW)

This chapter provides a comparative analysis of demographics and travel behavior characteristics of Fort Worth Transit Authority riders making home-based trips to non-work locations or vice versa (HBNW).

Household Size/Household Income

The household income results show that a large majority of transit riders (over 80%) are from low-income households, reported as making under \$25,000 annually (Tables 4-1 and Table 4-2).

Table 4-1: FWTA HBNW Household Size/Household Income

Weighted Income	HHSIZE						Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	2094.53	1897.60	1268.43	1357.54	1219.54	108.69	7946.33
25-50 K (2)	255.72	159.62	190.70	193.33	193.57	0.00	992.94
50-75 K (3)	70.37	58.75	21.44	18.81	31.79	0.00	201.16
75 K + (4)	0.00	17.48	11.79	17.38	5.93	0.00	52.58
DK/RF	82.42	160.10	52.57	68.53	110.4	183.75	657.77
Total	2503.04	2293.55	1544.93	1655.59	1561.23	292.44	9850.78

Table 4-2: FWTA HBNW Household Size/Household Income

% Total Income	HHSIZE						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	21.26%	19.26%	12.88%	13.78%	12.38%	1.10%	80.67%
25-50 K (2)	2.60%	1.62%	1.94%	1.96%	1.97%	0.00%	10.08%
50-75 K (3)	0.71%	0.60%	0.22%	0.19%	0.32%	0.00%	2.04%
75 K + (4)	0.00%	0.18%	0.12%	0.18%	0.06%	0.00%	0.53%
DK/RF	0.84%	1.63%	0.53%	0.70%	1.12%	1.87%	6.68%
Total	25.41%	23.28%	15.68%	16.81%	15.85%	2.97%	100.00%

Ignoring those who refused to report their income, 86% of HBNW riders are from low-income households (Figure 4-1). Around half of HBNW riders are from one- or two-person households, with slightly more from single-person households.

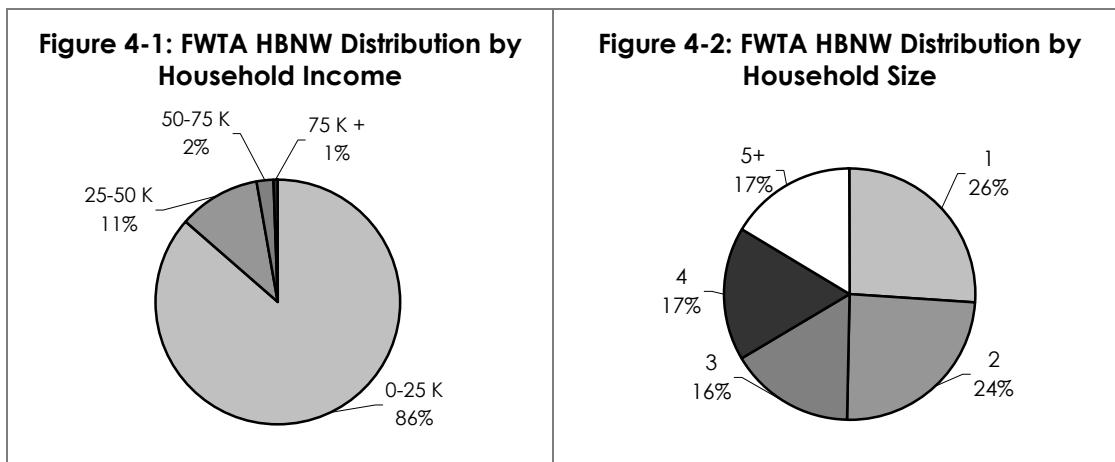


Figure 4-3 presents the income distribution of riders by household size. Riders are most likely to be from lower-income households regardless of household size, but the connection is most pronounced in the two-person households.

Figure 4-3: FWTAs HBNW Distribution of Household Income by Household Size

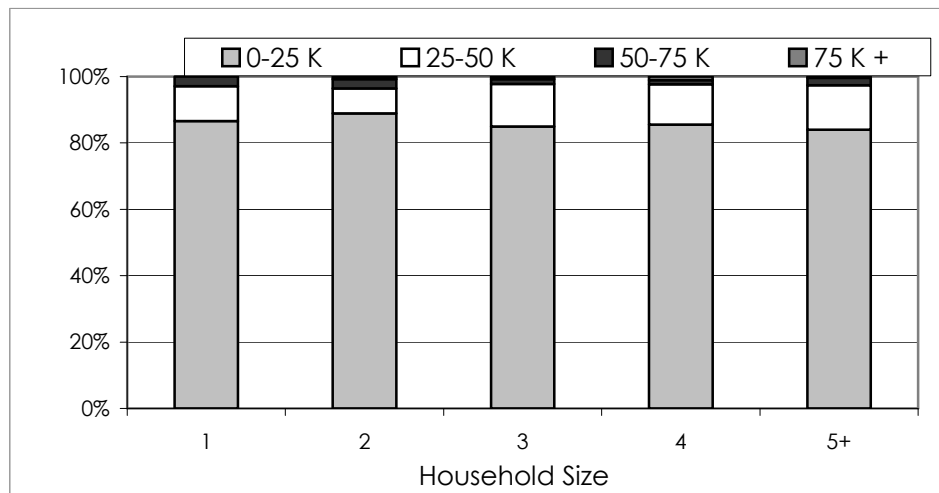
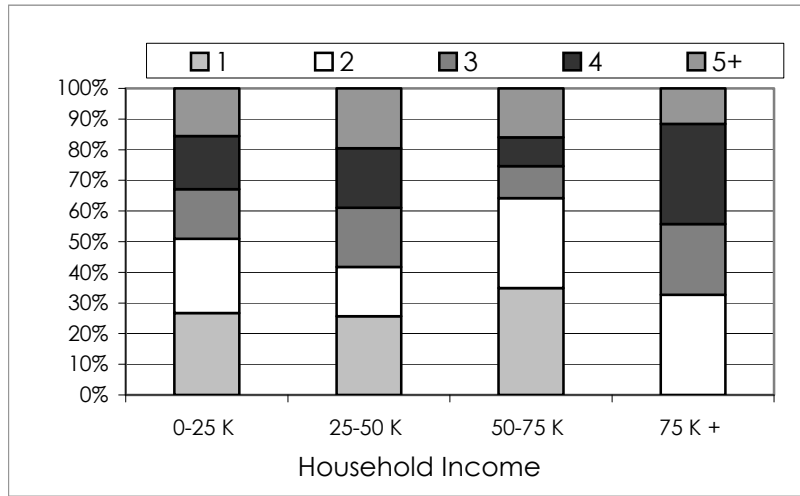


Figure 4-4 presents the household size distribution of riders by income category. Riders in two-person households are most likely to be in the third income category (50-75K). In the highest income category (75K+), there were no riders surveyed that reported being from single-person households.

Figure 4-4: FFTA HBNW Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes Per Linked Trips

HBNW riders were slightly less likely to get to their final destination in one route than the typical weekday passenger (Figures 4-5 and 4-6). Weekday passengers take an average of 1.56 routes to get to their final destination, while HBNW riders take an average of 1.60 (Table 4-3).

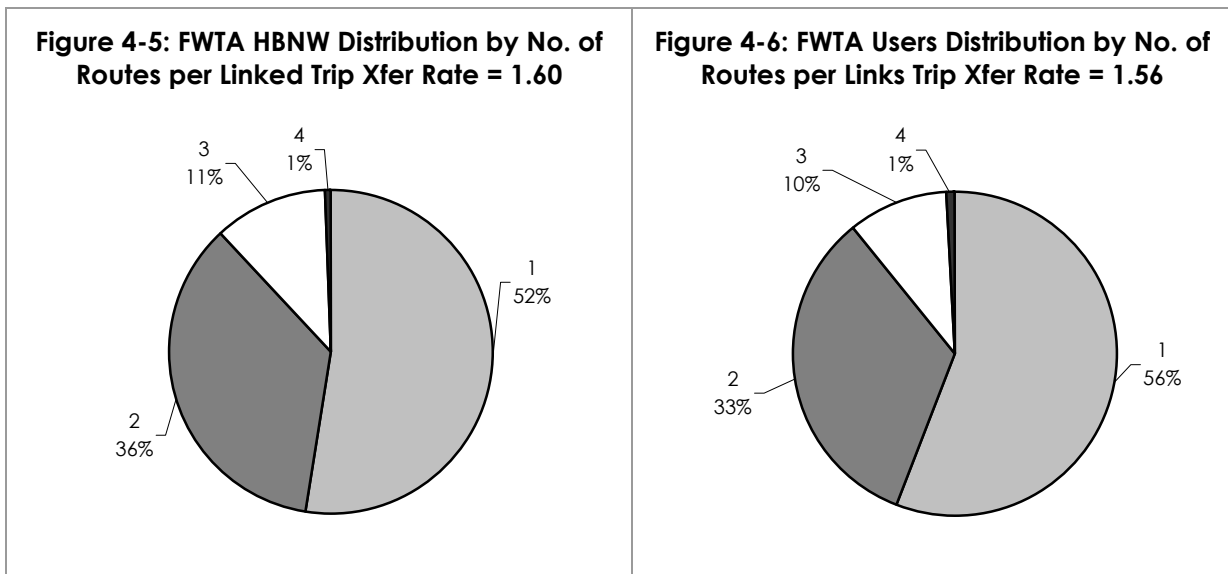


Table 4-3: FFTA HBNW Trip Transfer Rate

Transfer Rate	Sample	Expanded
HBNW Xfer Rate ⁴	2	1.60
WkDy Xfer Rate ⁵	2	1.56

⁴ Transfer Rate (Sample) = $\sum_{i=1}^5 (\text{NumVehicles}_i * \text{Num Samples}_i) / \sum (\text{Num Samples}_i)$

⁵ Transfer Rate (Expansion) = $\sum_{i=1}^5 (\text{Expansion}_i) / \sum_{i=1}^5 (\text{Expansion}_i / \text{NumVehicles}_i)$

Tables 4-4 shows the distribution of number of vehicles taken by HBNW passengers for their one-way trips. Almost 80% of riders who used transit for HBNW trip purpose made 0 or 1 transfer to reach their final destination.

Table 4-4: Number of Vehicles (Weekday, HBNW Trip Purpose)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	382	3,224.08	32.73%	3,224.08	52.41%
2	507	4,396.07	44.63%	2,198.04	35.73%
3	217	2,061.27	20.92%	687.09	11.17%
4	19	169.36	1.72%	42.34	0.69%
Total	1125	9,850.78	100.00%	6,151.55	100.00%

Table 4-5 presents the distribution of number of transfers for all riders regardless of trip purpose. It shows similar distribution of number of vehicles taken by all riders by HBNW passengers.

Table 4-5: Number of Vehicles (All Weekday Trips)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	945	8,367.52	35.79%	8367.52	55.77%
2	1142	10,046.99	42.97%	5023.50	33.48%
3	480	4,445.83	19.01%	1481.94	9.88%
4	58	521.62	2.23%	130.41	0.87%
Total	2625	23,381.96	100.00%	15003.36	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-6 and Figure 4-6 show how passengers typically get to the transit. Over 56% walk to the bus/rail, while 35.17% transferred from another bus. Of those arriving at their first route, over 90% walk, while close to 10% used a vehicle.

Table 4-6: HBNW Trip Mode of Access

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	5566.51	56.51
DRIVE (Drop Off, Drive Alone, Carpool)	587.1	5.96
OTHER	13.63	0.14
BUS transfer*	3465.01	35.17
TRE transfer*	218.53	2.22
Total	9850.78	100.00

* If Surveyed Route is not 1st route, it is considered a transfer.

Figure 4-7: HBNW Trip Mode of Access

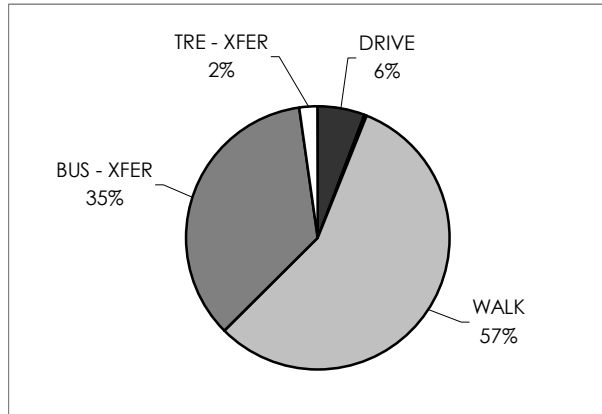


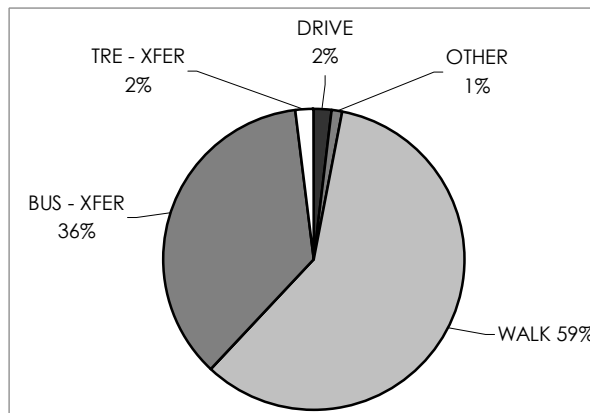
Table 4-7 and Figure 4-8 show the difference between modes of access and egress. After arriving at the transit stop, 58.66% of passengers walk to their next location, compared to 56.51% who walked from their access location to the transit. Also, 36.25% transfer to another bus, while 56.51% transferred from another bus.

Table 4-7: HBNW Trip Mode of Egress From the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	5771.39	58.59
DRIVE (Drop Off, Drive Alone, Carpool)	191.67	1.95
OTHER	126.5	1.28
BUS transfer**	3570.61	36.25
TRE transfer**	190.61	1.93
Total	9850.78	100.00

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-8: HBNW Trip Mode of Egress From the Surveyed Route



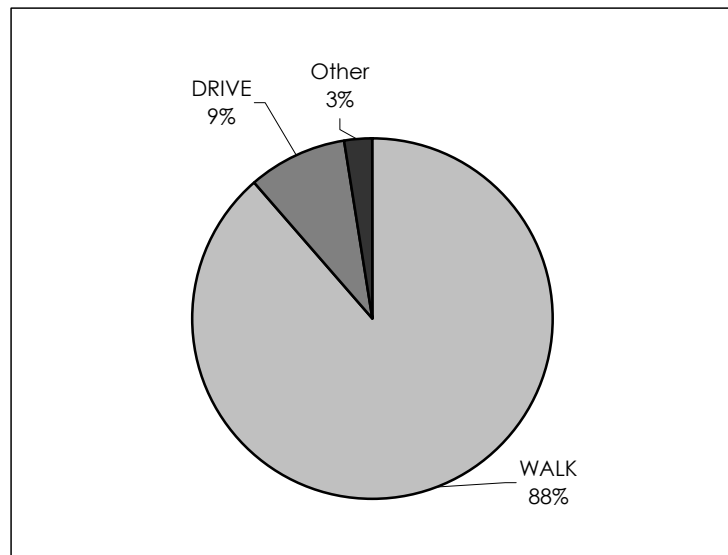
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, we see how the average transit rider both gets to the transit as well as leaves from the transit. Of HBNW passengers 88.62% traveled to and from the transit by foot or wheelchair only, while 8.78% used a vehicle for at least one leg (Table 4-8 and Figure 4-9).

Table 4-8: Mode of Access and Mode of Egress for HBNW Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPLES	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	8,729.75	88.62%	1,002	89.07%
DRIVE (Drive-Drive, Walk-Drive or Drive-Walk)	865.02	8.78%	101	8.98%
Other	256.01	2.60%	22	1.96%
Total	9,850.78	100.00%	1,125	100.00%

Figure 4-9: HBNW Trip Purpose Mode of Access/Egress to the Transit System



Total Trip Distance⁶

Figures 4-10 and 4-11 show how far FWTA passengers travel to get to their final destination. Close to 55% of riders travel less than 5 miles, but the data is skewed widely to the right. While the average passenger travels 6.26 miles, 10.53% travel over 10 miles.

⁶ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{\text{LAT}})^2 + (\text{Distance}_{\text{LONG}})^2}$$

where,

$$\text{Distance}_{\text{LAT}} = 69.1 \times (\text{LAT}_2 - \text{LAT}_1)$$

$$\text{Distance}_{\text{LONG}} = 69.1 \times (\text{LONG}_2 - \text{LONG}_1) \times \cos(\text{LAT}_1 / 57.3)$$

Figure 4-10: HBNW Trip Purpose – Total Distance (Average 6.26 miles)

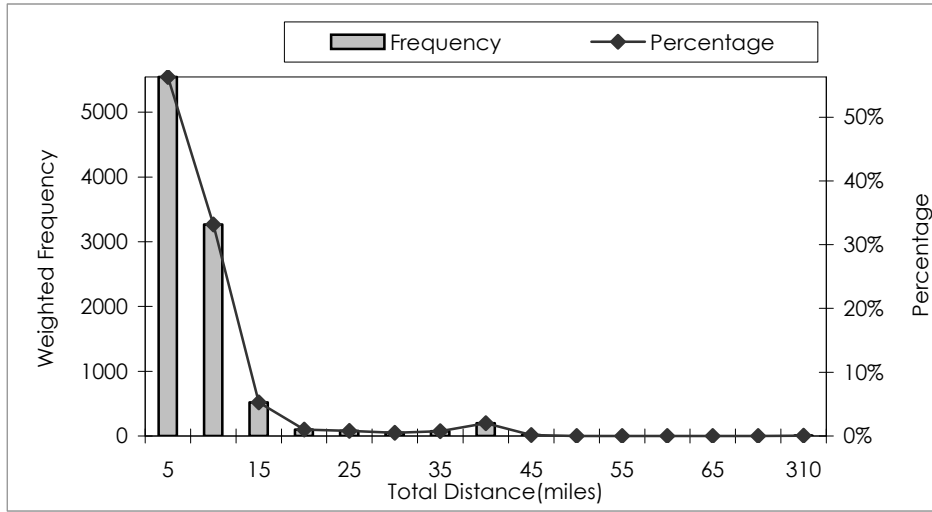
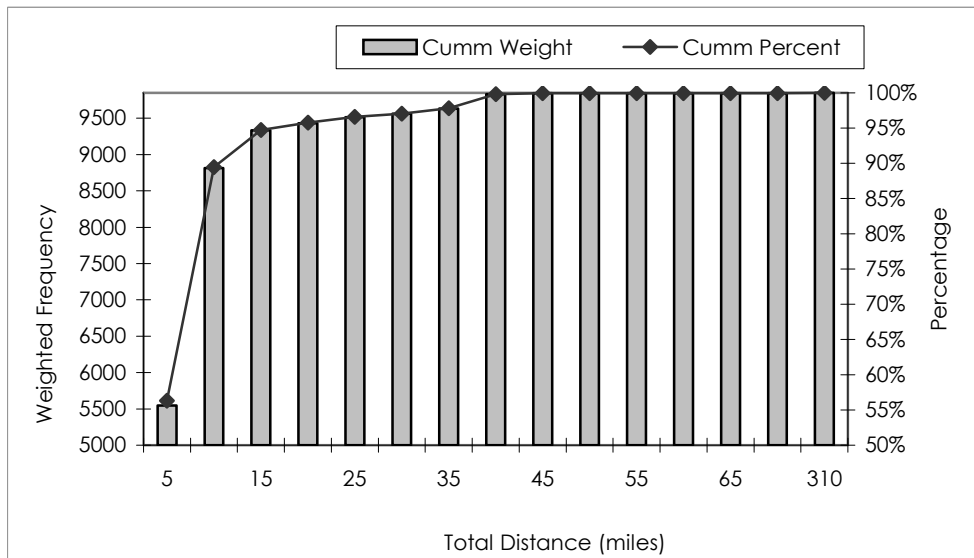


Figure 4-11: HBNW Trip Purpose – Cumulative Total Distance



FWTA – Home-Based Work Trip (HBW)

Trips for home-based work trips could show different demographics of riders and travel patterns from trips for other purposes. This section will address demographics of HBW trip transit riders and their travel characteristics.

Household Size/Household Income

Tables 4-9 and 4-10 show the distribution of household size and household income as a weighted number of total passengers and as a percentage, respectively.

Table 4-9: Household Size/Household Income

Weighted Income	Household Size						Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	1732.89	1720.98	1449.16	817.81	808.77	58.74	6588.35
25-50 K (2)	272.25	519.96	345.36	301.58	365.9	4.36	1809.41
50-75 K (3)	38.74	278.13	124.27	101.61	69.73	0.00	612.48
75 K + (4)	110.97	171.52	88.49	109.89	9.03	0.00	489.9
DK/RF	251.9	51.48	56.32	44.79	76.4	168.74	649.63
Total	2406.75	2742.07	2063.6	1375.68	1329.83	231.84	10149.77

Table 4-10: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	17.07%	16.96%	14.28%	8.06%	7.97%	0.58%	64.91%
25-50 K (2)	2.68%	5.12%	3.40%	2.97%	3.61%	0.04%	17.83%
50-75 K (3)	0.38%	2.74%	1.22%	1.00%	0.69%	0.00%	6.03%
75 K + (4)	1.09%	1.69%	0.87%	1.08%	0.09%	0.00%	4.83%
DK/RF	2.48%	0.51%	0.55%	0.44%	0.75%	1.66%	6.40%
Total	23.71%	27.02%	20.33%	13.55%	13.10%	2.28%	100.00%

The household income results show that out of the three trip purposes, HBW riders have the smallest majority (70%) of riders from low-income households (Figure 4-12). More than half of HBW riders are from one- or two-person households, while the typical HBW rider is most likely to be from a two-person household, at 28% (Figure 4-13).

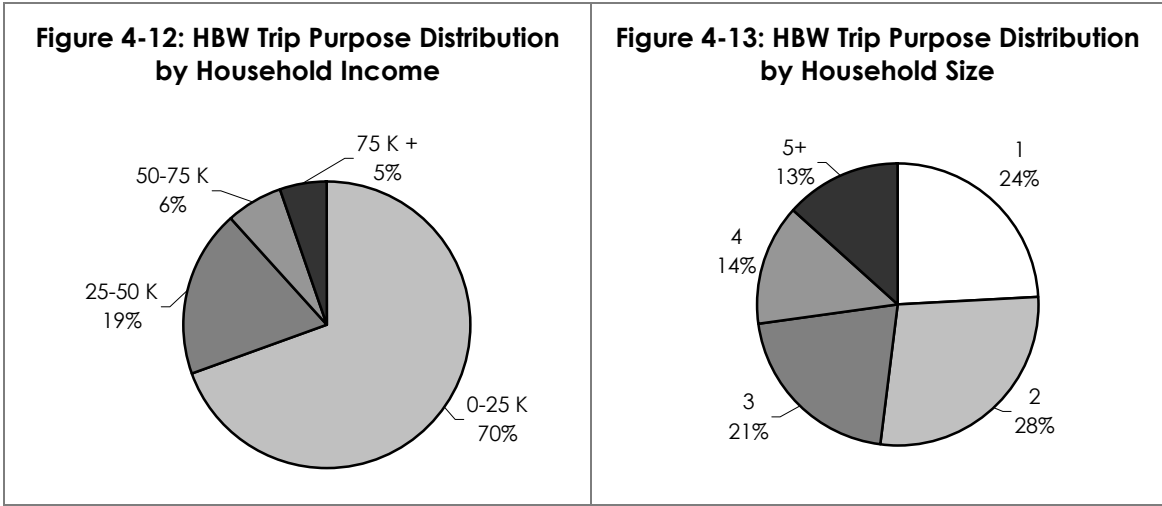


Figure 4-14 presents the income distribution of riders by household size. Riders are most likely to be from lower-income households regardless of household size, but the connection is most pronounced in the single-person households.

Figure 4-14: HBW Trip Purpose Distribution of Household Income by Household Size

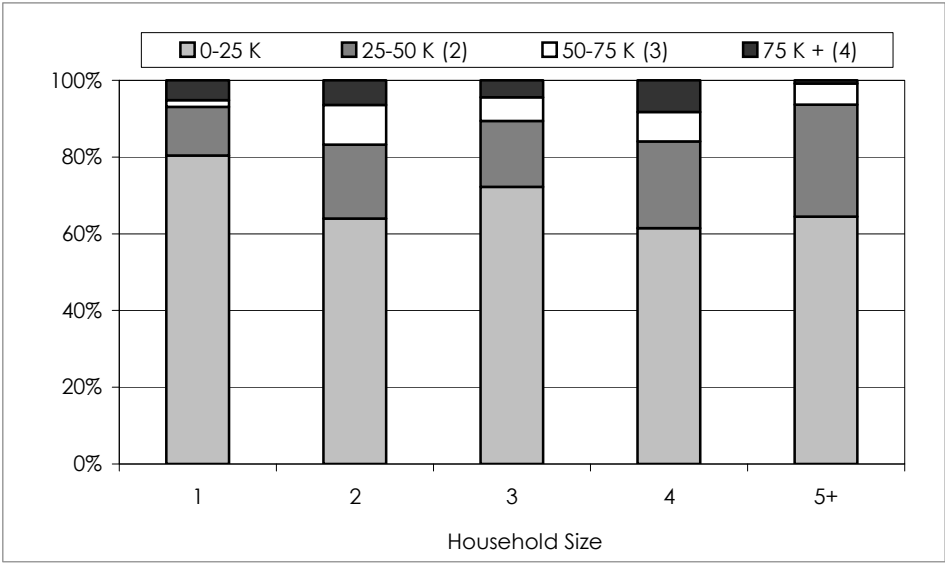
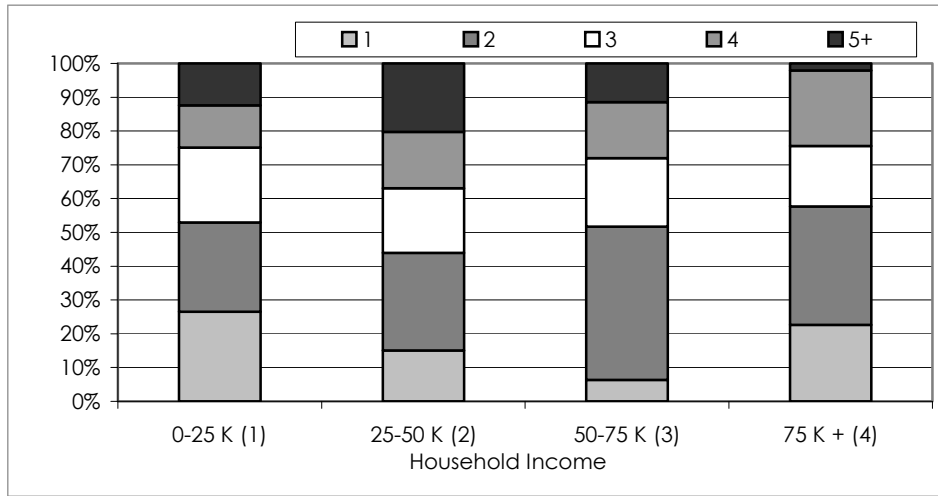


Figure 4-15 presents the household size distribution of riders by income category. Riders in two-person households are most likely to be in the third income category (50-75K). There is a significant representation of one-person households in the highest income category (75K+) at over 20%. However, they are most likely to be from two-person households.

Figure 4-15: FWTA HBW Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

HBW riders were about as likely to get to their final destination in one route as the typical weekday passenger (Figures 4-16 and 4-17). Fifty-six percent of HBW riders get to their final destination with one route compared to 55% for the typical weekday rider. Both categories average 1.56 routes (Table 4-11).

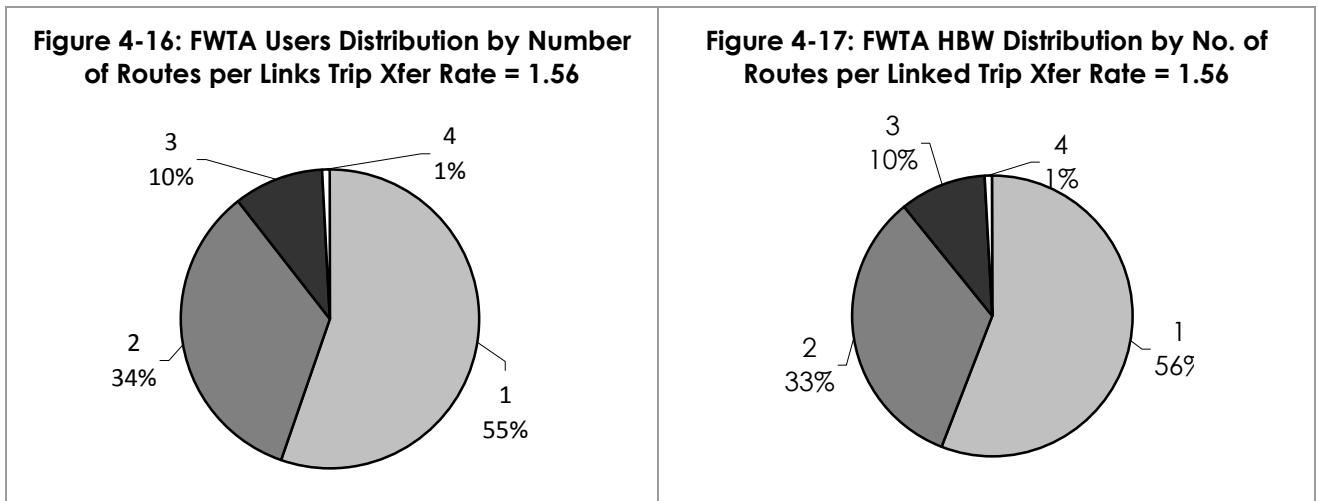


Table 4-11: FWTA HBW Trip Transfer Rate

Transfer Rate	Sample	Expanded
HBW Xfer Rate ⁷	2	1.56
Weekday Xfer Rate ⁸	2	1.56

⁷ Transfer Rate (Sample) = Sum_{i=1to5}(NumVehicles_i * Num Samples_i) / Sum (Num Samples_i)

⁸ Transfer Rate (Expansion) = Sum_{i=1to5}(Expansion_i) / Sum_{i=1to5}(Expansion_i/NumVehicles_i)

Tables 4-12 and 4-13 show the distribution of transit vehicles taken by HBW passengers and the typical weekday passenger to reach their final destination. Nearly 80% of riders made less than two transfers to complete their one-way trip. This distribution is very similar to all trips and HBNW trips.

Table 4-12: Num Vehicles (Weekday, HBW Trip Purpose)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	419	3,581.56	35.29%	3,581.56	55.14%
2	486	4,454.75	43.89%	2,227.38	34.29%
3	218	1,895.18	18.67%	631.73	9.73%
4	27	218.28	2.15%	54.57	0.84%
Total	1,150	10,149.77	100.00%	6,495.23	100.00%

Table 4-13: Num Vehicles (All Weekdays)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	945	8,367.52	35.79%	8,367.52	55.77%
2	1,142	10,046.99	42.97%	5,023.50	33.48%
3	480	4,445.83	19.01%	1,481.94	9.88%
4	58	521.62	2.23%	130.41	0.87%
Total	2,625	23,381.96	100.00%	15,003.36	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-14 and Figure 4-18 show how passengers typically get to the transit. Nearly 56% walk to the bus/rail, while nearly 35% transferred from another bus.

Table 4-14: HBW Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	5674.51	55.91%
DRIVE (Drop Off, Drive Alone, Carpool)	565.89	5.58%
OTHER	48.91	0.48%
BUS transfer*	3542.71	34.90%
TRE transfer*	317.75	3.13%
Total	10149.77	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 4-18: HBW Mode of Access to the Surveyed Route

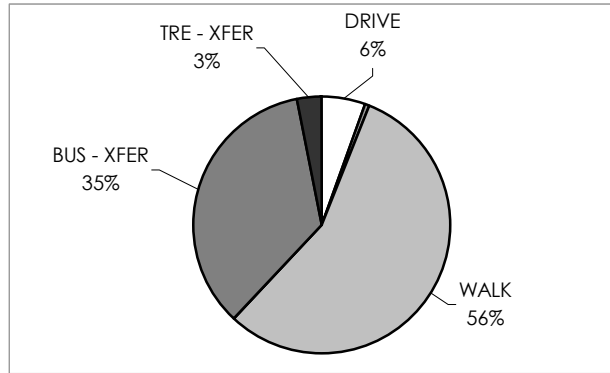


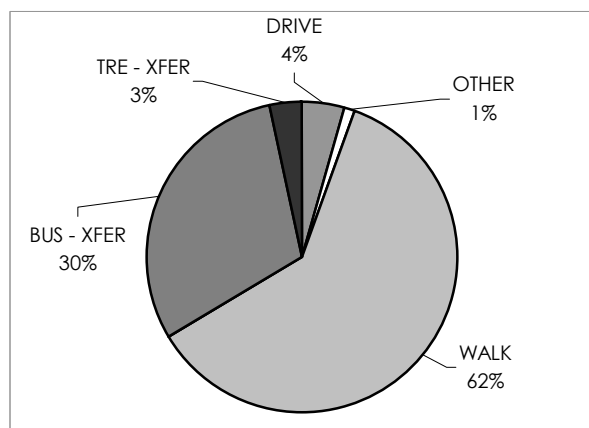
Table 4-15 and Figure 4-19 present the modes of egress from the surveyed route. After arriving at the transit stop, over 60% of passengers walk to their next location, while 30.14% transferred to another bus.

Table 4-15: FWTA HBW Mode of Egress from the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	6171.31	60.80%
DRIVE (Drop Off, Drive Alone, Carpool)	446.81	4.40%
OTHER	107.54	1.06%
BUS transfer**	3072.24	30.27%
TRE transfer**	351.87	3.47%
Total	10149.77	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-19: FWTA HBW Mode of Egress from the Surveyed Route



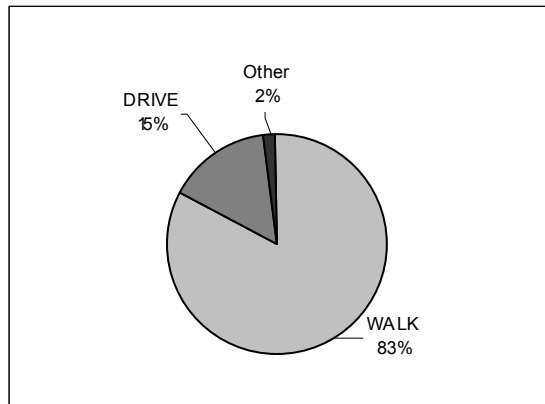
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, we see how HBW riders both get to the transit as well as leave from the transit. Of HBW passengers, A majority of FWTA rides who traveled for home based work trip (82.89%) travel to and from the transit by foot or wheelchair only, while 15.44% used a vehicle for at least one leg (Table 4-16 and Figure 4-20).

Table 4-16: Mode of Access and Mode of Egress for HBW Trip Purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPLES	Percentage -Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	8,413.32	82.89%	907	78.87%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	1,566.83	15.44%	221	19.22%
Other	169.62	1.67%	22	1.91%
Total	10,149.77	100.00%	1150	100.00%

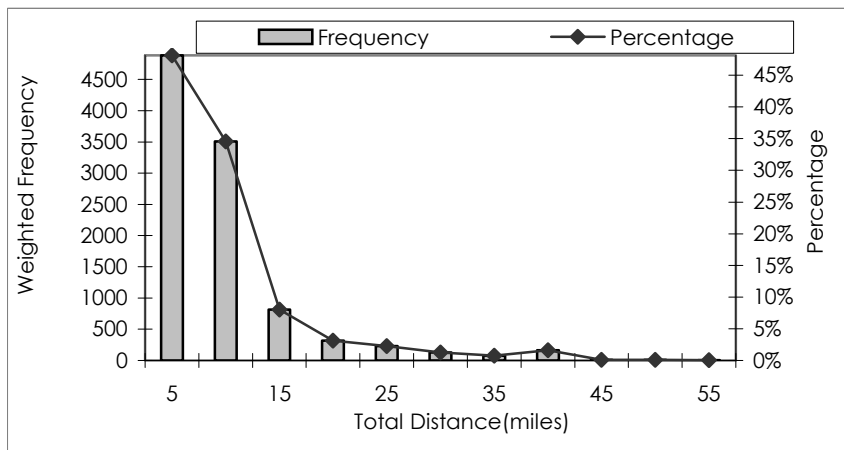
Figure 4-20: HBW Trip Purpose Mode of Access/Egress to the Transit System



Total Trip Distance⁹

Figures 4-21 and 4-22 show how far HBW passengers travel to get to their final destination. Close to 50% of riders travel less than 5 miles, but the data is skewed widely to the right. The average HBW passenger travels 7.41 miles.

Figure 4-21: HBW Trip Purpose – Total Distance (Average 7.41 miles)



⁹ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

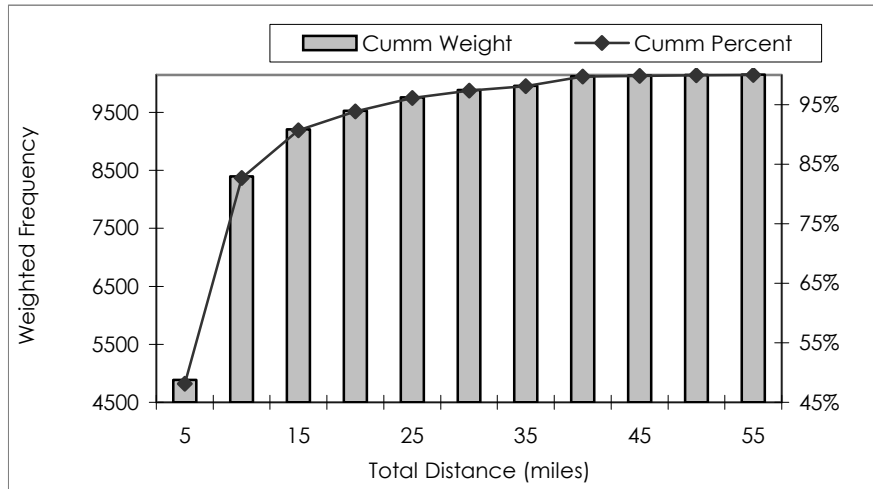
$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 4-22: HBW Trip Purpose – Cumulative Total Distance



FWTA – Non-Home-Based Trip (NHB)

This section provides an analysis of demographics and travel behavior characteristics of FWTA transit riders making non-home-based trips (NHB). NHB riders make up a little over 1 in 7 of the total weekday ridership.

Household Size/Household Income

A majority of NHB transit riders are from low-income households (Table 4-17 and Table 4-18). However, NHB riders are more likely to be from the highest income quartile than the previous two trip purposes (HBNW and HBW).

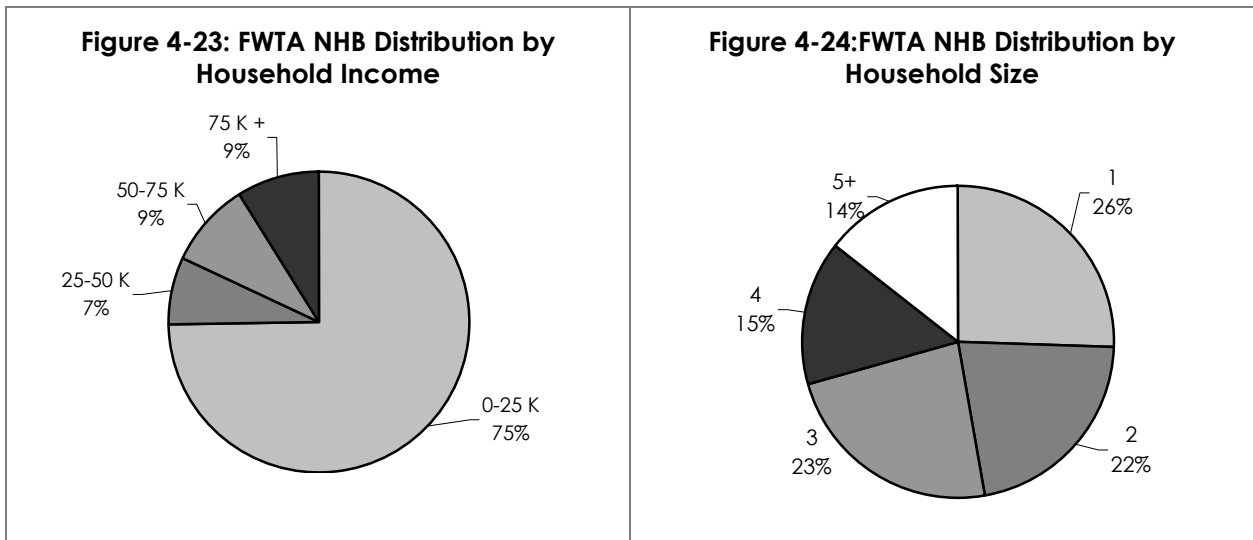
Table 4-17: Household Size/Household Income

Weighted Income	HHSIZE						Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	775.24	481.37	386.9	300.62	274.98	65.9	2285.01
25-50 K (2)	22.02	103.83	35.85	18.10	40.01	0.00	219.81
50-75 K (3)	27.27	36.67	135.57	33.97	44.16	0.00	277.64
75 K + (4)	5.04	37.84	79.05	82.45	69.03	0.00	273.41
DK/RF	7.93	51.46	124.54	62.17	47.29	32.15	325.54
Total	838.5	713.17	761.91	497.31	475.47	98.05	3381.41

Table 4-18: Household Size/Household Income %

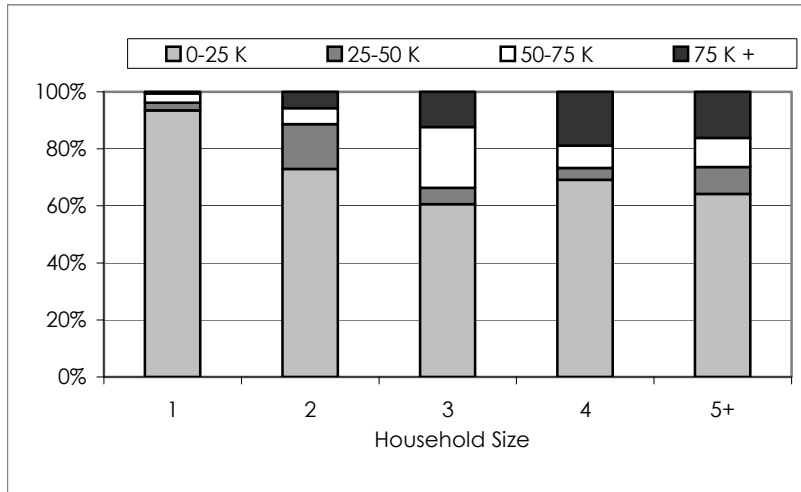
% Total Income	HHSIZE						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	22.93%	14.24%	11.44%	8.89%	8.13%	1.95%	67.58%
25-50 K (2)	0.65%	3.07%	1.06%	0.54%	1.18%	0.00%	6.50%
50-75 K (3)	0.81%	1.08%	4.01%	1.00%	1.31%	0.00%	8.21%
75 K + (4)	0.15%	1.12%	2.34%	2.44%	2.04%	0.00%	8.09%
DK/RF	0.23%	1.52%	3.68%	1.84%	1.40%	0.95%	9.63%
Total	24.80%	21.09%	22.62%	14.83%	14.06%	2.90%	100.00%

Displayed on a pie chart with non-responses taken out, Figure 4-23 shows how NHB riders are more likely to be from either the third or fourth income quartile than the second. This is in stark contrast to both HBNW and HBW purposes, where riders are more likely to be from the second quartile than from the top two quartiles combined. NHB passengers are more likely to be from larger households, with three-person households (and larger) represented in more than half of NHB riders (Figure 4-24).



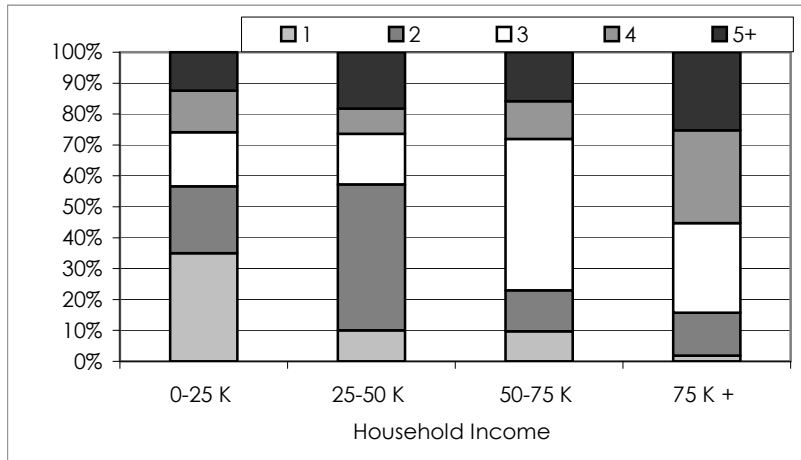
The distribution of household income by household size shows how low-income NHB riders are much more likely to be from single-person households (Figure 4-25). The larger households are more likely to be in the higher income quartiles than the smaller households.

Figure 4-25: FWTA NHB Trip Purpose Distribution of Household Income by Household Size



Looking at the household sizes grouped by income categories, Figure 4-26 shows how third quartile riders are most likely to be from three-person households, while second quartile riders are most likely to be from two-person households.

Figure 4-26: NHB Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

NHB riders are the most likely to only take one route, at 67% (Figure 4-27), while only 56% of the average weekday passenger does such. Weekday passengers take an average of 1.56 routes to get to their final destination, while NHB riders take an average of 1.43 routes (Table 4-19).

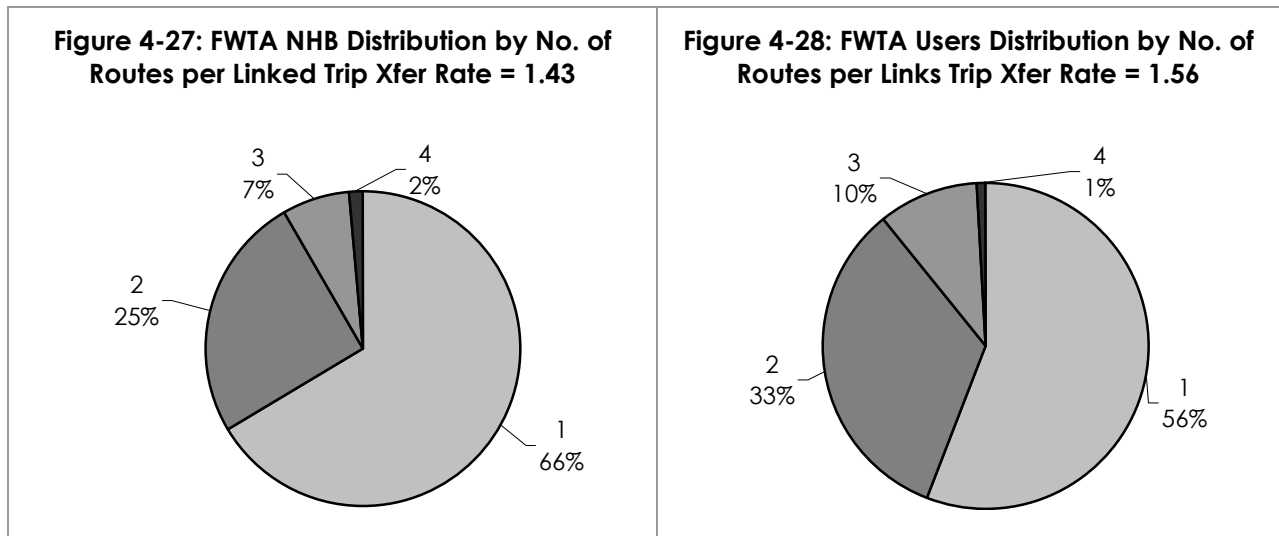


Table 4-19: FWTAs NHB Trip Transfer Rate

Transfer Rate	Sample	Expanded
NHB Xfer Rate ¹⁰	2	1.43
WkDy Xfer Rate ¹¹	2	1.56

¹⁰ Transfer Rate (Sample) = $\sum_{i=1}^n (\text{NumVehicles}_i * \text{Num Samples}_i) / \sum (\text{Num Samples}_i)$

¹¹ Transfer Rate (Expansion) = $\sum_{i=1}^n (\text{Expansion}_i) / \sum_{i=1}^n (\text{Expansion}_i / \text{NumVehicles}_i)$

Table 4-20 shows the distribution of the number of transit vehicles taken by NHB passengers. More than 81% of riders who travel for non-home-based trips made 0 or 1 transfer to complete their one-way trip, which is a slightly higher rate than home-based trips.

Table 4-20: Number of Vehicles (Weekday, NHB Trip Purpose)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	144	1,561.88	46.19%	1,561.88	66.28%
2	149	1,196.17	35.38%	598.09	25.38%
3	45	489.38	14.47%	163.13	6.92%
4	12	133.98	3.96%	33.50	1.42%
Total	350	3,381.41	100.00%	2,356.59	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-21 and Figure 4-29 show how NHB passengers typically get to the transit. Over 60% walk to the bus/rail, while around 30% transferred from another bus.

Table 4-21: NHB Trip Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	2097.37	62.03%
DRIVE (Drop Off, Drive Alone, Carpool)	251.71	7.44%
OTHER	13.88	0.41%
BUS transfer*	991.4	29.32%
TRE transfer*	27.05	0.80%
Total	3381.41	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 4-29: NHB Trip Mode of Access to the Surveyed Route

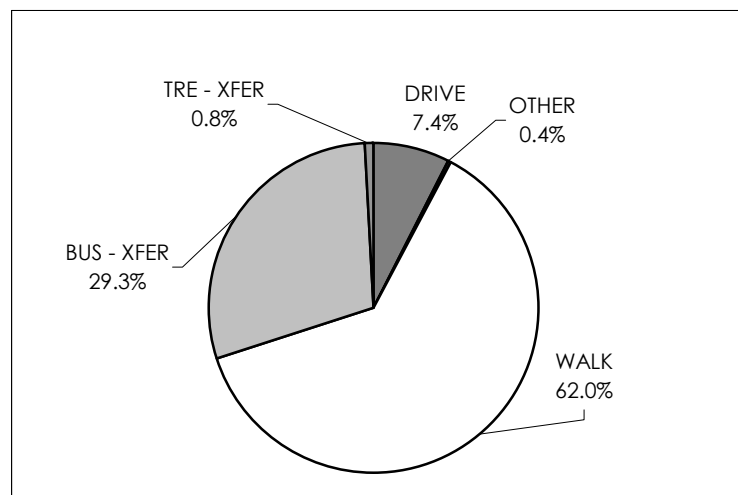


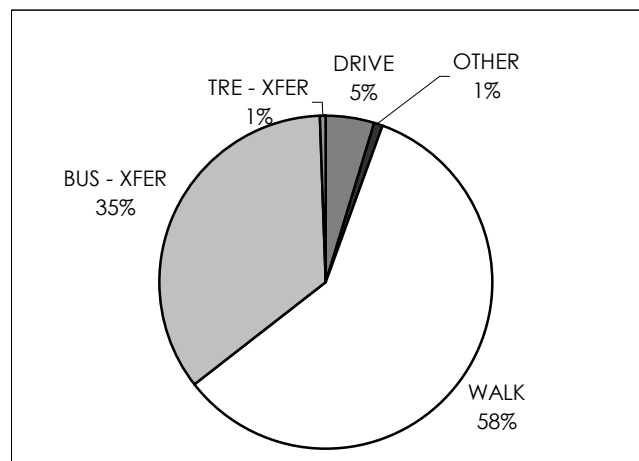
Table 4-22 and Figure 4-30 show the difference between modes of egress. After arriving at the transit stop, 59.03% of passengers walk to their destination, while to 34.90% transfer to another bus.

Table 4-22: NHB Trip Mode of Egress from the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	1996.21	59.04%
DRIVE (Drop Off, Drive Alone, Carpool)	155.61	4.60%
OTHER	27.62	0.82%
BUS transfer**	1180.28	34.90%
TRE transfer**	21.69	0.64%
Total	3381.41	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-30: NHB Trip Mode of Egress from the Surveyed Route



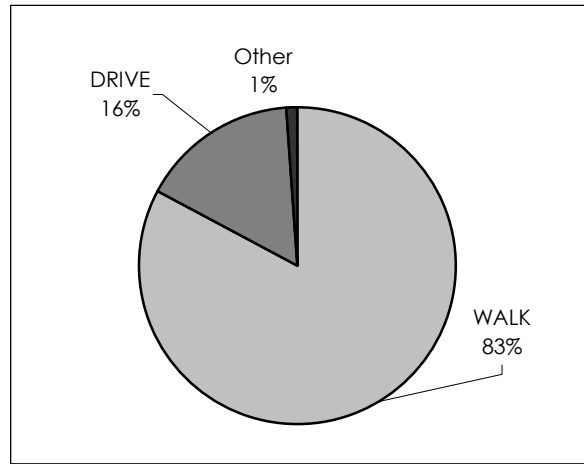
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, we see how the average transit rider both gets to the transit as well as leaves from the transit. Table 4-23 and Figure 4-31 present distribution of combination of mode of access and mode of egress for NHB trips.

Table 4-23: Mode of Access and Mode of Egress for NHB Trip Purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPLES	Percentage -Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	2,800.01	82.81%	281	80.29%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	544.49	16.10%	63	18.00%
Other	36.91	1.09%	6	1.71%
Total	3,381.41	17.19%	350	10.00%

Figure 4-31: NHB Trip Purpose Mode of Access/Egress to the Transit System



Of NHB passengers, 82.81% traveled to and from the transit by foot or wheelchair only, while 16.10% used a vehicle for at least one leg (Table 4-24 and Figure 4-29).

Table 4-24: NHB Trip Purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPN	Percentage -Samples
NHNW (Non-Home/Non-Work, Non-Work/Non-Home)	1,790.04	52.94%	202	57.71%
NHW (Work to Non-Home, Non-Home to Work)	1,591.37	47.06%	148	42.29%
Total	3,381.41	100.00%	350	100.00%

Out of the non-home-based trips, 42.29% are either arriving from or going to work, while 57.71% are neither coming from or going to work, around 1,590 passengers daily (table 4-25).

Total Trip Distance¹²

Figures 4-32 and 4-33 show how far FFTA passengers travel to get to their final destination. Close to 60% of riders travel less than 5 miles, but the data is skewed widely to the right. The average passenger travels 4.34 miles.

¹² Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 4-32: NHB Trip Purpose – Total Distance (Average 4.34 miles)

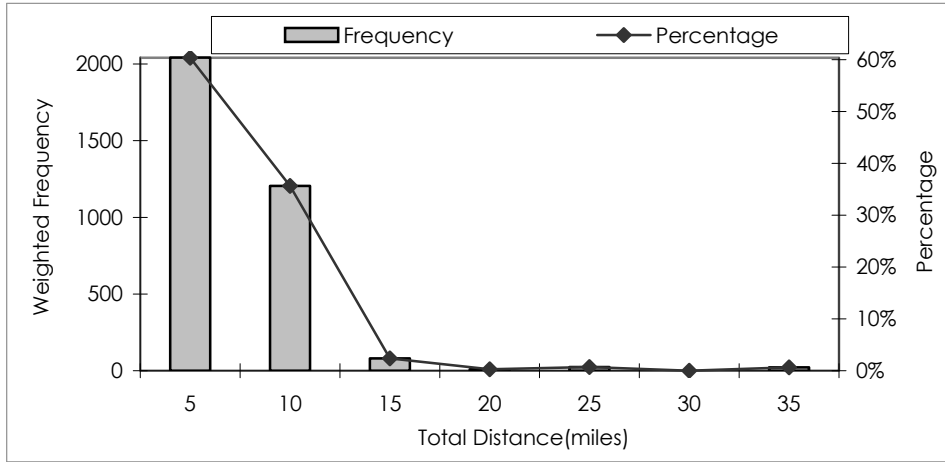
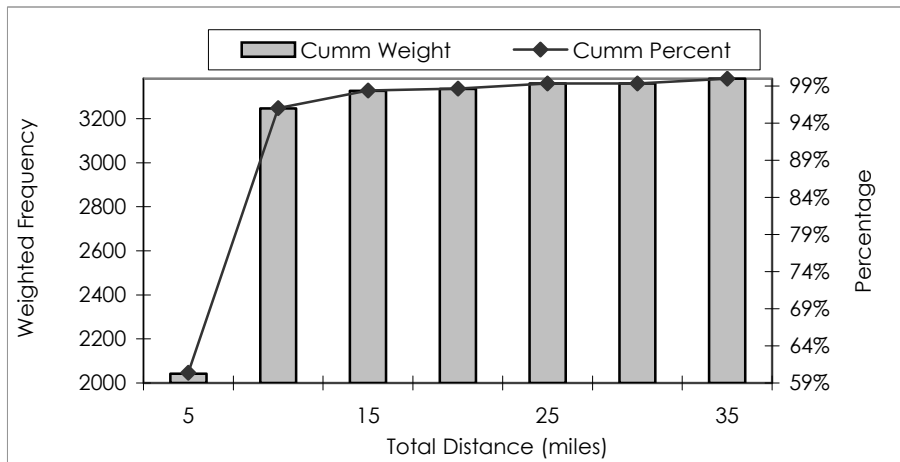


Figure 4-33: NHB Trip Purpose – Cumulative Total Distance



DCTA – Home-Based Non-Work Trip (HBNW)

This chapter provides an analysis of demographics and travel behavior characteristics of DCTA transit riders making home-based trips to non-work locations or vice versa (HBNW).

Household Size/Household Income

The household income results show a large majority of transit riders (over 80%) are from low-income households, reported as making under \$25,000 annually (Table 4-25 and Table 4-26).

Table 4-25: Household Size/Household Income

% Total Income	Household Size						Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	1277.34	2079.51	884.49	2438.49	42.47	3.55	6725.85
25-50 K (2)	144.65	198.57	290.61	66.6	24.4	0.00	724.83
50-75 K (3)	0.00	39.13	68.49	11.48	0.00	0.00	119.1
75 K + (4)	19.65	74.56	77.75	324.03	159.14	0.00	655.13
DK/RF	17.17	169.5	287.96	0.00	5.98	0.00	480.61
Total	1458.81	2561.27	1609.3	2840.6	231.99	3.55	8705.52

Table 4-26: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	14.67%	23.89%	10.16%	28.01%	0.49%	0.04%	77.26%
25-50 K (2)	1.66%	2.28%	3.34%	0.77%	0.28%	0.00%	8.33%
50-75 K (3)	0.00%	0.45%	0.79%	0.13%	0.00%	0.00%	1.37%
75 K + (4)	0.23%	0.86%	0.89%	3.72%	1.83%	0.00%	7.52%
DK/RF	0.20%	1.95%	3.31%	0.00%	0.07%	0.00%	5.52%
Total	16.76%	29.42%	18.49%	32.63%	2.66%	0.04%	100.00%

Ignoring those who refused to report their income, 82% of HBNW riders are from low-income households with less than \$25,000 of household income (Figure 4-34). In terms of household size, 46% of DCTA riders who used the transit for HBNW purposes are from single- or two-person households (Figure 4-35).

Figure 4-34: HBNW Trip Purpose Distribution by Household Income

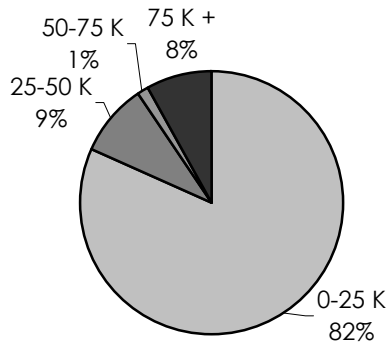
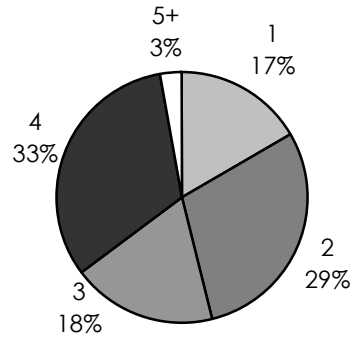


Figure 4-35: HBNW Trip Purpose Distribution by Household Size



By looking at Figures 4-36 and 4-37, which present the income distribution of riders by household size and household size distribution by household income respectively, the majority of lower-income households with less than \$25,000 of household income are from single-person households, while the majority of large household riders are from households with high household income levels.

Figure 4-36: HBNW Trip Purpose Distribution of Household Income by Household Size

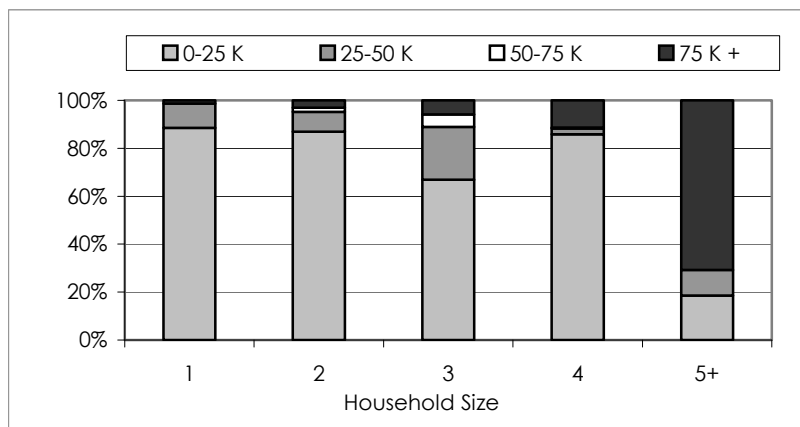
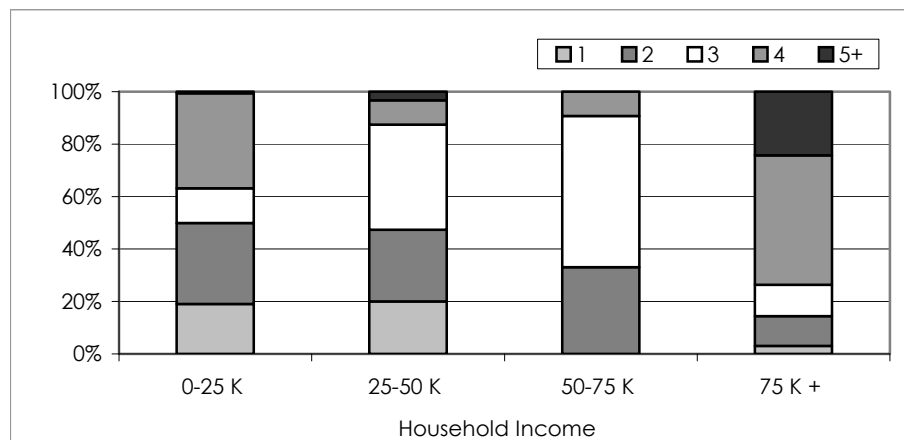


Figure 4-37: HBNW Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

HBNW riders were likely to make less transfer to reach to their final destination than the typical weekday passenger (Figures 4-38 and 4-39). All weekday passengers take an average of 1.07 number of routes to get to their final destination while HBNW riders take an average of 1.06 (Table 4-27).

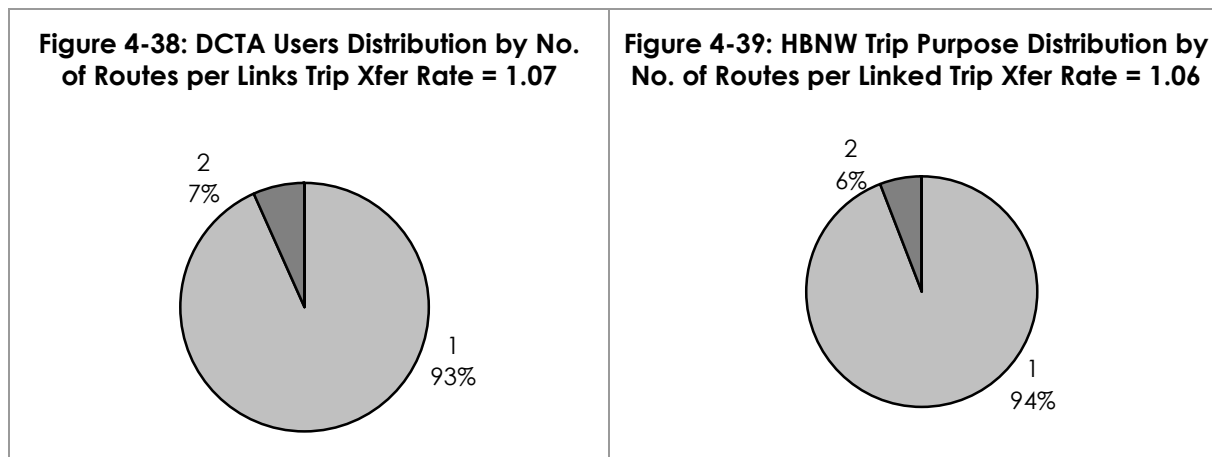


Table 4-27: DCTA HBNW Trip Transfer Rate

Transfer Rate	Sample	Expanded
HBNW Xfer Rate ¹³	1	1.06
Weekday Xfer Rate ¹⁴	1	1.07

Tables 4-28 and 4-29 show the distribution of transit vehicles taken by HBNW passengers and all weekday passengers to reach their final destination. All passengers who make HBNW trips made 0 or 1 transfer to complete their one-way trips, same as all weekday passengers.

Table 4-28: Number of Vehicles (Weekday, HBNW Trip Purpose)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	163	7,731.70	88.81%	7,731.70	94.08%
2	45	973.82	11.19%	486.91	5.92%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	208	8,705.52	100.00%	8,218.61	100.00%

¹³ Transfer Rate (Sample) = $\text{Sum}_{i=1 \text{ to } 5}(\text{NumVehicles}_i * \text{Num Samples}_i) / \text{Sum}(\text{Num Samples}_i)$

¹⁴ Transfer Rate (Expansion) = $\text{Sum}_{i=1 \text{ to } 5}(\text{Expansion}_i) / \text{Sum}_{i=1 \text{ to } 5}(\text{Expansion}_i / \text{NumVehicles}_i)$

Table 4-29: Number of Vehicles (All Weekdays)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	277	11,197.89	87.51%	11197.89	93.34%
2	83	1,597.66	12.49%	798.83	6.66%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	360	12,795.55	100.00%	11,996.72	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-30 and Figure 4-40 show how passengers typically get to the transit. The vast majority of riders who travel for HBNW trips walked to access the transit from their origin. Four percent of these riders used a vehicle, and slightly over 4% of riders transferred from other bus to the surveyed route.

Table 4-30: DCTA HBNW Trip Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	7980.64	91.67%
DRIVE (Drop Off, Drive Alone, Carpool)	305.52	3.51%
OTHER	48.34	0.56%
BUS transfer*	371.02	4.26%
TOTAL	8,705.52	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 4-40: DCTA HBNW Trip Mode of Access to the Surveyed Route

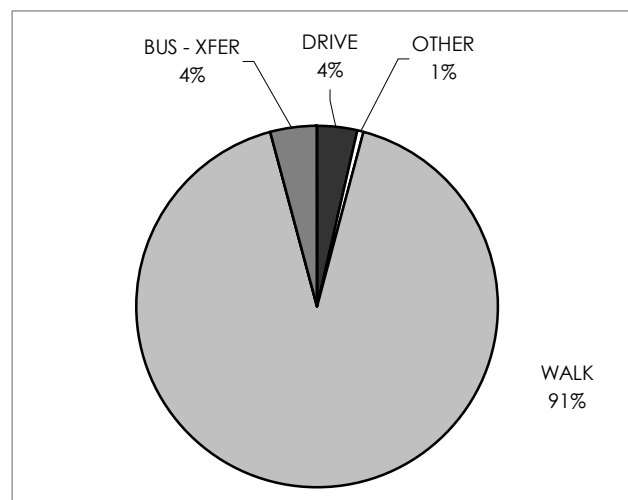


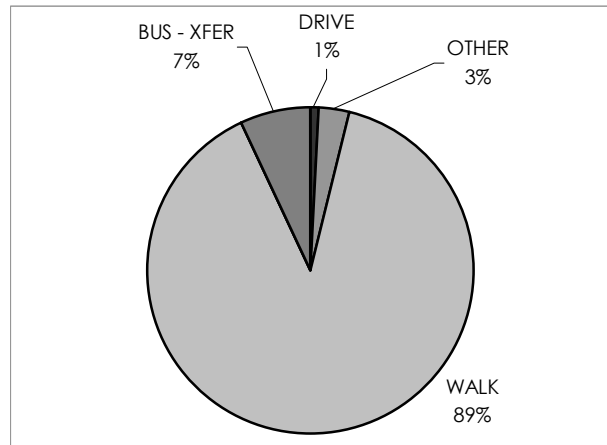
Table 4-31 and Figure 4-41 show distribution of mode of egress from the surveyed route to the next mode of transportation or to the final destination. After arriving at the transit stop, 89% of passengers walk to their next location, slightly less than 91% of walk access. Only 1% of riders used a vehicle to the next location from the surveyed route. Seven percent of riders make a transfer to another bus.

Table 4-31: DCTA HBNW Trip Mode of Egress to the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	7,756.79	89.10%
DRIVE (Pick Up, Drive Alone, Carpool)	84.07	0.97%
OTHER	261.86	3.01%
BUS transfer**	602.80	6.92%
Total	8,705.52	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-41: Distribution by Mode of Egress from Surveyed Route



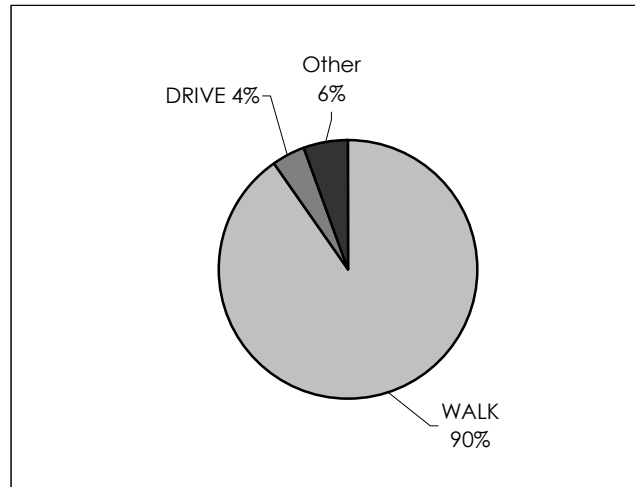
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, we see how the average transit rider both gets to the transit as well as leaves from the transit. Of HBNW passengers, Over 90% of DCTA transit riders with HBNW trip purpose traveled to and from the transit by walk, while less than 0.5% used a vehicle for at least one leg (Table 4-32 and Figure 4-42).

Table 4-32: Mode of Access and Mode of Egress for HBNW Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	Percentage-Samples	
			SAMPLES	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	7,849.93	90.17%	177	85.10%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	375.31	4.31%	24	11.54%
Other	480.28	5.52%	7	3.37%
Total	8,705.52	100.00%	208	100.00%

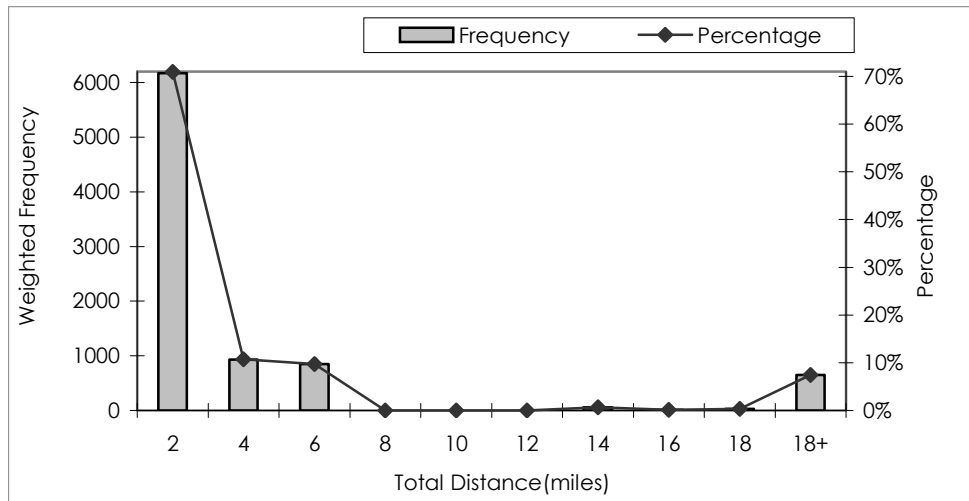
Figure 4-42: HBNW Trip Purpose Mode of Access/Egress to the Transit System



Total Trip Distance¹⁵

Figures 4-43 and 4-44 show how far DCTA passengers travel to get to their final destination for HBNW trip purpose. Nearly 90% of riders travel less than 8 miles, while the average passenger for HBNW trip purpose travels 12.47 miles.

Figure 4-43: HBNW Trip Purpose – Total Distance (Average 12.47 miles)



¹⁵ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

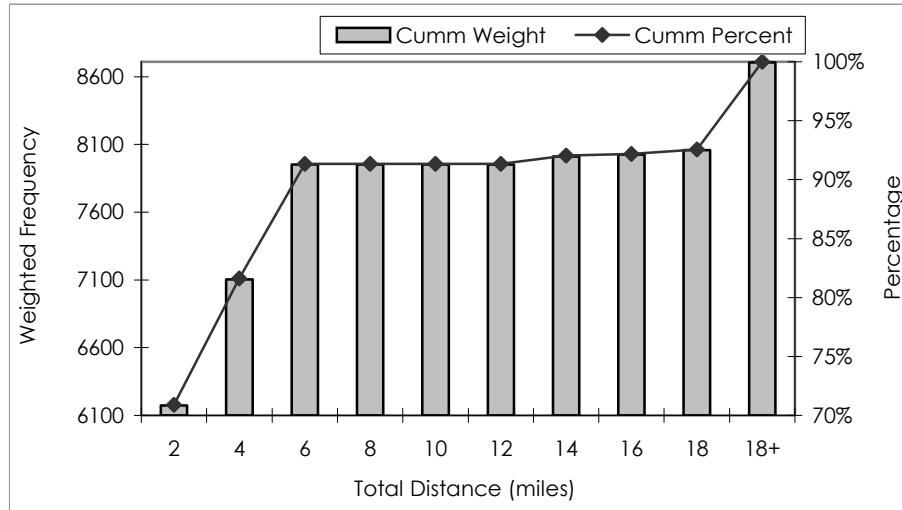
$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 4-44: HBNW Trip Purpose – Cumulative Total Distance



DCTA – Home-Based Work Trip (HBW)

DCTA transit riders who used the surveyed route for home-based work trip purpose may show different demographic characteristics and travel behavior characteristics from the rest of riders. The following analysis explores any distinguishable characteristics of DCTA transit riders for HBW trips.

Household Size/Household Income

Many DCTA transit riders for HBW trips purpose are from the low-income households (40%) and single- or two-person households.

Table 4-33: Household Size/Household Income

Weighted Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	46.98	274.6	68.97	11.87	36.88	0.00	439.3
25-50 K (2)	67.89	154.55	12.14	16.88	7.69	0.00	259.15
50-75 K (3)	6.86	24.58	16.85	5.8	13.72	0.00	67.81
75 K + (4)	7.71	281.91	19.07	14.57	0.00	0.00	323.26
DK/RF	7.71	4.92	0.00	0.00	0.00	0.00	12.63
Total	137.15	740.56	117.03	49.12	58.29	0.00	1102.15

Table 4-34: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	4.26%	24.91%	6.26%	1.08%	3.35%	0.00%	39.86%
25-50 K (2)	6.16%	14.02%	1.10%	1.53%	0.70%	0.00%	23.51%
50-75 K (3)	0.62%	2.23%	1.53%	0.53%	1.24%	0.00%	6.15%
75 K + (4)	0.70%	25.58%	1.73%	1.32%	0.00%	0.00%	29.33%
DK/RF	0.70%	0.45%	0.00%	0.00%	0.00%	0.00%	1.15%
Total	12.44%	67.19%	10.62%	4.46%	5.29%	0.00%	100.00%

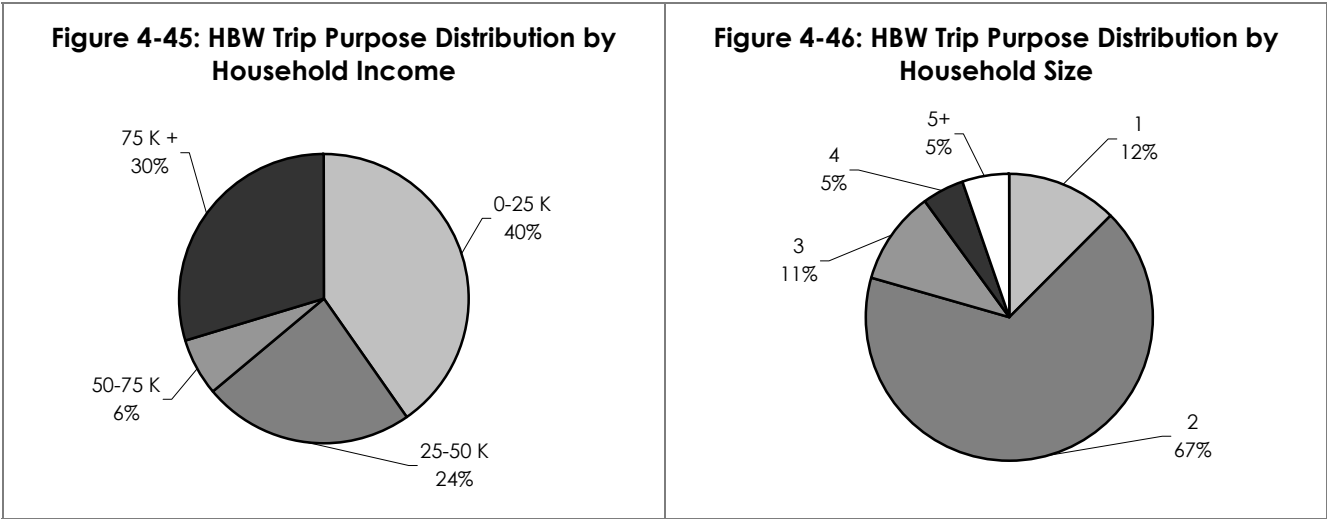


Figure 4-47 presents the income distribution of riders by household size. Riders are most likely to be from lower-income households regardless of household size.

Figure 4-47: HBNW Trip Purpose Distribution of Household Income by Household Size

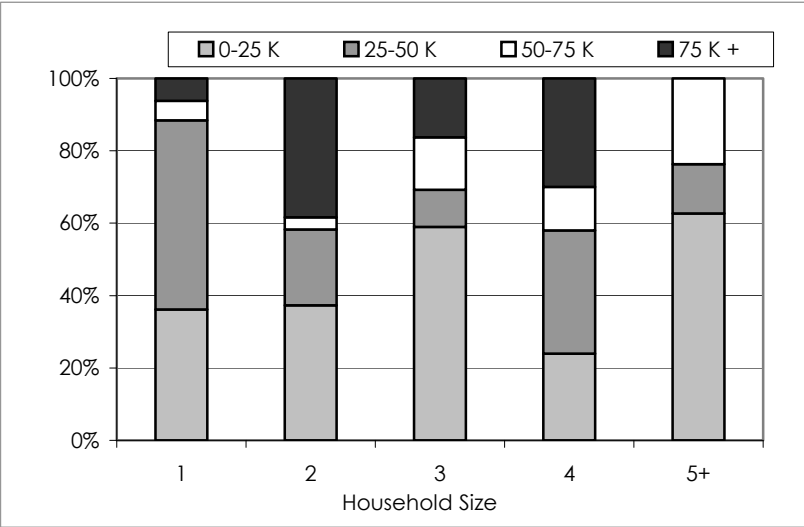
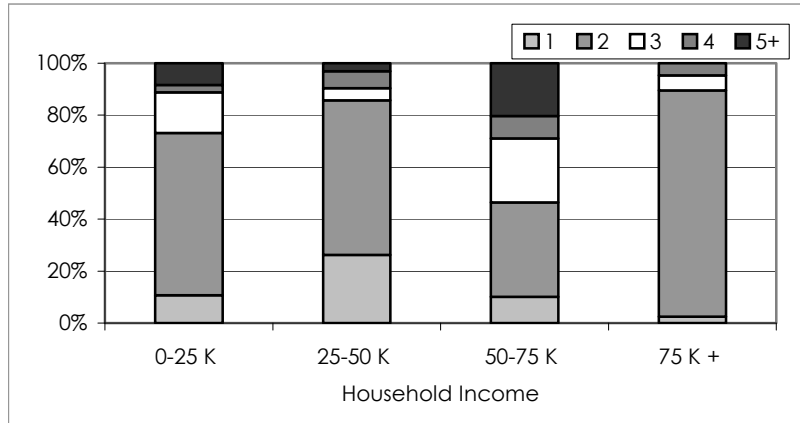


Figure 4-48 presents the household size distribution of riders by income category. Riders from two-person households are most likely to be the largest group in all income categories, particularly riders from high household income households.

Figure 4-48: HBW Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

The vast majority of HBW trips by transit were occurred with one linked trip (85%). Only 8% of riders who traveled for HBW trip made two linked trip (Figure 4-50).

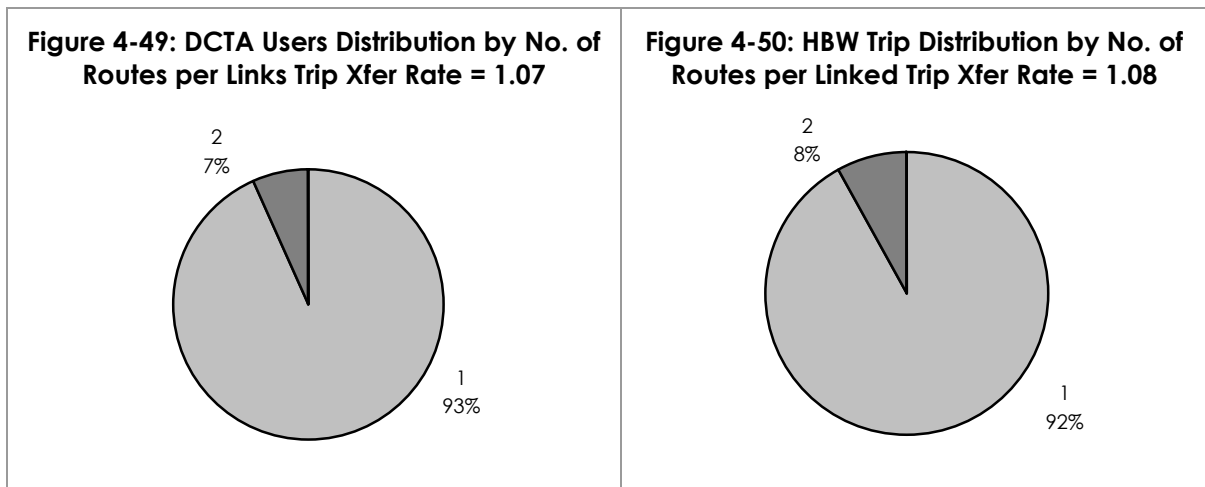


Table 4-35: FFTA HBW Trip Transfer Rate

Transfer Rate	Sample	Expanded
HBW Xfer Rate ¹⁶	1	1.08
WkDy Xfer Rate ¹⁷	1	1.07

Tables 4-36 and 4-37 show the distribution of transit vehicles taken by HBW passengers and the typical weekday passenger to reach their final destination. Eighty-five percent of HBW trip riders used a single vehicle to make their one-way trip, while 15% of HBW trip riders made one transfer for a whole one-way trip.

¹⁶ Transfer Rate (Sample) = $\text{Sum}_{i=1 \text{ to } 5}(\text{Num Vehicles}_i * \text{Num Samples}_i) / \text{Sum}(\text{Num Samples}_i)$

¹⁷ Transfer Rate (Expansion) = $\text{Sum}_{i=1 \text{ to } 5}(\text{Expansions}_i) / \text{Sum}_{i=1 \text{ to } 5}(\text{Expansions}_i / \text{Num Vehicles}_i)$

Table 4-36: Number of Vehicles (Weekday, HBW Trip Purpose)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	50	939.17	85.21%	939.17	92.02%
2	16	162.98	14.79%	81.49	7.98%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	66.00	1,102.15	100.00%	1,020.66	100.00%

Table 4-37: Number of Vehicles (All Weekdays)

Number of Vehicles	Sample	Weighted Sum	% Weight	Linked Trips	%LT
1	277	11,197.89	87.51%	11197.89	93.34%
2	83	1,597.66	12.49%	798.83	6.66%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	360	12,795.55	100.00%	11,996.72	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-38 and Figure 4-51 show how passengers typically get to the transit. Slightly over 80% of riders walk to the bus or rail, while 10% of riders used a vehicle. Five percent of riders transferred from another bus.

Table 4-38: DCTA HBW Trip Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	886.35	80.42%
DRIVE (Drop Off, Drive Alone, Carpool)	98.91	8.97%
OTHER	49.63	4.50%
LRT transfer*	6.86	0.62%
BUS transfer*	60.4	5.48%
Total	1,102.15	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 4-51: DCTA HBW Trip Mode of Access to the Surveyed Route

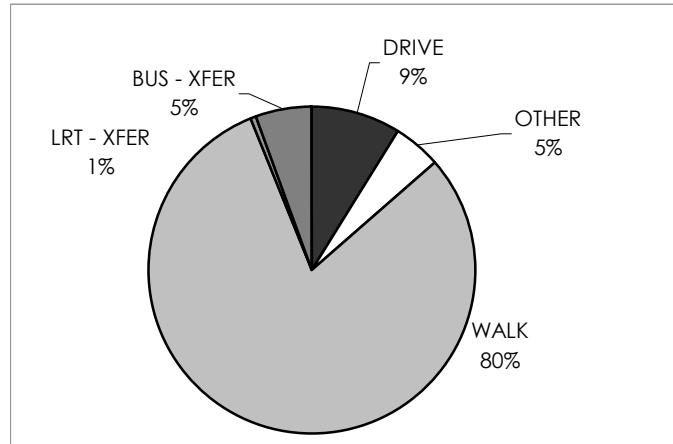


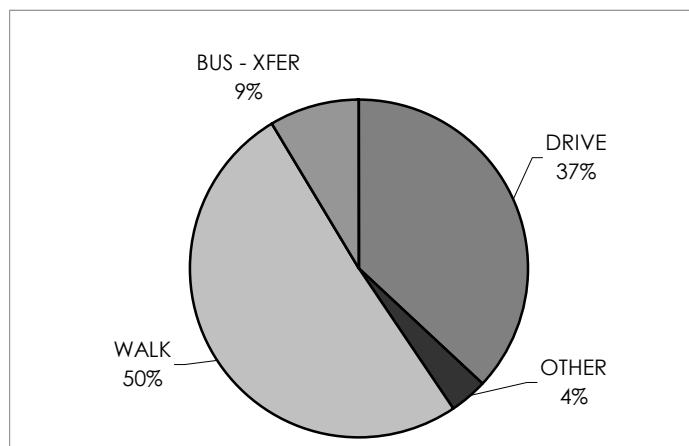
Table 4-39 and Figure 4-52 show the modes of egress from the transit. After arriving at the transit stop, over 50% of passengers walk to their next location, while 37% used a vehicle from the surveyed route to their final destination. Nine percent of riders transferred to another bus to reach their final destination.

Table 4-39: DCTA HBW Mode of Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	559.05	50.72%
DRIVE (Pick Up, Drive Alone, Carpool)	408.63	37.08%
OTHER	38.75	3.52%
BUS transfer**	95.72	8.68%
Total	1,102.15	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-52: DCTA HBW Mode of Egress from the Surveyed Route



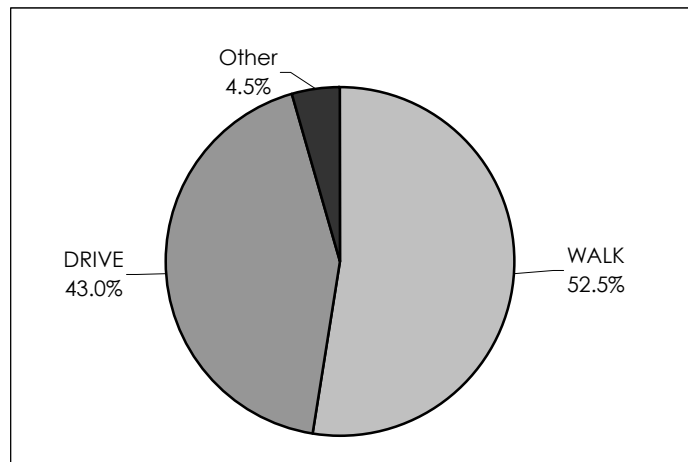
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, Of HBW passengers, nearly 53% of riders for HBW trip purpose traveled to and from the transit by walk, while over 43% of riders used a vehicle for at least one leg (Table 4-40 and Figure 4-53).

Table 4-40: Mode of Access and Mode of Egress for HBNW Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	578.33	52.47%	32	48.49%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	474.19	43.03%	26	39.39%
Other	49.63	4.50%	8	12.12%
Total	1,102.15	100.00%	66	100.00%

Figure 4-53: HBW Trip Purpose Mode of Access/Egress to the Transit System



Total Trip Distance¹⁸

Figures 4-54 and 4-55 show how far HBW passengers travel to get to their final destination. Close to 58% of riders travel less than 5 miles while the average HBW passenger travels 12.47 miles. Cumulatively, 75% of riders who traveled for HBW trip purpose traveled less than 30 miles (Figure 4-62).

¹⁸ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 4-54: HBW Trip Purpose – Total Distance (Average 12.47 miles)

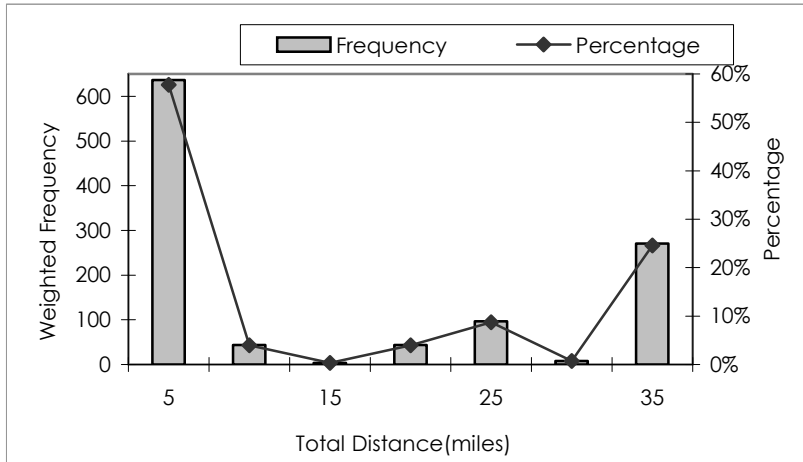
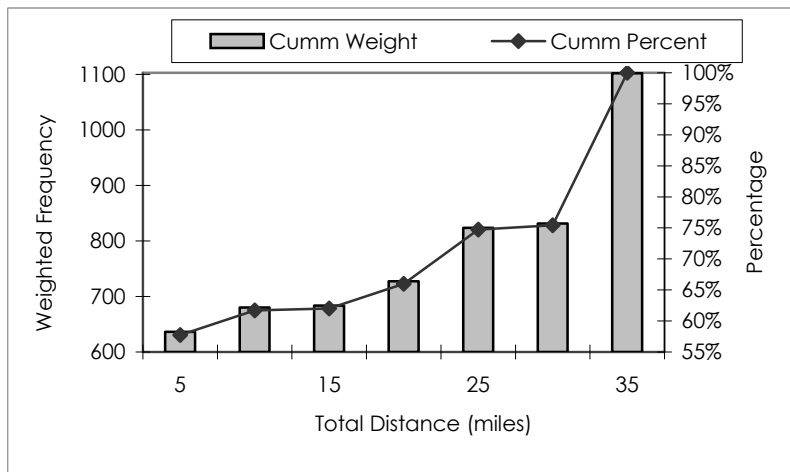


Figure 4-55: HBW Trip Purpose – Cumulative Total Distance



DCTA – Non-home Based Trip (NHB)

This section examines demographic characteristics and travel behavior characteristics of DCTA transit riders for non-home-based trips.

Household Size/Household Income

A majority of NHB transit riders are from low-income households with household income less than \$25,000, and from small size households with one or two household members (Table 4-41 and Table 4-42).

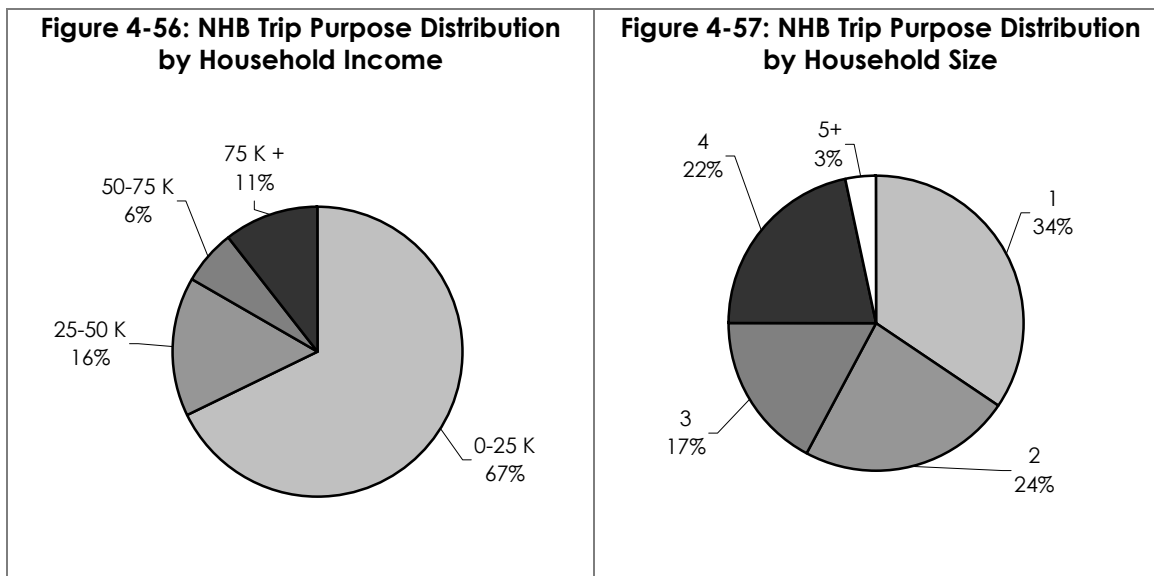
Table 4-41: Household Size/Household Income

Weighted Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	857.82	536.69	236.43	231.66	17.17	30.5	1910.27
25-50 K (2)	17.17	122.98	72.73	216.23	15.37	0.00	444.48
50-75 K (3)	0.00	0.00	58.74	45.45	65.54	0.00	169.73
75 K + (4)	0.00	17.17	131.61	149.94	0.00	0.00	298.72
DK/RF	138.57	19.96	6.15	0.00	0.00	0.00	164.68
Total	1013.56	696.8	505.66	643.28	98.08	30.5	2987.88

Table 4-42: Household Size/Household Income %

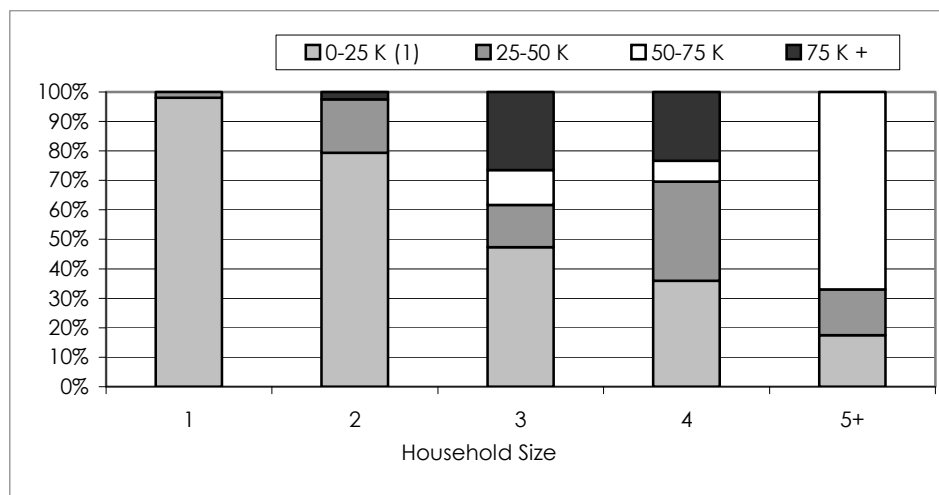
% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	28.71%	17.96%	7.91%	7.75%	0.57%	1.02%	63.93%
25-50 K (2)	0.57%	4.12%	2.43%	7.24%	0.51%	0.00%	14.88%
50-75 K (3)	0.00%	0.00%	1.97%	1.52%	2.19%	0.00%	5.68%
75 K + (4)	0.00%	0.57%	4.40%	5.02%	0.00%	0.00%	10.00%
DK/RF	4.64%	0.67%	0.21%	0.00%	0.00%	0.00%	5.51%
Total	33.92%	23.32%	16.92%	21.53%	3.28%	1.02%	100.00%

Displayed on a pie chart with non-responses taken out, Figure 4-56 shows how NHB riders are more likely to be from lower-income households (less than \$50,000 household income). Eighty-three of riders are from households with household income less than \$50,000. In terms of household size, 57% of riders are from one- or two-person households.



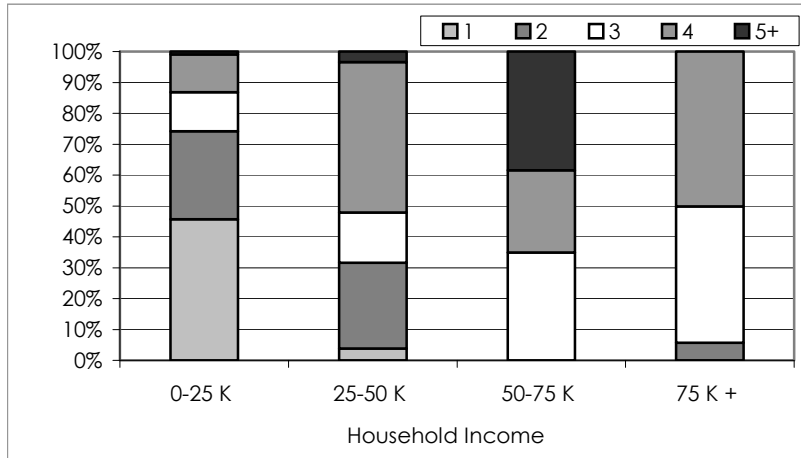
The distribution of household income by household size shows how low-income NHB riders are much more likely to be from single person households (Figure 4-58). The larger households are more likely to be in the higher-income quartiles than the smaller households.

Figure 4-58: NHB Trip Purpose Distribution of Household Income by Household Size



Looking at the household sizes grouped by income categories, Figure 4-59 shows that riders from low-income households (household income less than \$25,000) are from one- or two-person households while, riders from high-income household (more than \$75,000) are more likely to be from larger households, three or more person households.

Figure 4-59: NHB Trip Purpose Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

NHB trip riders on DCTA transit are more likely to take one vehicle only, and do not make any transfers (92%). This pattern is consistent regardless of trip purpose.

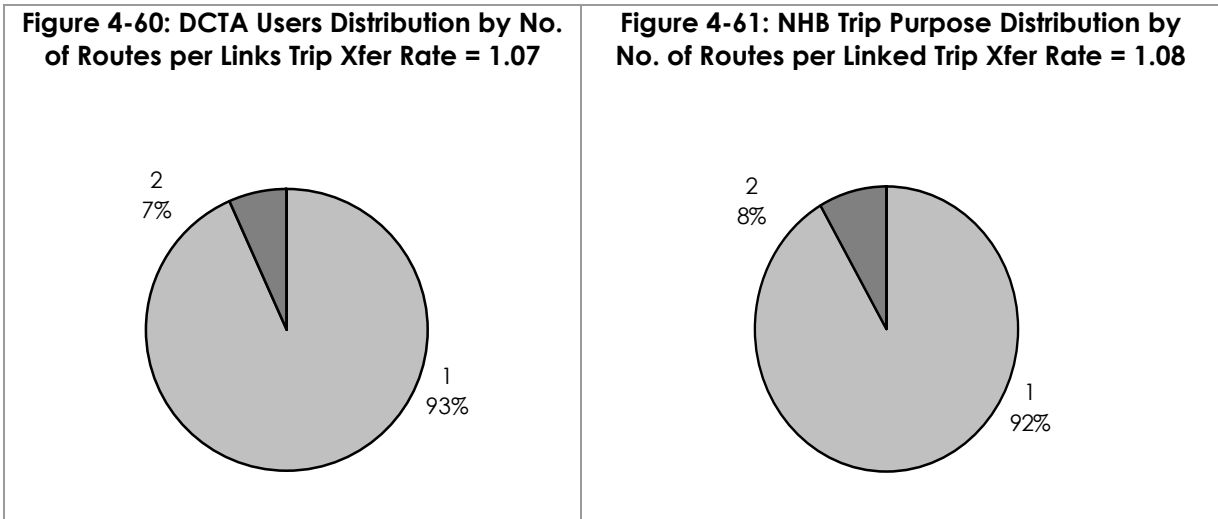


Table 4-43: DCTA NHB Trip Transfer Rate

Transfer Rate	Sample	Expanded
NHB Xfer Rate ¹⁹	2	1.08
Weekday Xfer Rate ²⁰	2	1.07

Table 4-44 shows the distribution of the number of transit vehicles taken by NHB passengers. Similar to other trip purposes, the vast majority of riders for NHB trip purposes also made no transfers (85%), with over 15% with one transfer.

¹⁹ Transfer Rate (Sample) = $\sum_{i=1}^5 (\text{Num Vehicles}_i * \text{Num Samples}_i) / \sum (\text{Num Samples}_i)$
²⁰ **Transfer Rate (Expansion) = $\sum_{i=1}^5 (\text{Expansions}_i) / \sum_{i=1}^5 (\text{Expansions}_i / \text{Num Vehicles}_i)$

Table 4-44: Number of Vehicles (Weekday, NHB Trip Purpose)

Number of Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	64	2,527.02	84.58%	2,527.02	91.64%
2	22	460.86	15.42%	230.43	8.36%
Total	86.00	2,987.88	100.00%	2,757.45	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 4-45 and Figure 4-62 show how NHB passengers typically get to the transit. Over 82% walked to the bus/rail, while around 11% used a vehicle to access the transit. Two percent of riders for NHB trips transferred from another bus.

Table 4-45: DCTA NHB Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	2475.11	82.84%
DRIVE (Drop Off, Drive Alone, Carpool)	336.39	11.26%
OTHER	104.72	3.50%
BUS transfer*	71.66	2.40%
Total	2,987.88	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 4-62: DCTA NHB Mode of Access to the Surveyed Route

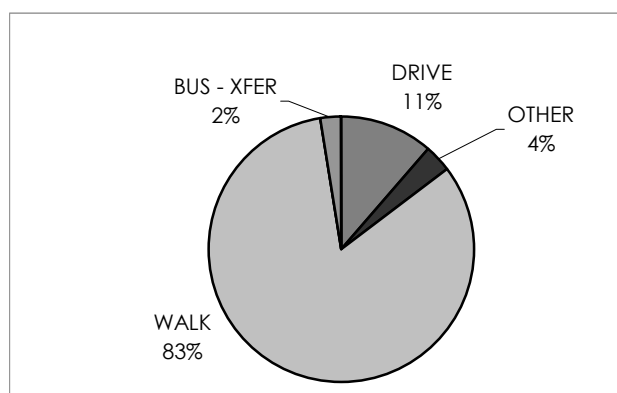


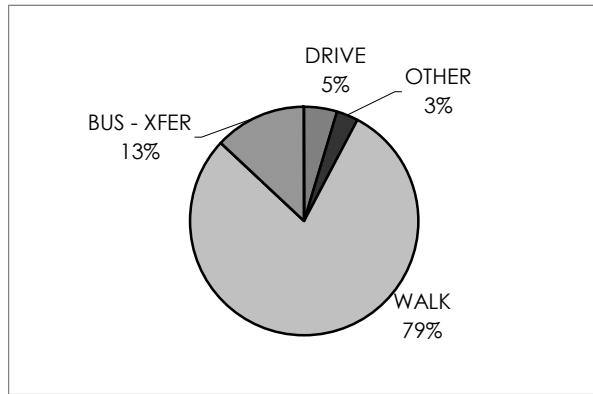
Table 4-46 and Figure 4-63 presents distribution of mode of egress from the surveyed route to the next transit if transfer occurs to the final destination. It turned out that a majority of riders for NHB trips walked from the surveyed route to their final destination (79%). Nearly 5% drove (used a vehicle as a mode of egress) while 13% transferred to another bus.

Table 4-46: DCTA HBW Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	2,365.75	79.18%
DRIVE (Pick Up, Drive Alone, Carpool)	143.58	4.81%
OTHER	89.35	2.99%
BUS transfer**	389.20	13.03%
Total	2,987.88	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 4-63: DCTA HBW Egress from the Surveyed Route



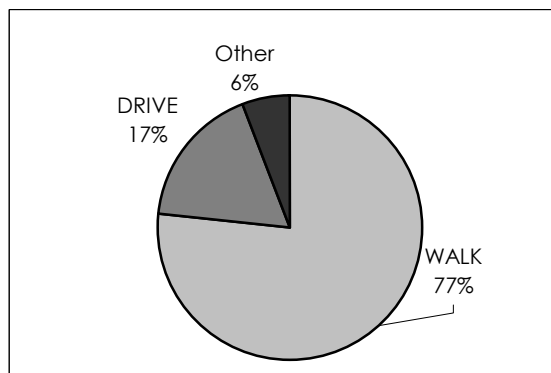
Mode of Access/Egress to the Transit System

Combining the mode of access with the mode of egress, Nearly 77% of DCTA transit riders for NHB trip purposes walked to and from the transit, while 17% used a vehicle for at least one leg (Table 4-47 and Figure 4-64).

Table 4-47: Mode of Access and Mode of Egress for NHB Trip Purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPN	Percentage -Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	2,292.05	76.71%	62	72.09%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	518.66	17.36%	17	19.77%
Other	177.17	5.93%	7	8.14%
Total	2,987.88	100.00%	86	100.00%

Figure 4-64: DCTA NHB Trip Purpose Mode of Access/Egress to the Transit System



Out of the non-home-based trips, 90% of the trips were for either arriving from or going to work, while only about 10% are neither coming from nor going to work.

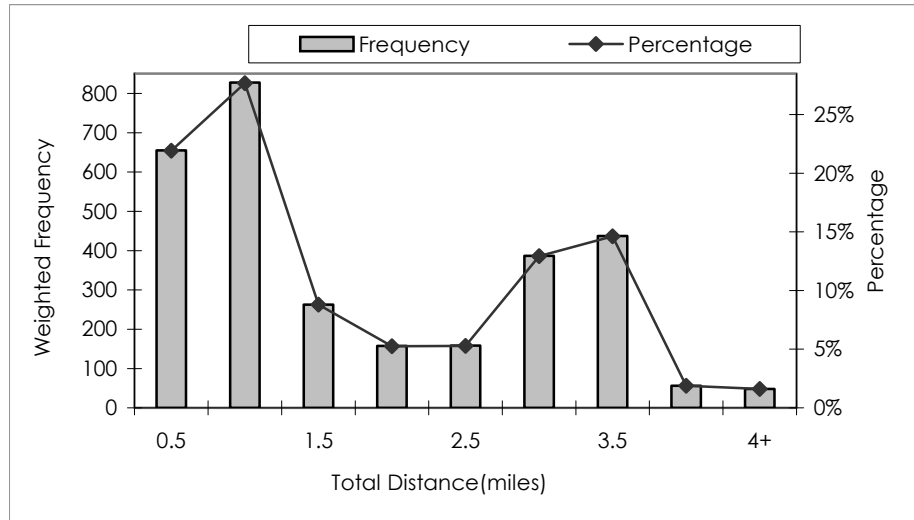
Table 4-48: NHB Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
NHNW (Non-Home/Non-Work,Non-Home/Non-Work)	2,695.56	90.22%	72	83.72%
NHW (Work to Non-Home, Non-Home to Work)	292.32	9.78%	14	16.28%
Total	2,987.88	100.00%	86	100.00%

Total Trip Distance²¹

Figures 4-65 and 4-66 show how far DCTA passengers for NHB trip traveled to get to their final destination. Close to 70% of riders travel less than 2.5 miles. About 60% of riders made a shorter trip than the average 1.78 miles.

Figure 4-65: NHB Trip Purpose – Total Distance (Average 1.78 miles)



²¹ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

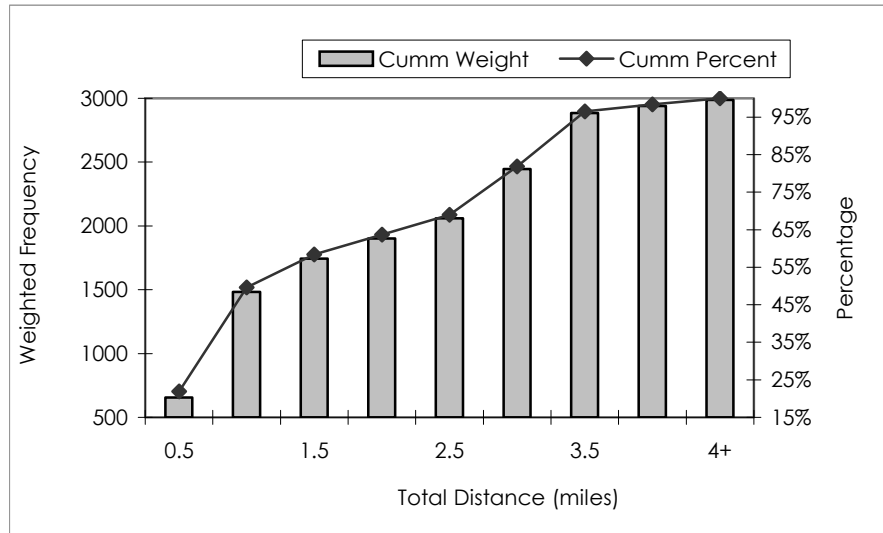
$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 4-66: NHB Trip Purpose – Cumulative Total Distance



5. Survey Data Analysis by Service Type

This chapter provides an analysis of demographics and travel behavior characteristics of T-transit and DCTA transit riders by transit service type, i.e., local bus, express, and UNT shuttle (only applicable for DCTA transit). Appendix C presents the distribution of weighted boardings by route and service type.

FWTA – LOCAL BUS

Household Size/Household Income

The household size results indicate that local bus riders are most likely to be from one- or two-person households, but they are close to evenly split between the two (Table 5-1 and 5-2).

Table 5-1: Household Size/Household Income

Weighted Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	4554.59	4008.57	3043.39	2443.3	2298.76	219.54	16568.15
25-50 K (2)	520.51	720.3	542.95	486.42	572.32	0.00	2842.5
50-75 K (3)	122.37	340.48	258.24	140.27	124.58	0.00	985.94
75 K + (4)	112.42	177.36	149.38	149.36	76.3	0.00	664.82
DK/RF	337.71	257.42	233.43	170.16	234.09	375.38	1608.19
Total	5647.6	5504.13	4227.39	3389.51	3306.05	594.92	22669.6

Table 5-2: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	20.09%	17.68%	13.42%	10.78%	10.14%	0.97%	73.09%
25-50 K (2)	2.30%	3.18%	2.40%	2.15%	2.52%	0.00%	12.54%
50-75 K (3)	0.54%	1.50%	1.14%	0.62%	0.55%	0.00%	4.35%
75 K + (4)	0.50%	0.78%	0.66%	0.66%	0.34%	0.00%	2.93%
DK/RF	1.49%	1.14%	1.03%	0.75%	1.03%	1.66%	7.09%
Total	24.91%	24.28%	18.65%	14.95%	14.58%	2.62%	100.00%

The distribution of income categories is largely skewed to the right with 78% of local bus riders being from low-income households (Figure 5-1). Ignoring those who did not declare their household size, the data show that over 50% of local bus riders are from one- or two-person households, with larger households gradually tapering off (Figure 5-2).

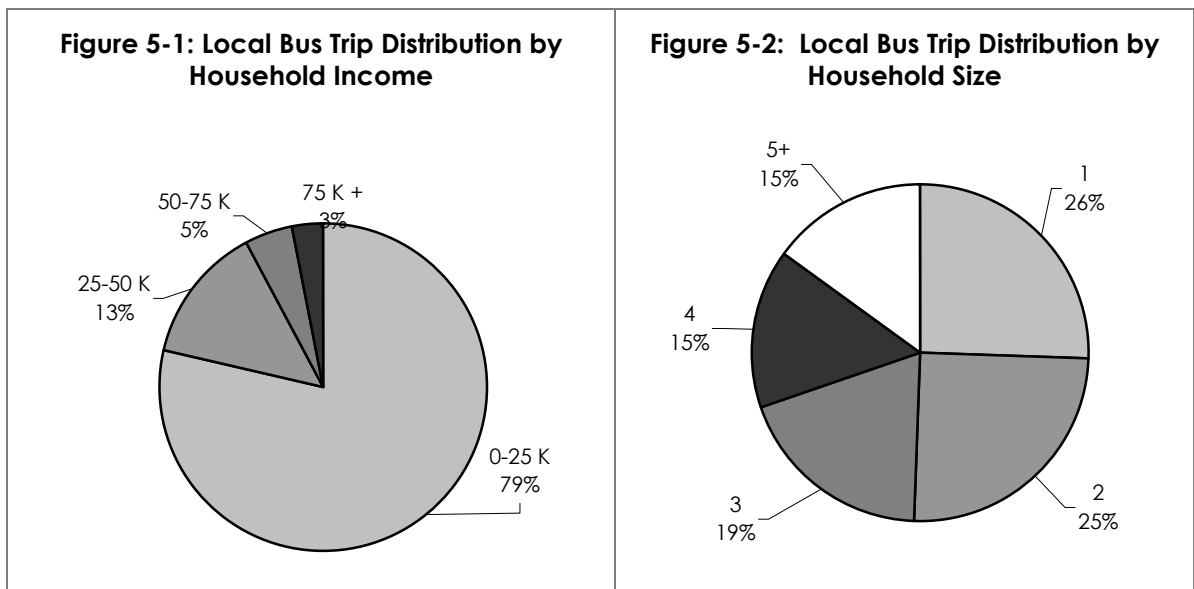


Figure 5-3 shows income distribution of local bus riders grouped by household size. Over 80% of local bus riders in one-person households are from low-income households (household income less than \$25,000). For the other income categories, similar pattern is observed. At least 60% or higher percentage of households in each household size category is comprised by low-income households (household income less than \$25,000).

Figure 5-3: Local Bus Trip Distribution of Household Income by Household Size

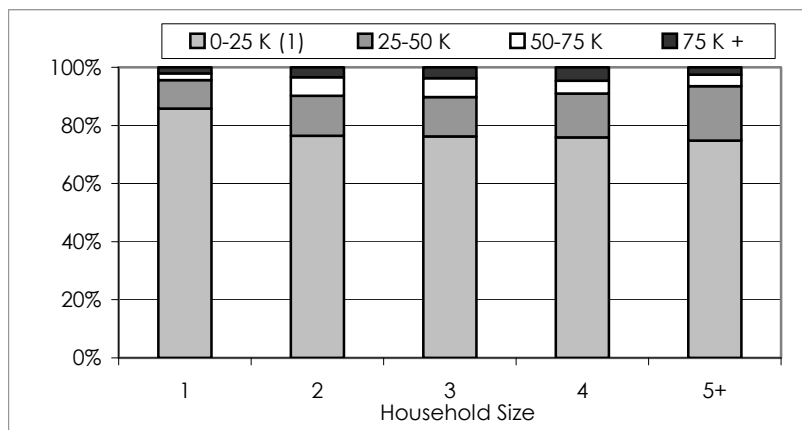
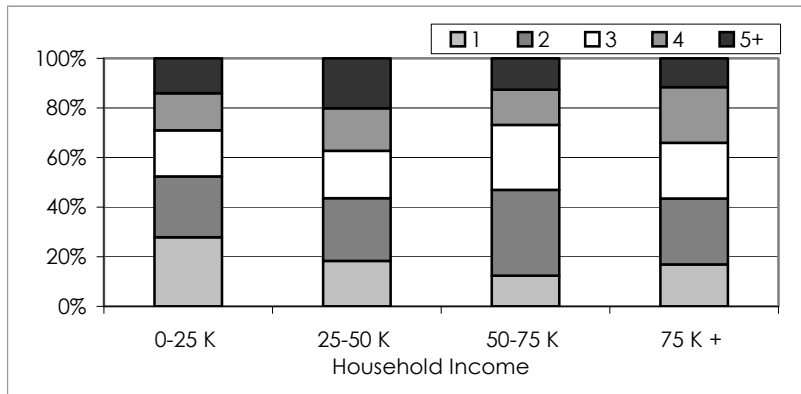


Figure 5-4 shows household size distribution of local bus riders grouped by income quartiles. Overall, large portions of households in each income quartiles are from small size households with three or less household members.

Figure 5-4: Local Bus Trip Distribution of Household Size by Household Income



Distribution by Number of Routes Per Linked Trip

Local bus riders were slightly less likely to get to their final destination in one route than the typical weekday passenger (Figures 5-5 and 5-6). Transfer rate of all weekday passengers is 1.56, while local bus riders recorded an average of 1.57 transfer rate (Table 5-3).

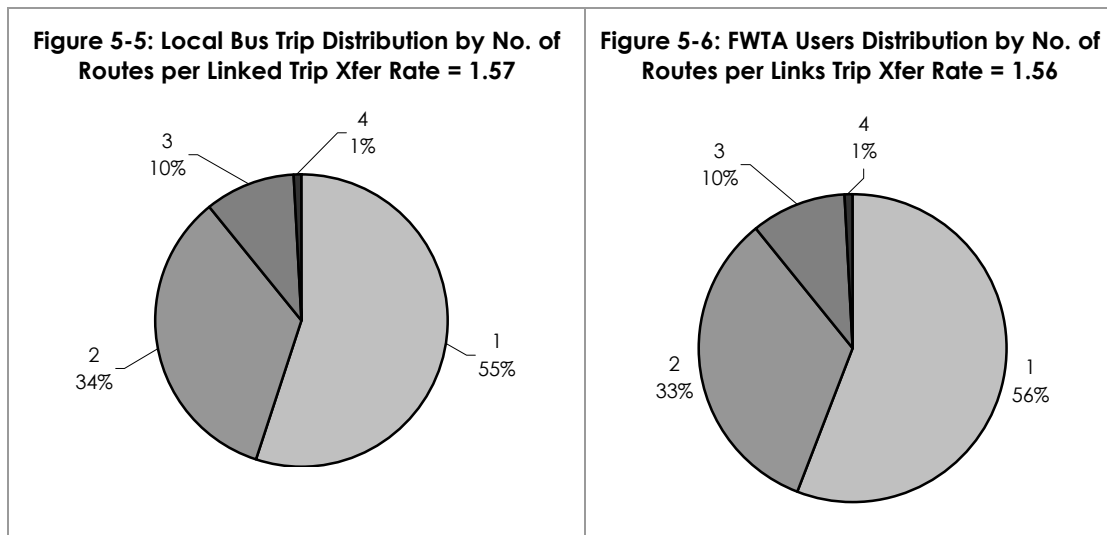


Table 5-3: FWTA Local Bus Trip Transfer Rate

Transfer Rate	Sample	Expanded
Local Bus Xfer Rate ²²	2	1.57
Weekday Xfer Rate ²³	2	1.56

Tables 5-4 and 5-5 show the distribution of transit vehicles taken by local passengers and all weekday passengers to reach their final destination. Nearly 79% of local bus riders reported that they would complete their one-way trip with no transfers or one transfer.

²² Transfer Rate (Sample) = $\sum_{i=1}^5 (\text{Num Vehicles}_i * \text{Num Samples}_i) / \sum (\text{Num Samples}_i)$

²³ Transfer Rate (Expansion) = $\sum_{i=1}^5 (\text{Expansion}_i) / \sum_{i=1}^5 (\text{Expansion}_i / \text{Num Vehicles}_i)$

Table 5-4: Number of Vehicles (Weekday, Local Bus Trip)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	826	7,938.14	35.01%	7,938.14	54.89%
2	1108	9,931.06	43.81%	4,965.53	34.33%
3	442	4,299.65	18.97%	1,433.22	9.91%
4	52	500.75	2.21%	125.19	0.87%
Total	2,428.00	22,669.60	100.00%	14,462.07	100.00%

Table 5-5: Number of Vehicles (all weekdays)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	945	8,367.52	35.79%	8367.52	55.77%
2	1142	10,046.99	42.97%	5023.50	33.48%
3	480	4,445.83	19.01%	1481.94	9.88%
4	58	521.62	2.23%	130.41	0.87%
Total	2625	23,381.96	100.00%	15003.36	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 5-6 and Figure 5-7 show how local bus passengers typically get to the surveyed route. Over 57% walk, while around 35% transferred from another bus.

Table 5-6: FWTA Local Bus Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	12991.24	57.31%
DRIVE (Drop Off, Drive Alone, Carpool)	1199.39	5.29%
OTHER	73.48	0.32%
BUS – XFER*	7842.16	34.59%
TRE – XFER*	563.33	2.48%
Total	22,669.60	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 5-7: FWTA Local Bus Mode of Access to the Surveyed Route

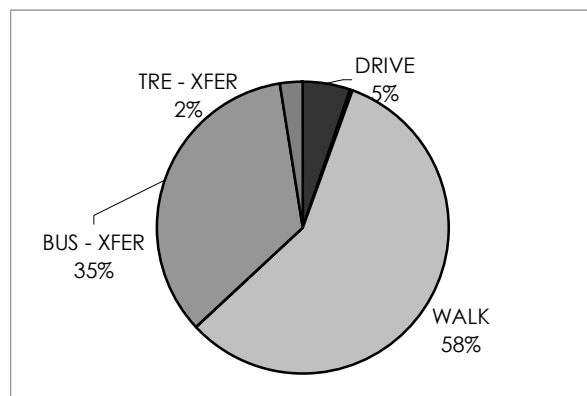


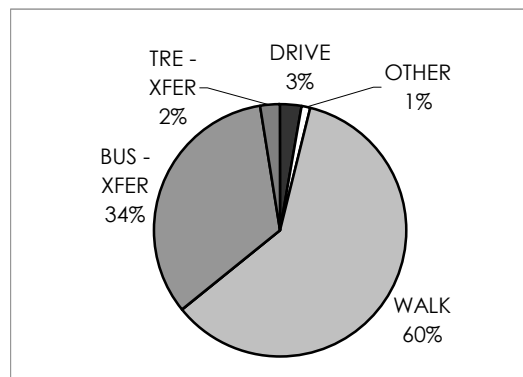
Table 5-7 and Figure 5-8 show the modes of egress from the transit. After arriving at the transit stop, over 60% of passengers walk to their next location, while nearly 34% transfer to another bus.

Table 5-7: FWTA Local Bus Mode of Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	13,618.58	60.07%
DRIVE (Pick Up, Drive Alone, Carpool)	628.39	2.77%
OTHER	256.92	1.13%
BUS – XFER**	7,627.27	33.65%
TRE – XFER**	538.44	2.38%
Total	22,669.60	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 5-8: FWTA Local Bus Mode of Egress from the Surveyed Route



Mode of Access/Egress to the Transit System

Table 5-8 and Figure 5-9 combine the mode of access with the mode of egress to see how local bus riders both get to the transit, as well as leave from the transit. Nearly 87% of FWTA local bus riders travel to and from the transit by foot or wheelchair only according to the expanded frequency.

Table 5-8: Mode of Access and Mode of Egress for Local Bus trip purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	19,617.24	86.54%	2100	86.49%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	2,594.56	11.45%	280	11.53%
Other	457.80	2.02%	48	1.98%
Total	22,669.60	100.00%	2428	100.00%

Figure 5-9: Local Bus Trip Mode of Access/Egress to the Transit System

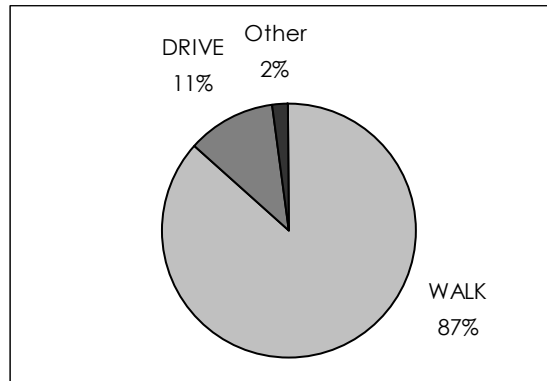
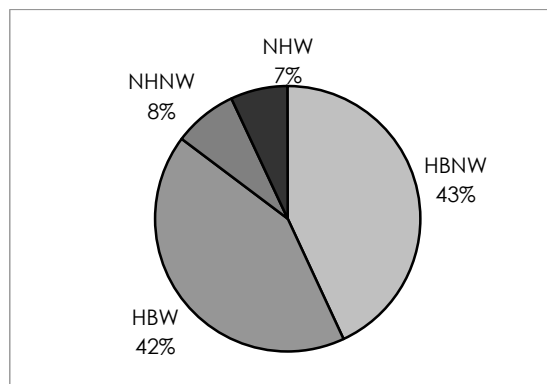


Table 5-9 and Figure 5-10 show the distribution of trip purposes for local bus riders. Local bus riders are most likely to be going from home to a non-work location or vice versa (HBNW trip). Over 85% of local bus trips was reported to be home-based trips.

Table 5-9: Combination of Mode of Access and Mode of Egress for Local Bus trip purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPN	Percentage -Samples
HBNW (Home to Non-Work, Non-Work to Home)	9,791.48	43.19%	1110	45.72%
HBW (Home to Work, Work to Home)	9,543.60	42.10%	978	40.28%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	1,774.60	7.83%	200	8.24%
NHW (Work to Non-Home, Non-Home to Work)	1,559.92	6.88%	140	5.77%
Total	22,669.60	100.00%	2428	100.00%

Figure 5-10: Local Bus Trip Distribution by Trip Purpose



Total Trip Distance²⁴

Figures 5-11 and 5-12 show the distribution of distances local bus passengers travel to get to their final destinations. Just over 50% of riders travel less than 5 miles. Average total distance of the trips that local bus riders made was 6.22 miles.

Figure 5-11: Local Bus Trip – Total Distance (Avg. 6.22 mile)

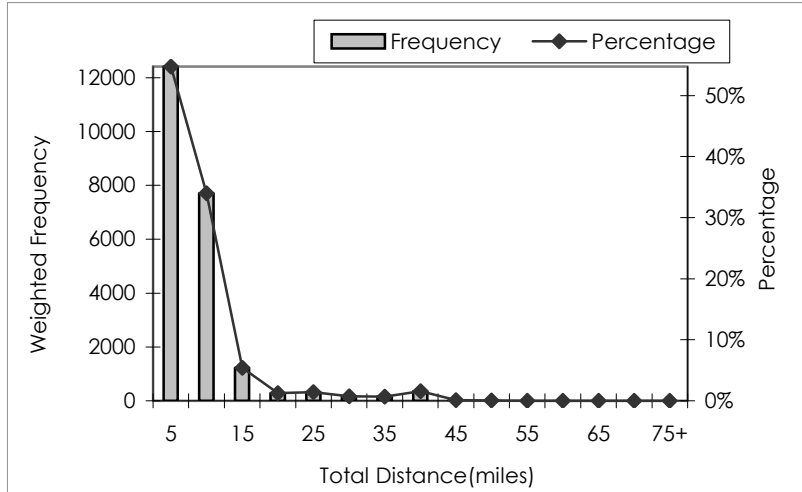
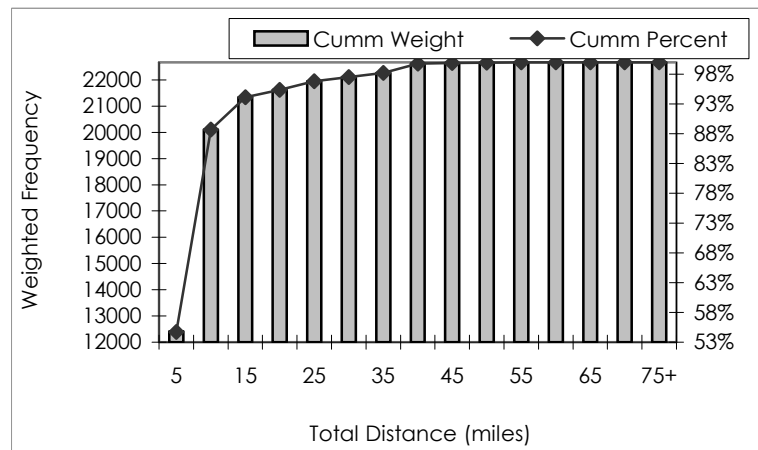


Figure 5-12: Local Bus Trip – Cumulative Total Distance



²⁴ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

FWTA – EXPRESS

Household Size/Household Income

The household size results indicate that express bus riders are most likely to be from two-person households. They are also more likely to be from three-person households than one-person households, with 143 and 100 passengers daily for the two categories (Tables 5-10 and 5-11).

Table 5-10: Household Size/Household Income

Weighted Income	Household Size						Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	48.07	91.38	61.1	32.67	4.53	13.79	251.54
25-50 K (2)	29.48	63.11	28.96	26.59	27.16	4.36	179.66
50-75 K (3)	14.01	33.07	23.04	14.12	21.1	0.00	105.34
75 K + (4)	3.59	49.48	29.95	60.36	7.69	0.00	151.07
DK/RF	4.54	5.62	0.00	5.33	0.00	9.26	24.75
Total	99.69	242.66	143.05	139.07	60.48	27.41	712.36

Table 5-11: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	6.75%	12.83%	8.58%	4.59%	0.64%	1.94%	35.31%
25-50 K (2)	4.14%	8.86%	4.07%	3.73%	3.81%	0.61%	25.22%
50-75 K (3)	1.97%	4.64%	3.23%	1.98%	2.96%	0.00%	14.79%
75 K + (4)	0.50%	6.95%	4.20%	8.47%	1.08%	0.00%	21.21%
DK/RF	0.64%	0.79%	0.00%	0.75%	0.00%	1.30%	3.47%
Total	13.99%	34.06%	20.08%	19.52%	8.49%	3.85%	100.00%

Figure 5-13 shows the distribution of income categories of express bus riders. While a plurality of riders is from low-income households, 63% are not. Figure 5-14 shows the distribution of household size of express bus riders. One and two-person households make up 50% of ridership.

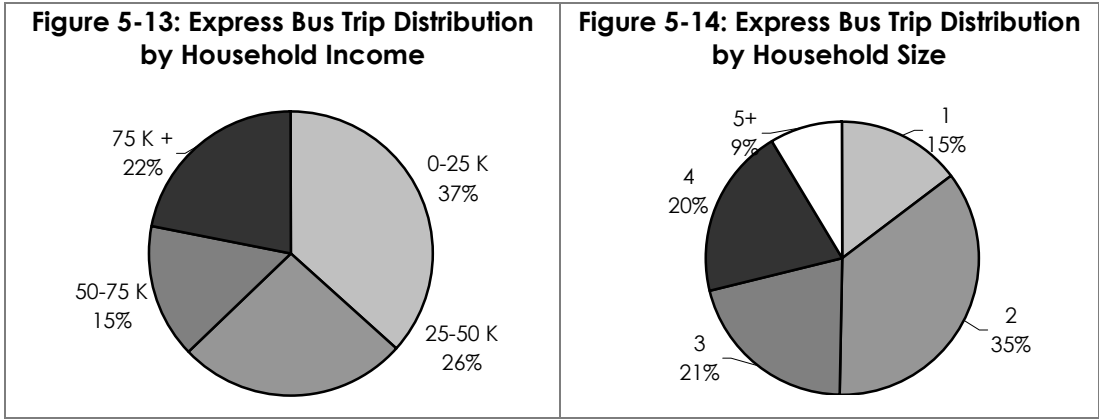


Figure 5-15 shows income distribution of express bus riders grouped by household size. Close to 50% of riders from single-person households are low-income. However, those larger households are likely to be from higher-income quartiles.

Figure 5-15: Express Bus Trip Distribution of Household Income by Household Size

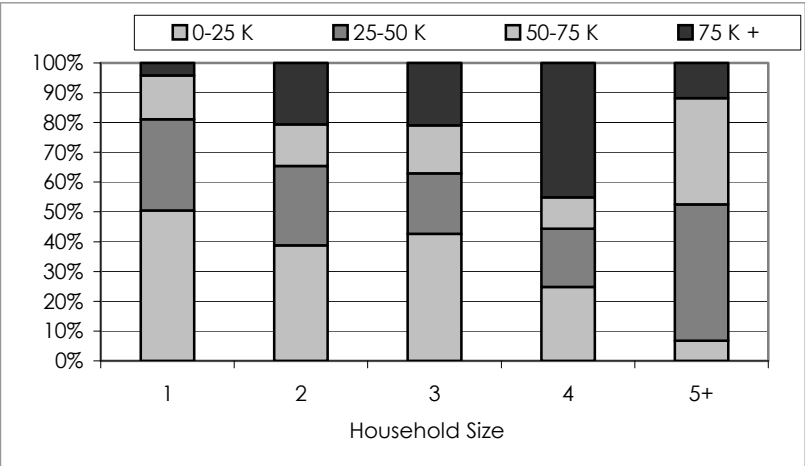
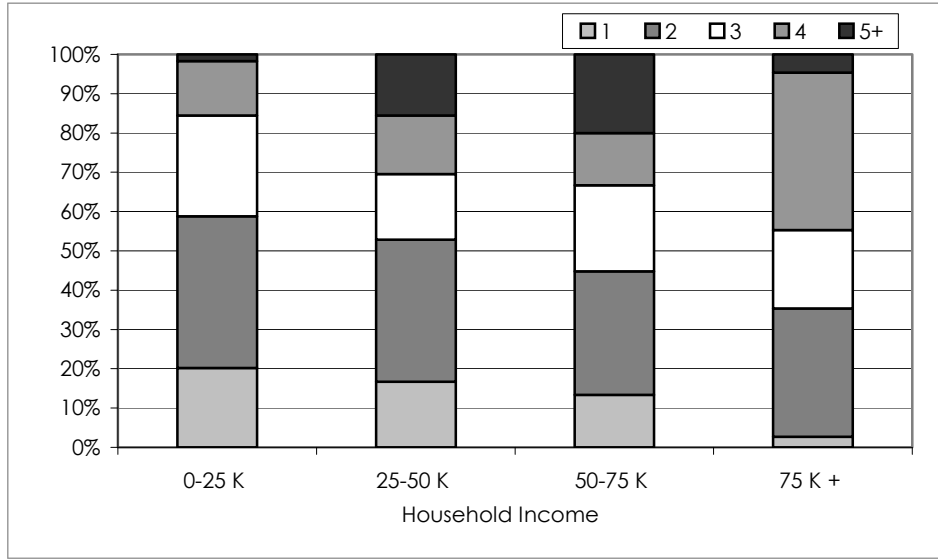


Figure 5-16 shows household size distribution of express bus riders grouped by income quartiles. Those in the bottom two quartiles are most likely to be from two-person households, while those in the highest quartile are most likely to be from four-person households.

Figure 5-16: Express Bus Trip Distribution of Household Size by Household



Distribution by Number of Routes per Linked Trip

Many more express bus riders get to their final destination in one route than all weekday passenger at 79% versus 56% (Figures 5-17 and 5-18). Weekday passengers take an average of 1.56 routes per linked trip, while express bus riders take an average of 1.32 (Table 5-3).

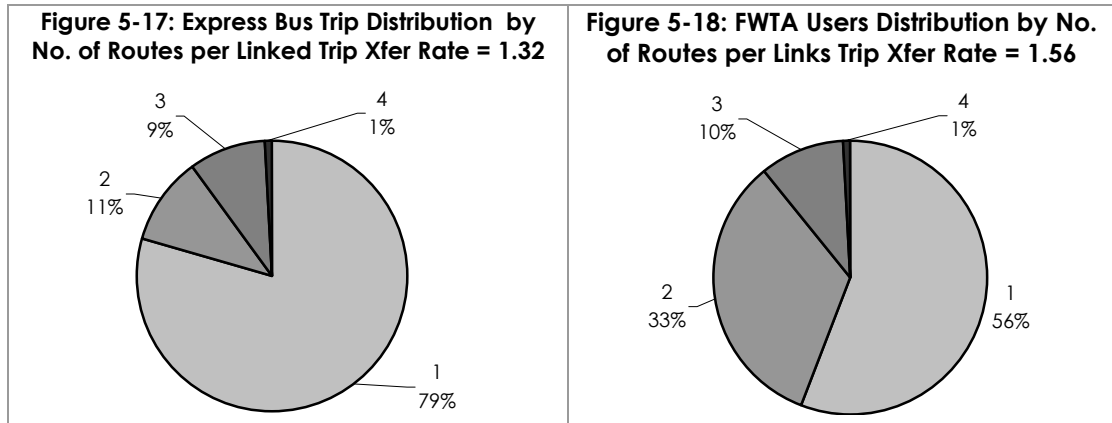


Table 5-12: FWTA Express Transfer Trip Rate

Transfer Rate	Sample	Expanded
Express Bus Xfer Rate ²⁵	2	1.32
WkDy Xfer Rate ²⁶	2	1.56

Tables 5-13 and 5-14 show the distribution of transit vehicles taken by express passengers and all weekday passengers to reach their final destination. A large portion of express riders took only one

²⁵ Transfer Rate (Sample) = $\sum_{i=1}^5 (\text{NumVehicles}_i * \text{Num Samples}_i) / \sum (\text{Num Samples}_i)$
²⁶ **Transfer Rate (Expansion) = $\sum_{i=1}^5 (\text{Expansion}_i) / \sum_{i=1}^5 (\text{Expansion}_i / \text{NumVehicles}_i)$

number of routes. Per linked trips, 79% of riders used one vehicle, while only 36% of all weekday passengers used one vehicle to complete their one-way trip. Per linked trips, nearly 56% of all weekday passengers used one vehicle.

Table 5-13: Number of Vehicles (Weekday, Express bus rider)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	119	429.38	60.28%	429.38	79.33%
2	34	115.93	16.27%	57.97	10.71%
3	38	146.18	20.52%	48.73	9.00%
4	6	20.87	2.93%	5.22	0.96%
Total	197.00	712.36	100.00%	541.29	100.00%

Table 5-14: Number of Vehicles (All Weekdays)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	945	8,367.52	35.79%	8367.52	55.77%
2	1142	10,046.99	42.97%	5023.50	33.48%
3	480	4,445.83	19.01%	1481.94	9.88%
4	58	521.62	2.23%	130.41	0.87%
Total	2625	23,381.96	100.00%	15003.36	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 5-15 and Figure 5-19 show how express bus passengers typically get to the transit: 48.73% walk, 21.40% transferred from another bus, and 28.82% use a vehicle, either driven by themselves or another.

Table 5-15: FWTA Express Bus Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	347.15	48.73%
DRIVE (Drop Off, Drive Alone, Carpool)	205.31	28.82%
OTHER	2.94	0.41%
BUS – XFER*	156.96	22.04%
Total	712.36	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 5-19: FWTA Express Bus Mode of Access to the Surveyed Route

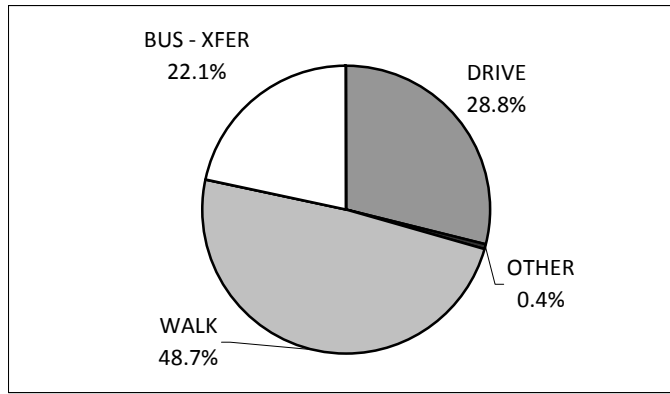


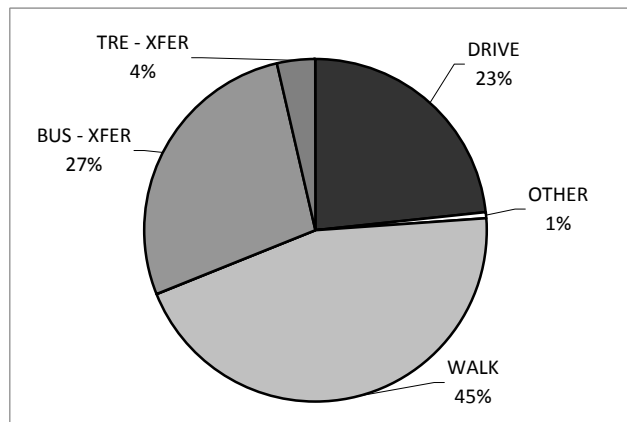
Table 5-16 and Figure 5-20 show the modes of egress from the transit. After arriving at the transit stop, close to 45% of passengers walk to their next location, while nearly 27% transfer to another bus.

Table 5-16: FFTA Express Bus Mode of Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	320.33	44.97%
DRIVE (Pick Up, Drive Alone, Carpool)	165.70	23.26%
OTHER	4.74	0.67%
BUS – XFER**	195.86	27.49%
TRE – XFER**	25.73	3.61%
Total	712.36	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 5-20: FFTA Express Bus Mode of Egress from the Surveyed Route



Mode of Access/Egress to the Transit System

Combining the modes of access and egress, nearly 54% of express bus passengers use a vehicle to either get to the bus or get from the bus, while about 46% walk or use a wheelchair for both access and egress (Table 5-17 and Figure 5-21).

Table 5-17: Mode of Access and Mode of Egress for Express Bus Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	325.84	45.74%	90	45.69%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	381.78	53.59%	105	53.30%
Other*	4.74	0.67%	2	1.02%
Total	712.36	100.00%	197	100.00%

Figure 5-21: FWTA Express Bus Trip Mode of Access/Egress to the Transit System

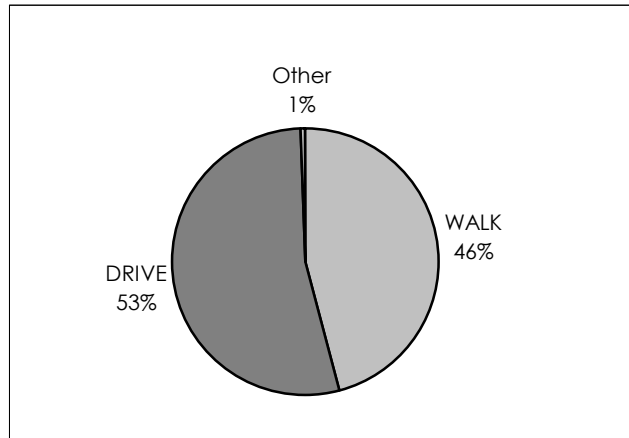
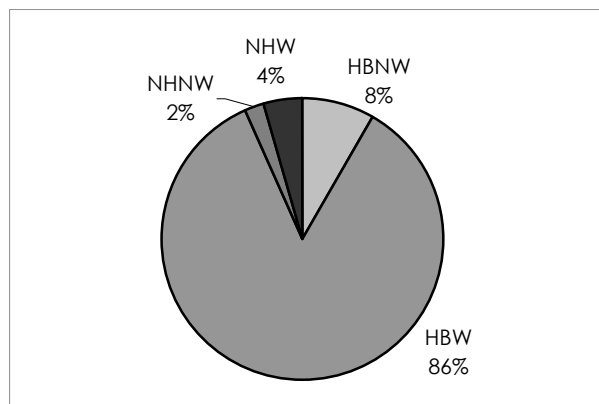


Table 5-18 and Figure 5-22 show the distribution of trip purposes for express bus riders. Close to 85% of express bus riders are going from work to home or vice versa (HBW).

Table 5-18: Express Bus Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
HBNW (Home to Non-Work, Non-Work to Home)	59.30	8.32%	15	7.61%
HBW (Home to Work, Work to Home)	606.17	85.09%	172	87.31%
NHNW (Non-Home to Non-Work, Non-Work to Non-Home)	15.44	2.17%	2	1.02%
NHW (Work to Non-Home, Non-Home to Work)	31.45	4.41%	8	4.06%
Total	712.36	100.00%	197	100.00%

Figure 5-22: Express Bus Trip Distribution by Trip Purpose



Total Trip Distance²⁷

Express bus riders are most likely to travel between 5 and 11 miles, with an average of 11.63 miles (Figure 5-23). Express bus passengers travel longer distances than other riders, but over 70% travel under 15 miles per linked trip (Figure 5-24).

Figure 5-23: Express Bus Trip – Total Distance (Avg 11.63 mile)

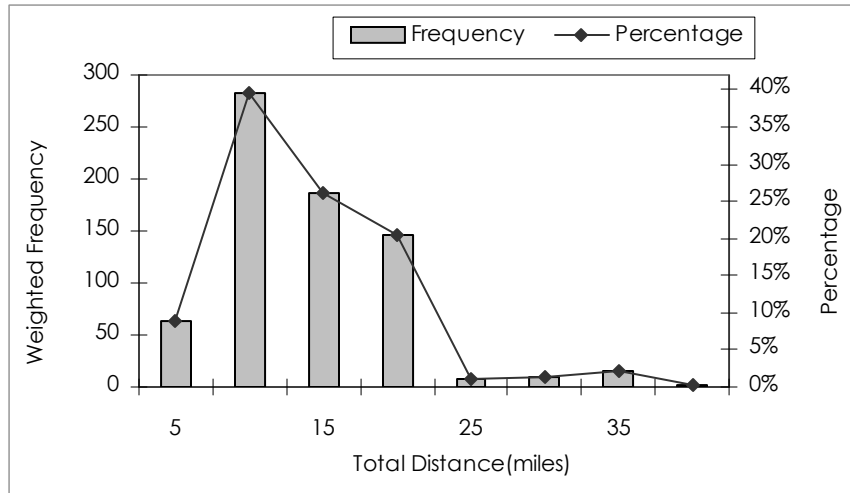
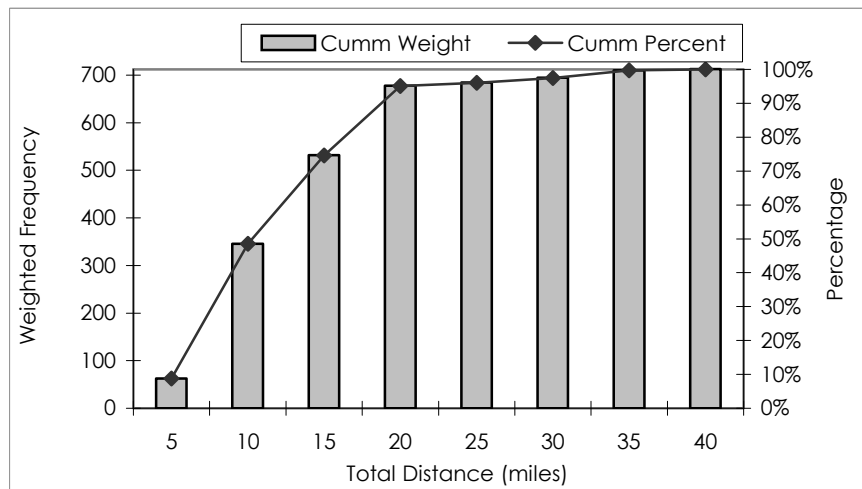


Figure 5-24: Express Bus Trip – Cumulative Total Distance



²⁷ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

DCTA – LOCAL

Household Size/Household Income

The household size results indicate that local bus riders are most likely to be from one-person households and low-income households. (Tables 5-19 and 5-20).

Table 5-19: Household Size/Household Income

% Total	Household Size						% Total
Income	1	2	3	4	5+	DK/RF	
0-25 K (1)	320.38	125.95	151.01	183.97	26.05	34.05	841.41
25-50 K (2)	61.98	34.17	20.6	29.98	23.06	0.00	169.79
50-75 K (3)	0.00	10.01	3.13	17.28	0.00	0.00	30.42
75 K + (4)	0.00	0.00	0.00	3.08	0.00	0.00	3.08
DK/RF	0.00	24.35	6.15	0.00	5.98	0.00	36.48
Total	382.36	194.48	180.89	234.31	55.09	34.05	1081.18

Table 5-20: Household Size/Household Income %

% Total	Household Size						% Total
Income	1	2	3	4	5+	DK/RF	
0-25 K (1)	29.63%	11.65%	13.97%	17.02%	2.41%	3.15%	77.82%
25-50 K (2)	5.73%	3.16%	1.91%	2.77%	2.13%	0.00%	15.70%
50-75 K (3)	0.00%	0.93%	0.29%	1.60%	0.00%	0.00%	2.81%
75 K + (4)	0.00%	0.00%	0.00%	0.28%	0.00%	0.00%	0.28%
DK/RF	0.00%	2.25%	0.57%	0.00%	0.55%	0.00%	3.37%
Total	35.36%	17.99%	16.73%	21.67%	5.10%	3.15%	100.00%

Ignoring those who did not respond, Figure 5-25 shows the distribution of income categories of local bus riders. Over 80% are from the lowest income category. Figure 5-26 shows the distribution of household size of local bus riders. Local bus riders are most likely to be from one-person households at 37%.

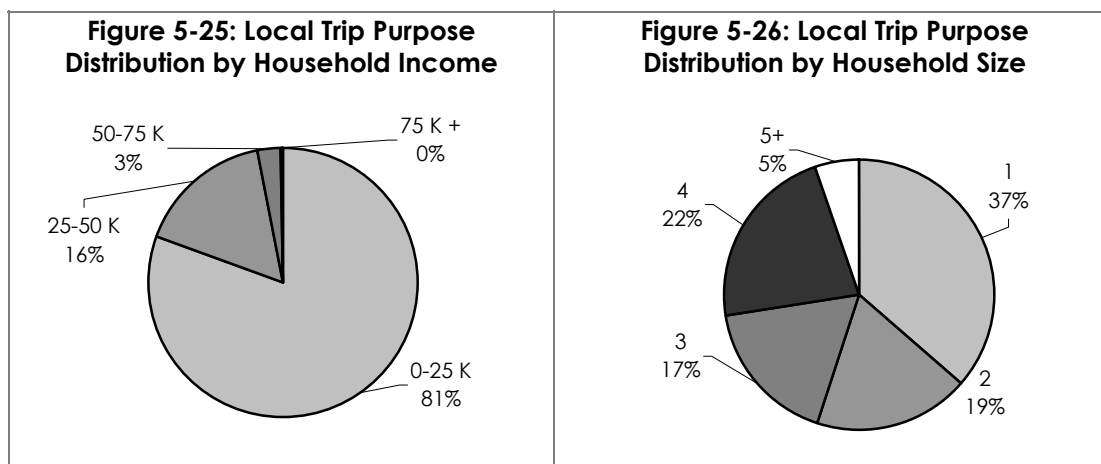


Figure 5-27 shows income distribution of local bus riders grouped by household size. The upper two quartiles are barely represented. However, of the largest household size category, riders are equally likely to be from the second quartile as the bottom quartile.

Figure 5-27: Local bus Trip Distribution of Household Income by Household Size

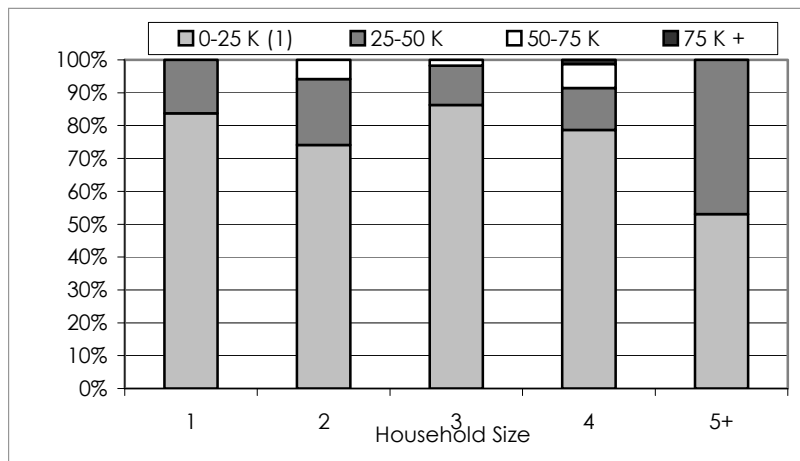
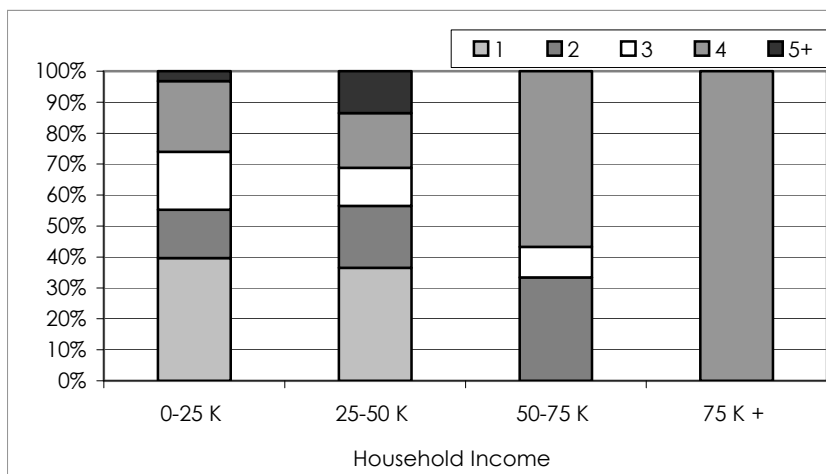


Figure 5-28 shows household size distribution of local bus riders grouped by income quartiles. Riders in the higher income categories are more likely to be from larger households while riders in the lower income categories are more likely to be from smaller households.

Figure 5-28: Local Bus Trip Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

Local bus riders are much less likely to get to their destination in one route than all weekday passengers at 56% versus 92% (Figures 5-29 and 5-30). DCTA local bus riders are more likely to make less transfers as comparing their transfer rate of 1.44 per linked trip to all weekday passengers' transfer rate of 1.07.

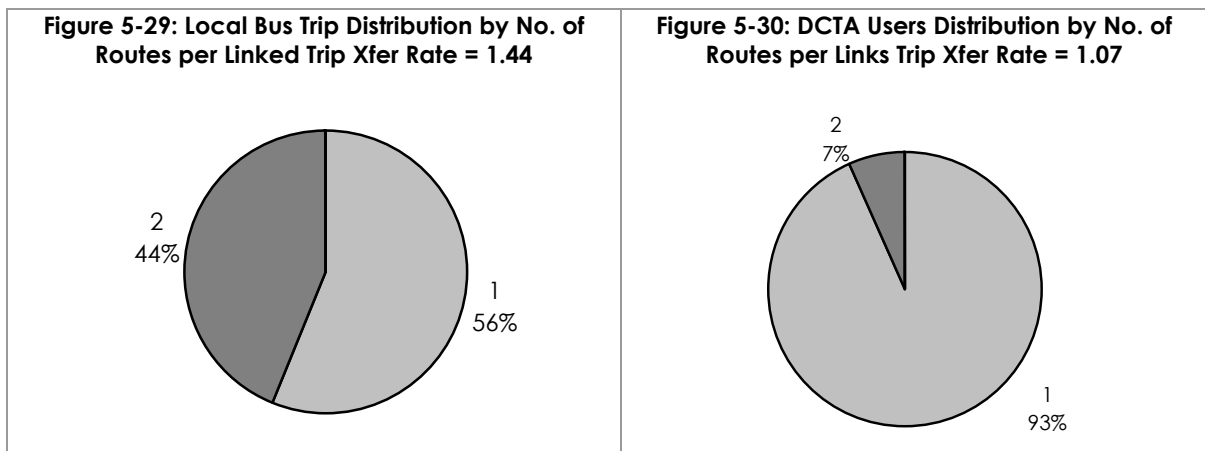


Table 5-21: DCTA Local Bus Trip Transfer Rate

Transfer Rate	Sample	Expanded
Local Bus Xfer Rate ²⁸	2	1.44
WkDy Xfer Rate ²⁹	1	1.07

Table 5-22 and Table 5-23 show the number of transit vehicles that local bus passengers used to get to their final destination in comparison with the number of transit vehicles that all weekday passengers used for their one-way trip.

Table 5-22: Number of Vehicles (Weekday, Local Bus Trip)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	48	420.77	38.92%	420.77	56.03%
2	62	660.41	61.08%	330.21	43.97%
3	0	0.00	0.00%	0.00	0.00%
Total	110.00	1,081.18	100.00%	750.98	100.00%

Table 5-23: Number of Vehicles (All weekday)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	277	11,197.89	87.51%	11197.89	93.34%
2	83	1,597.66	12.49%	798.83	6.66%
4	0	0.00	0.00%	0.00	0.00%
Total	360	12,795.55	100.00%	11,996.72	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 5-24 and Figure 5-31 show how local bus passengers typically get to the transit. The vast majority of local bus riders (80%) walked to the bus/rail.

²⁸ Transfer Rate (Sample) = $\text{Sum}(i=1 \text{ to } 5(\text{NumVehicles}_i * \text{Num Samples}_i)) / \text{Sum}(\text{Num Samples}_i)$

²⁹ Transfer Rate (Expansion) = $\text{Sum}(i=1 \text{ to } 5(\text{Expansion}_i)) / \text{Sum}(i=1 \text{ to } 5(\text{Expansion}_i / \text{NumVehicles}_i))$

Table 5-24: DCTA Local Bus Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	865.97	80.09%
DRIVE (Drop Off, Drive Alone, Carpool)	58.21	5.38%
OTHER	106.24	9.83%
BUS – XFER*	50.76	4.69%
Total	1,081.18	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 5-31: DCTA Local Bus Mode of Access to the Surveyed Route

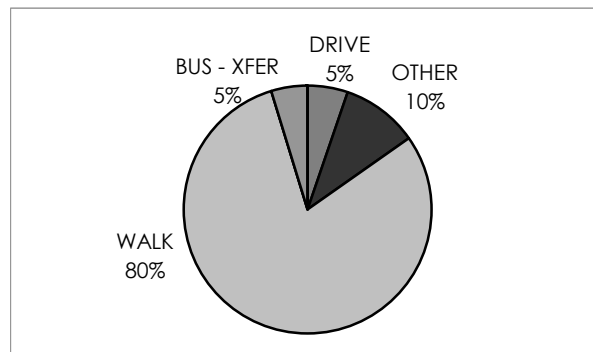


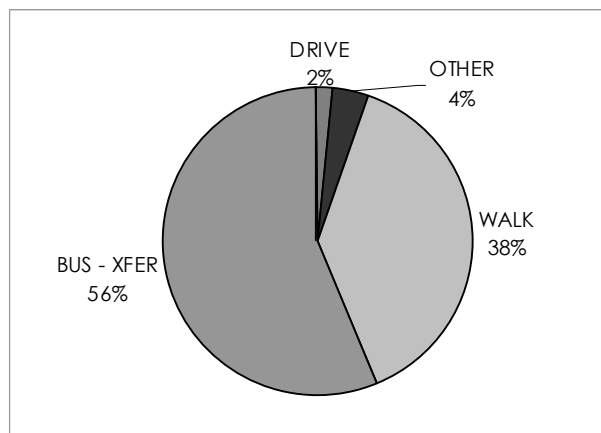
Table 5-25 and Figure 5-32 show the difference between modes of egress. After arriving at the transit stop, 38.14% of passengers walked to their destination, while 56.39% transferred to another bus. Only less than 2 % of riders used a vehicle to egress from the surveyed route to their final destination.

Table 5-25: DCTA Local Bus Trip Mode of Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	412.35	38.14%
DRIVE (Pick Up, Drive Alone, Carpool)	16.88	1.56%
OTHER	42.30	3.91%
BUS – XFER**	609.65	56.39%
Total	1,081.18	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 5-32: DCTA Local Bus Trip Mode of Egress from the Surveyed Route



Mode of Access/Egress to the Transit System

Table 5-26 and Figure 5-33 combine the mode of access with the mode of egress to see how the local bus riders both get to the transit as well as leave from the transit. Expanded and weighted from our sample, 7% local bus passengers daily use a vehicle for at least one leg, while over 84% passengers walk for both parts.

Table 5-26: Mode of Access and Mode of Egress for Local Bus Trip

MOA_MOE	ExpanWGT	Percentage-Weighted	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	899.43	83.19%	86	78.18%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	71.96	6.66%	11	10.00%
Other*	109.79	10.15%	13	11.82%
Total	1,081.18	100.00%	110	100.00%

Figure 5-33: Local Bus Trip Mode of Access/Egress to the Transit System

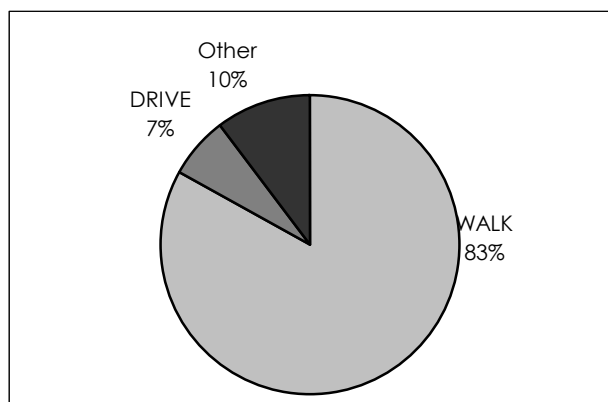


Table 5-27 separates local bus passengers by trip purpose. Most local bus passengers are either going from home to a non-work location, or vice versa (HBNW).

Table 5-27: Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
HBNW (Home to Non-Work, Non-Work to Home)	506.14	46.81%	55	50.00%
HBW (Home to Work, Work to Home)	253.02	23.40%	33	30.00%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	299.14	27.67%	20	18.18%
NHW (Work to Non-Home, Non-Home to Work)	22.88	2.12%	2	1.82%
Total	1,081.18	100.00%	110	100.00%

Total Trip Distance³⁰

Figures 5-34 and 5-35 show how far riders travel to get to their final destination. Local bus passengers are most likely to travel between 2 and 3 miles, with an average 3.00 miles.

Figure 5-34: Local Bus Trip – Total Distance (Avg. 3.00 mile)

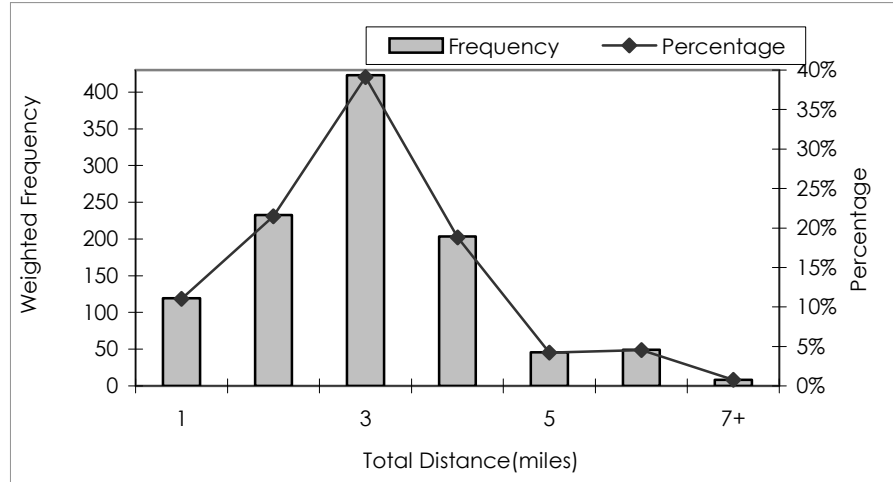
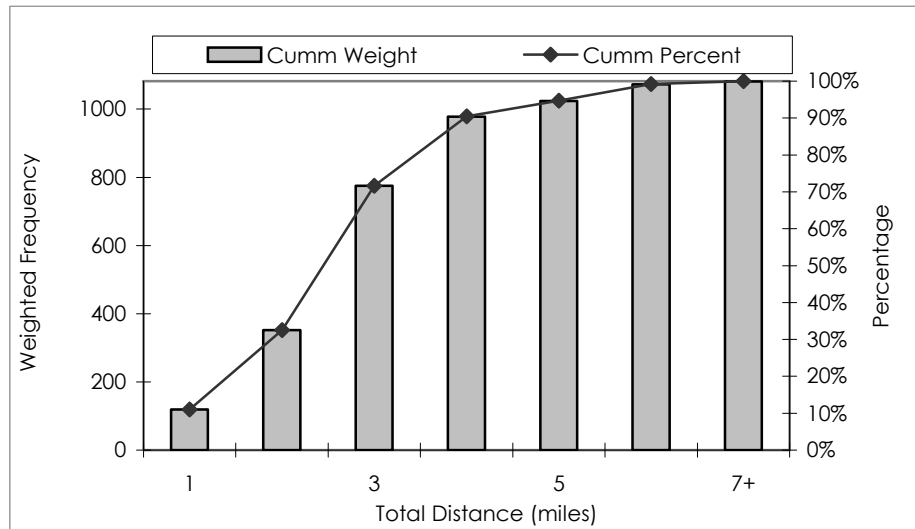


Figure 5-35: Local Bus Trip – Cumulative Total Distance



³⁰ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

DCTA – EXPRESS

Household Size/Household Income

Tables 5-28 and 5-29 show the distribution of household income and household size among DCTA express bus users. The household size results indicate that express bus riders are most likely to be from two-person households. In terms of household income, express bus riders are most likely from the households with the highest income household group (\$75,000 or higher household income).

Table 5-28: Household Size/Household Income

Weighted Income	Household Size						%Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	3.43	30.09	6.86	0.00	6.86	0.00	47.24
25-50 K (2)	0.00	34.29	18.00	10.29	0.00	0.00	62.58
50-75 K (3)	6.86	18.00	17.15	7.71	13.72	0.00	63.44
75 K + (4)	7.71	285.34	14.57	18.00	3.43	0.00	329.05
DK/RF	7.71	0.00	0.00	0.00	0.00	0.00	7.71
Total	25.71	367.72	56.58	36	24.01	0.00	510.02

Table 5-29: Household Size/Household Income %

% Total Income	Household Size						% Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	0.67%	5.90%	1.35%	0.00%	1.35%	0.00%	9.26%
25-50 K (2)	0.00%	6.72%	3.53%	2.02%	0.00%	0.00%	12.27%
50-75 K (3)	1.35%	3.53%	3.36%	1.51%	2.69%	0.00%	12.44%
75 K + (4)	1.51%	55.95%	2.86%	3.53%	0.67%	0.00%	64.52%
DK/RF	1.51%	0.00%	0.00%	0.00%	0.00%	0.00%	1.51%
Total	5.04%	72.10%	11.09%	7.06%	4.71%	0.00%	100.00%

Ignoring those who did not declare household income or their household size, 66% of express bus riders come from highest income households (Figure 5-36) and that over 70% of express bus riders are from two-person households (Figure 5-37).

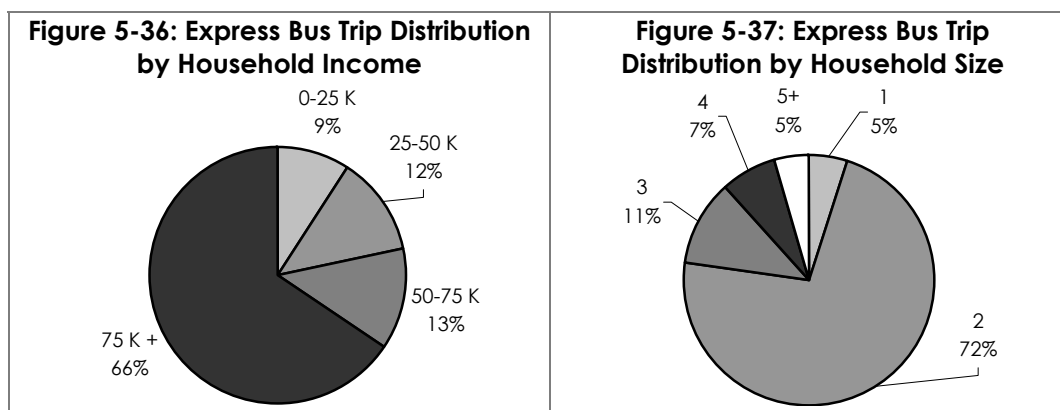


Figure 5-38 shows income distribution of express bus riders grouped by household size. Out of those in two-person households, nearly 80% are from the highest income quartile.

Figure 5-38: Express bus Trip Distribution of Household Income by Household Size

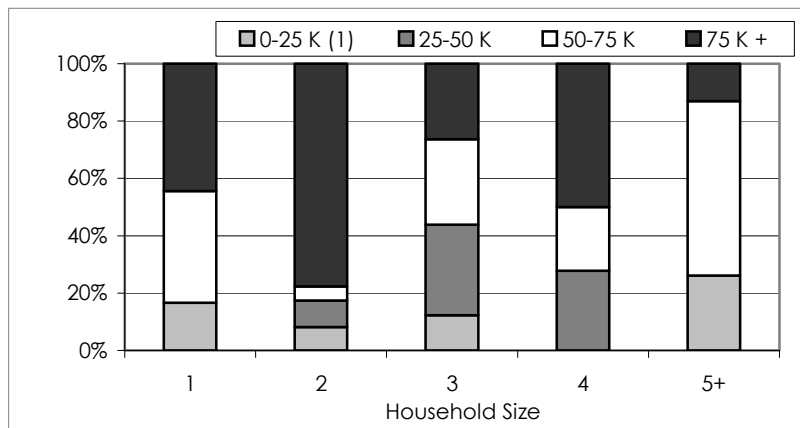
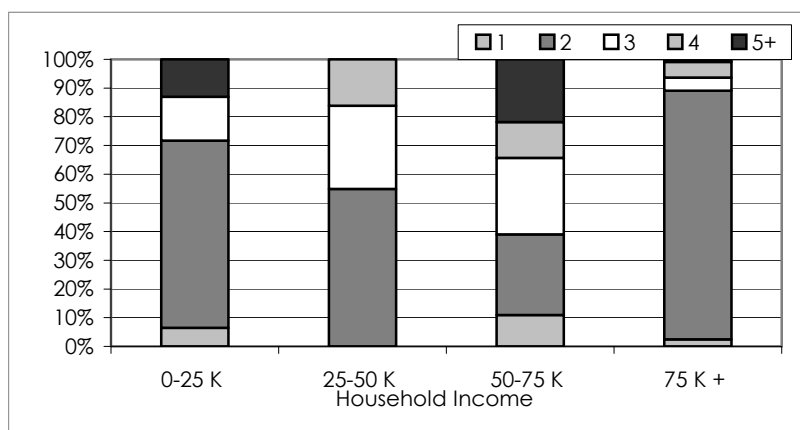


Figure 5-39 shows household size distribution of express bus riders grouped by income quartiles. Those in the highest income quartile are most likely to be from two-person households.

Figure 5-39: Express Bus Trip Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

Express bus riders were much more likely to get to their final destination in one route than all weekday passenger (Figures 5-40 and 5-41). Weekday passengers take an average of 1.05 routes to get to their final destination while express bus riders take an average of 1.07 (Table 5-30).

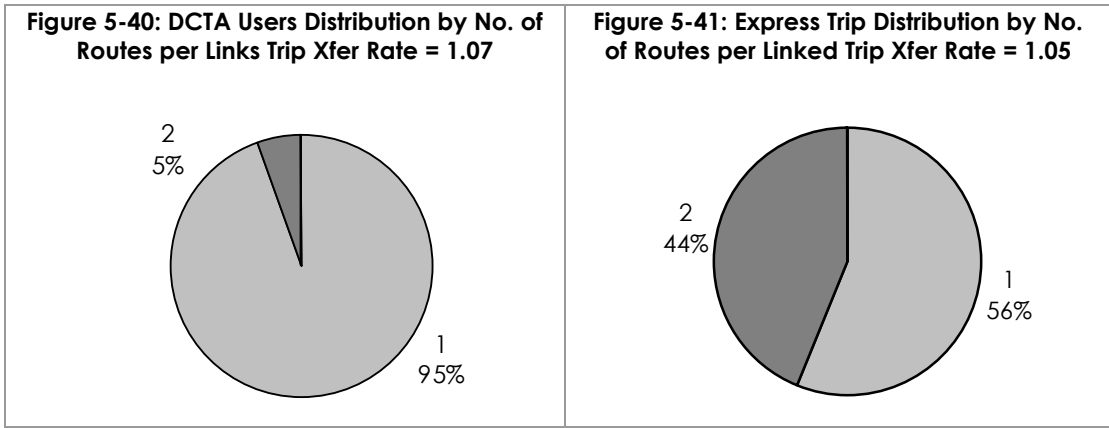


Table 5-30: DCTA Express Bus Trip Transfer Rate

Transfer Rate	Sample	Expanded
Express Bus Xfer Rate ³¹	1	1.05
WkDy Xfer Rate ³²	1	1.07

Tables 5-31 and 5-32 show the distribution of transit vehicles taken by express passengers and the typical weekday passenger to reach their final destination.

Table 5-31: Number of Vehicles (Weekday, Express Bus Trip)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	33	459.35	90.07%	459.35	94.77%
2	5	50.67	9.93%	25.34	5.23%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	38.00	510.02	100.00%	484.69	100.00%

Table 5-32: Number of Vehicles (All weekday)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	277	11,197.89	87.51%	11197.89	93.34%
2	83	1,597.66	12.49%	798.83	6.66%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	360	12,795.55	100.00%	11,996.72	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 5-33 and Figure 5-42 show how express bus passengers on the surveyed route accessed to their surveyed route. Over 80% of express bus passengers walked, while 11% used a vehicle. Six percent of express bus passengers transferred from another bus for their one-way trip.

³¹ Transfer Rate (Sample) = $\text{Sumi}=1\text{to}5(\text{NumVehicles}_i * \text{Num Samples}_i) / \text{Sum}(\text{Num Samples}_i)$

³² Transfer Rate (Expansion) = $\text{Sumi}=1\text{to}5(\text{Expansion}_i) / \text{Sumi}=1\text{to}5(\text{Expansion}_i/\text{NumVehicles}_i)$

Table 5-33: DCTA Express Bus Trip Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
DRIVE (Drop Off, Drive Alone, Carpool)	55.72	10.93%
LRT	6.86	1.35%
WALK (Walk, Wheelchair)	417.35	81.83%
BUS – XFER*	30.09	5.90%
Total	510.02	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 5-42: DCTA Express Bus Trip Mode of Access to the Surveyed Route

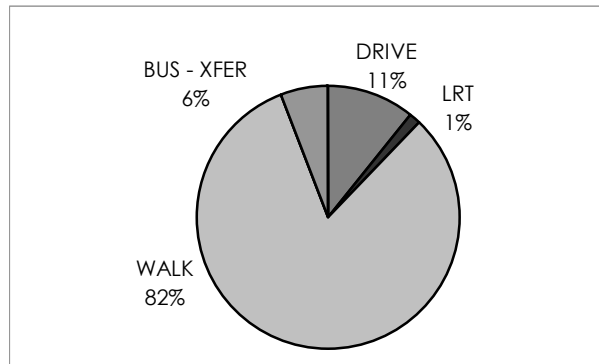


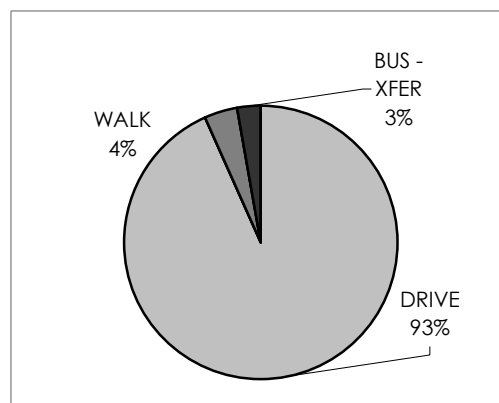
Table 5-34 and Figure 5-43 show the modes of egress from the surveyed route. After arriving at the alighting transit stop of the surveyed route, 93% of passengers used a vehicle to their next location, while only 4% walk.

Table 5-34: DCTA Express Bus Trip Mode of Egress from the Surveyed Route?

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
DRIVE (Pick Up, Drive Alone, Carpool)	475.72	93.27%
WALK (Walk, Wheelchair)	20.58	4.04%
BUS – XFER**	13.72	2.69%
Total	510.02	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 5-43: Express Bus Trip Distribution by Mode of Egress from Surveyed Route



Mode of Access/Egress to the Transit System

Table 5-35 and Figure 5-44 combine the mode of access with the mode of egress to see how express bus riders both get to the transit as well as leave from the transit. A vast majority of passengers (over 95%) traveled to and from the surveyed route by vehicle.

Table 5-35: Mode of Access and Mode of Egress for Express Bus Trip

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	24.01	4.71%	6	15.79%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	486.01	95.29%	32	84.21%
Total	510.02	100.00%	38	100.00%

Figure 5-44: Express Bus Trip Mode of Access/Egress to the Transit System

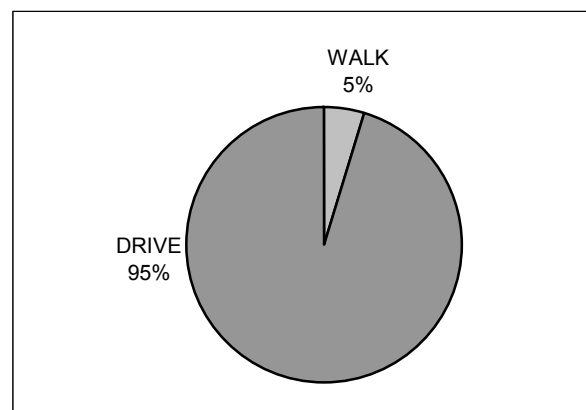


Table 5-36 shows the distribution of trip purposes for express bus riders. Express bus riders are most likely to be going from home to work or vice versa (HBW).

Table 5-36: Trip Purpose

MOA_MOE	ExpanWGT	Percentage-Weight	SAMPN	Percentage-Samples
HBNW (Home to Non-Work, Non-Work to Home)	48.02	9.42%	14	36.84%
HBW (Home to Work, Work to Home)	413.91	81.16%	20	52.63%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	30.09	5.90%	1	2.63%
NHW (Work to Non-Home, Non-Home to Work)	18.00	3.53%	3	7.89%
Total	510.02	100.00%	38	100.00%

Total Trip Distance³³

Figures 5-45 and 5-46 show the distribution of distances express bus passengers travel to get to their final destinations. Express bus passengers traveled almost 7 times longer than the local bus passengers. Just over 50% of riders travel less between 30 and 35 miles, with an average of 20.68 miles.

Figure 5-45: Express Bus Trip – Total Distance (Avg 20.68 mile)

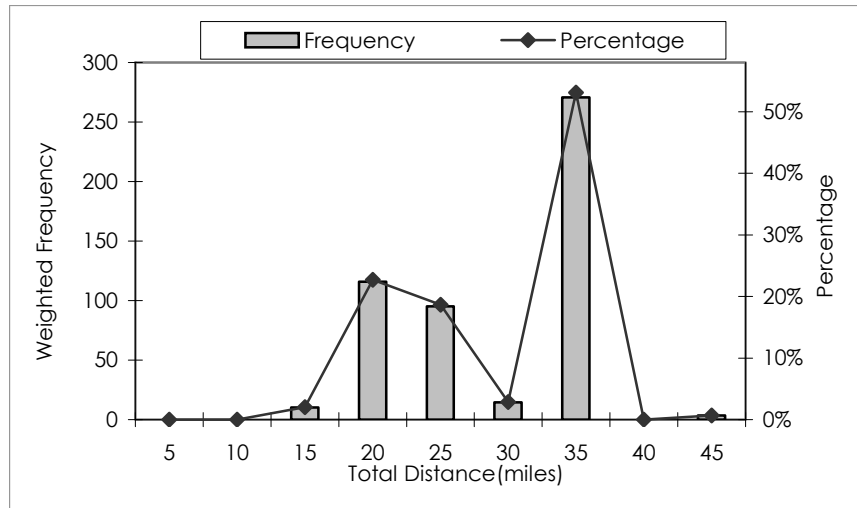
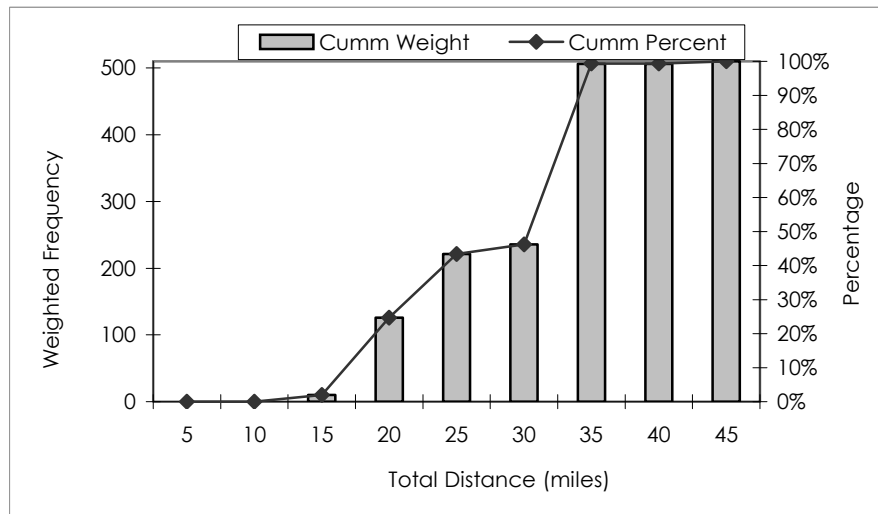


Figure 5-46: Express Bus Trip – Cumulative Total Distance



³³ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

DCTA – UNT SHUTTLE

Denton County Transportation Authority has providing the UNT Shuttle system to serve the students of UNT. The following addresses an analysis regarding UNT shuttle riders’ demographic characteristics and travel behavior characteristics.

Household Size/Household Income

The household size results indicate that local bus riders are most likely to be from one or two-person households, but they are close to evenly split between the two. Hence, regarding household size, this group is more likely from smaller households than local bus riders or express bus riders (Table 5-37 and 5-38).

Table 5-37: Household Size/Household Income

Weighted Income	Household Size						%Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	1858.33	2734.76	1032.02	2498.05	63.61	0.00	8186.77
25-50 K (2)	167.73	407.64	336.88	259.44	24.4	0.00	1196.09
50-75 K (3)	0.00	35.7	123.8	37.74	65.54	0.00	262.78
75 K + (4)	19.65	88.3	213.86	467.46	155.71	0.00	944.98
DK/RF	155.74	170.03	287.96	0.00	0.00	0.00	613.73
Total	2201.45	3436.43	1994.52	3262.69	309.26	0.00	11204.35

Table 5-38: Household Size/Household Income %

%	Household Size						%Total
	1	2	3	4	5+	DK/RF	
0-25 K (1)	16.59%	24.41%	9.21%	22.30%	0.57%	0.00%	73.07%
25-50 K (2)	1.50%	3.64%	3.01%	2.32%	0.22%	0.00%	10.68%
50-75 K (3)	0.00%	0.32%	1.10%	0.34%	0.58%	0.00%	2.34%
75 K + (4)	0.18%	0.79%	1.91%	4.17%	1.39%	0.00%	8.43%
DK/RF	1.39%	1.52%	2.57%	0.00%	0.00%	0.00%	5.48%
Total	19.65%	30.67%	17.80%	29.12%	2.76%	0.00%	100.00%

The distribution of income categories is largely skewed to the right with 78% of UNT shuttle bus riders being from low-income households (Figure 5-47). Ignoring those who did not declare their household size, the data show that 50% of UNT shuttle bus riders are from one or two-person households (Figure 5-48).

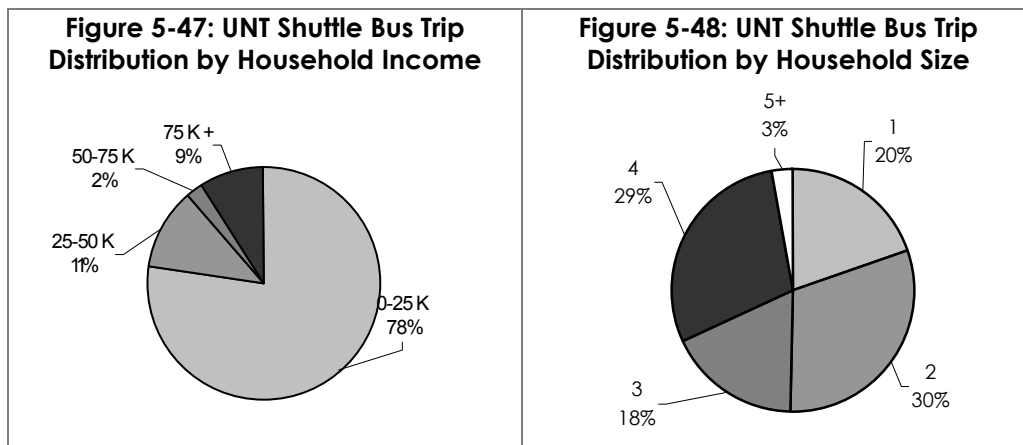


Figure 5-49: Shuttle bus Trip Distribution of Household Income by Household Size

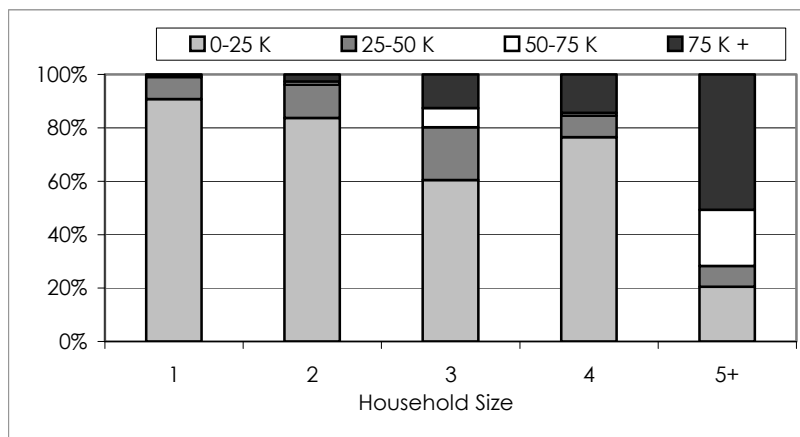
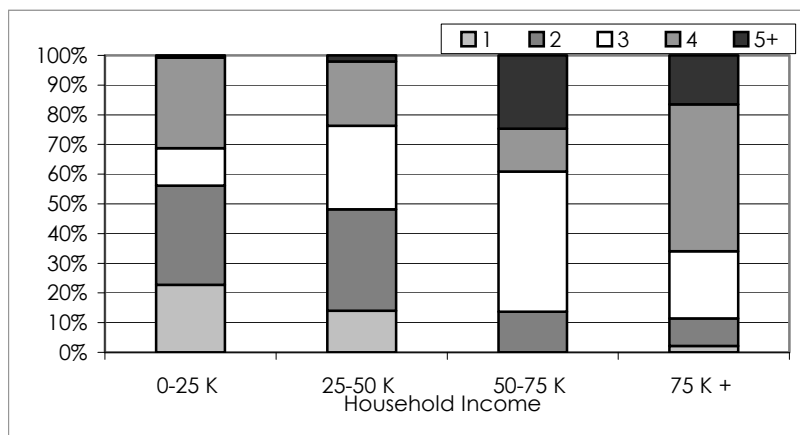


Figure 5-50 shows income distribution of UNT Shuttle bus riders grouped by household size. It is likely that UNT shuttle riders from lower income households are also from smaller households.

Figure 5-50: Shuttle Bus Trip Distribution of Household Size by Household Income



Distribution by Number of Routes per Linked Trip

UNT shuttle bus riders are less likely to make a transfer than all weekday DCTA transit riders with the transfer rate per linked trip of 1.04, in comparison with 1.07 of all passengers (Figures 5-51 and 5-52).

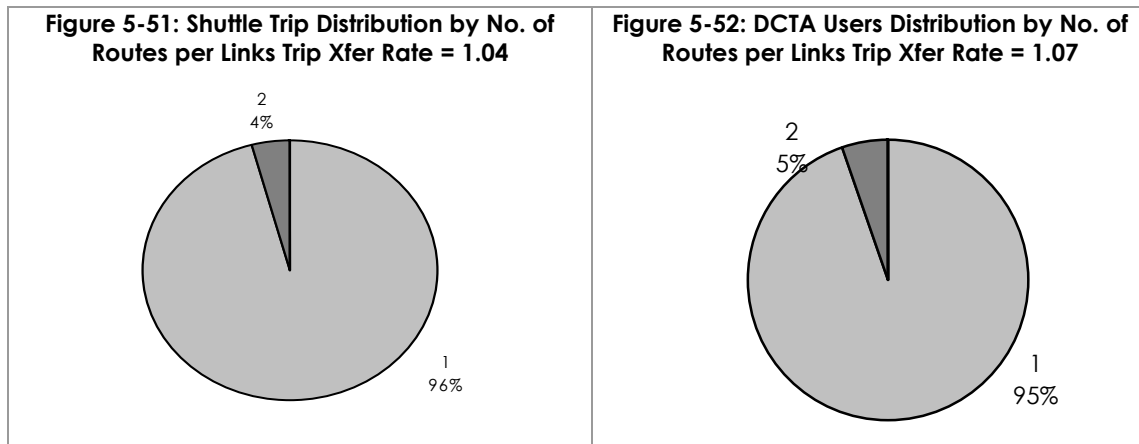


Table 5-39: DCTA Shuttle Bus Trip Transfer Rate

Transfer Rate	Sample	Expanded
Shuttle Xfer Rate ³⁴	1	1.04
WkDy Xfer Rate ³⁵	1	1.07

Tables 5-40 show the distribution of transit vehicles taken by UNT Shuttle bus passengers. Over 92% of UNT shuttle bus riders made zero transfer to complete their one-way trip.

Table 5-40: Number of Vehicles (Weekday, Local Bus Trip)

Num Vehicles	Sample	Weighted_Sum	% Weight	LinkedTrips	%LT
1	196	10,317.77	92.09%	10,317.77	95.88%
2	16	886.58	7.91%	443.29	4.12%
3	0	0.00	0.00%	0.00	0.00%
4	0	0.00	0.00%	0.00	0.00%
Total	212.00	11,204.35	100.00%	10,761.06	100.00%

Access and Egress Mode to/from the Surveyed Route

Table 5-41 and figure 5-53 show how local bus passengers accessed the surveyed route from their origin or from the previous transit if surveyed route was not the first route. Nearly 90% of riders walked to access the surveyed route from their origin, while around 6% used a vehicle. About 4% transferred from another bus.

³⁴ Transfer Rate (Sample) = $\text{Sum}(i=1 \text{ to } 5(\text{NumVehicles}_i * \text{Num Samples}_i)) / \text{Sum}(\text{Num Samples}_i)$

³⁵ **Transfer Rate (Expansion) = $\text{Sum}(i=1 \text{ to } 5(\text{Expansion}_i)) / \text{Sum}(i=1 \text{ to } 5(\text{Expansion}_i / \text{NumVehicles}_i))$

Table 5-41: UNT Shuttle Bus Trip Mode of Access to the Surveyed Route

Mode of Access	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	10058.78	89.78%
DRIVE (Drop Off, Drive Alone, Carpool)	626.89	5.60%
OTHER	96.45	0.86%
BUS – XFER*	422.23	3.77%
Total	11,204.35	100.00%

* If Surveyed Route is not 1st Route, it is considered a transfer.

Figure 5-53: UNT Shuttle Bus Trip Mode of Access to the Surveyed Route

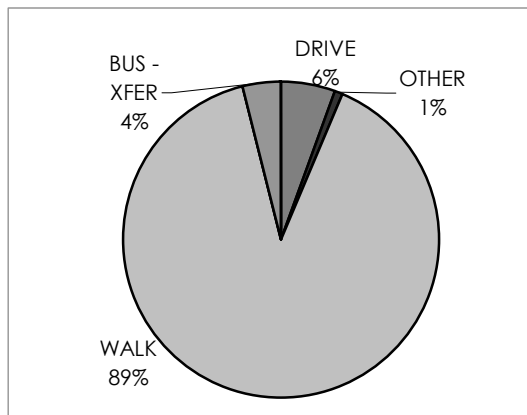


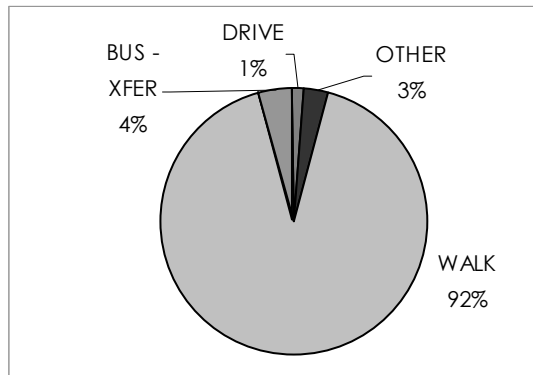
Table 5-42 and Figure 5-54 show the modes of egress from the surveyed route. The vast majority of UNT shuttle riders (91%) walked from the surveyed route to their final destination, which represents high accessibility of UNT shuttle to the places of the interest for shuttle riders.

Table 5-42: UNT Shuttle Bus Trip Mode of Egress from the Surveyed Route

Mode of Egress	NEW_EXPWGT_NOLT	% TOTAL
WALK (Walk, Wheelchair)	10,248.66	91.47%
DRIVE (Pick Up, Drive Alone, Carpool)	143.68	1.28%
OTHER	347.66	3.10%
BUS – XFER**	464.35	4.14%
Total	11,204.35	100.00%

** If surveyed route is not the last route, it is considered a transfer.

Figure 5-54: UNT Shuttle Bus Trip Mode of Egress from the Surveyed Route



Mode of Access/Egress to the Transit System

Table 5-43 and Figure 5-55 combine the mode of access with the mode of egress to see how local bus riders both get to the transit as well as leave from the transit. The main mode of access and egress used by UNT shuttle riders is Walk (87%).

Table 5-43: Mode of Access and Mode of Egress for UNT Shuttle Bus Trip

MOA_MOE	ExpanWGT	Percentage_Weight	SAMPN	Percentage-Samples
WALK (Walk-Walk, Wheelchair-Wheelchair)	9,796.87	87.44%	179	84.43%
DRIVE - (Drive-Drive, Walk-Drive or Drive-Walk)	810.19	7.23%	24	11.32%
Other*	597.29	5.33%	9	4.25%
Total	11,204.35	100.00%	212	100.00%

Figure 5-55: UNT Shuttle Bus Trip Mode of Access/Egress to the Transit System

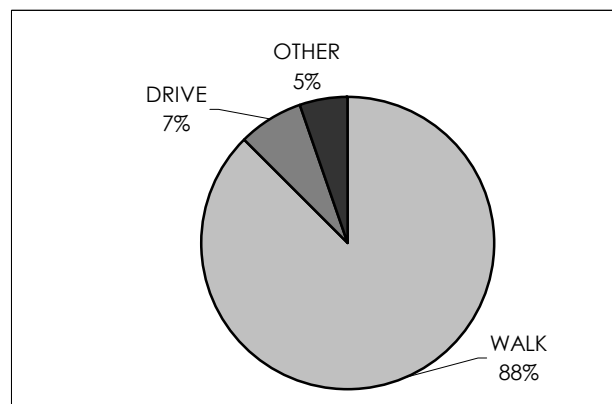


Table 5-44 presents the distribution of trip purposes for UNT shuttle bus riders. They are most likely to be going from home to a non-work location or vice versa (HBNW) with 73% of the total. Twenty percent of UNT shuttle bus riders made a trip for non-home based non-work trip purpose.

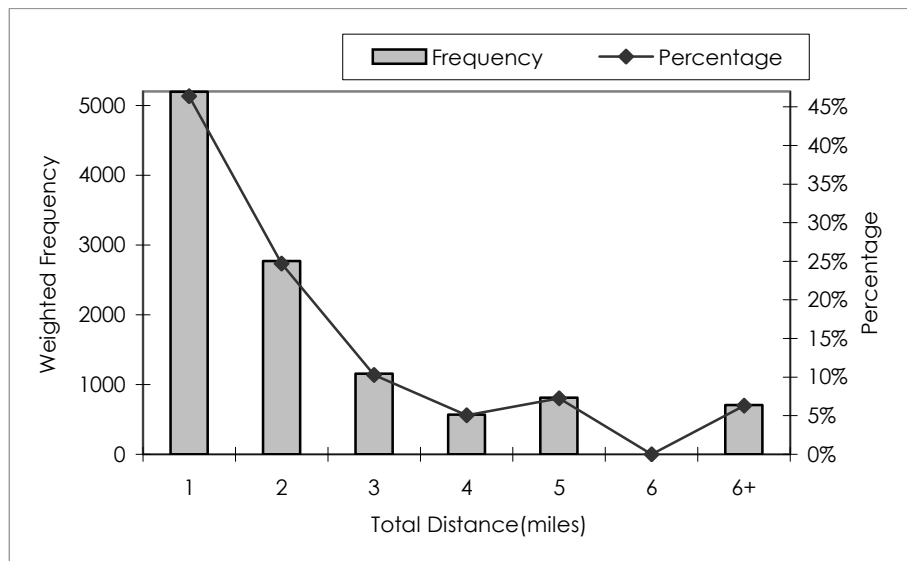
Table 5-44: Trip Purpose

MOA_MOE	ExpanWGT	Percentage -Weight	SAMPN	Percentage -Samples
HBNW (Home to Non-Work, Non-Work to Home)	8,151.36	72.75%	139	65.57%
HBW (Home to Work, Work to Home)	435.22	3.89%	13	6.13%
NHNW (Non-Home/Non-Work, Non-Home/Non-Work)	2,366.33	21.12%	51	24.05%
NHW (Work to Non-Home, Non-Home to Work)	251.44	2.24%	9	4.25%
Total	11,204.35	100.00%	212	100.00%

Total Trip Distance³⁶

Figures 5-56 and 5-57 show the distribution of total distances traveled by UNT shuttle bus riders. Eighty-one percent of total UNT shuttle riders traveled less than 3 miles. The average total travel distance of all UNT shuttle bus riders is 3.40 miles.

Figure 5-56: Shuttle Bus Trip – Total Distance (Avg. 3.40 mile)



³⁶ Total trip distance is a calculated straight-line distance between geocoded origin and destination.

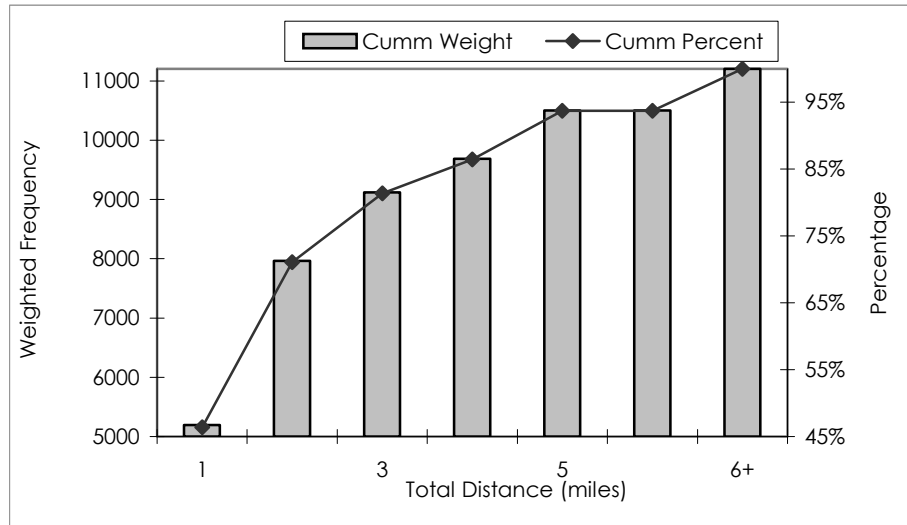
$$\text{Trip Distance} = \sqrt{(\text{Distance}_{LAT})^2 + (\text{Distance}_{LONG})^2}$$

where,

$$\text{Distance}_{LAT} = 69.1 \times (LAT_2 - LAT_1)$$

$$\text{Distance}_{LONG} = 69.1 \times (LONG_2 - LONG_1) \times \cos(LAT_1 / 57.3)$$

Figure 5-57: Shuttle Bus Trip – Cumulative Total Distance




Appendix A: Survey Instruments


Figure A-4: DCTA Survey Instrument (Spanish)

Por favor proporcione comentarios adicionales acerca de los servicios de DCTA.


¡Muchas gracias! Regrese la encuesta completa al encuestador o póngala en cualquier buzón (sin gastos de envío).



AUSTIN TX 78746-9907
208 WILD BARN RD STE A300
C/O MUSTATS
DCTA ON-BOARD SURVEY
POSTAGE WILL BE PAID BY ADDRESSEE
BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 5478
AUSTIN TX



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

Si va en un correo, favor de indicar en el sobre "DCTA"

25019-06-4-21020081

DCTA Encuesta de Usuarios de Transporte Público

Por favor tome un minuto y ayúdenos a planificar sus necesidades de tránsito completando esta encuesta. Regrese la encuesta completa al encuestador.

Por favor llene esta forma inclusiva si ya llenó una en otro recorrido.

Escriba las letras y números claramente en mayúsculas: A B C 1 2 3 Rellene el círculo con: ●

B-2008

1. ¡REGÍSTRESE PARA GANAR UNO DE CINCO PREMIOS EN EFECTIVO DE \$100 AL CONTESTAR TODAS LAS PREGUNTAS!
Por favor proporcione su nombre, número de teléfono y la dirección de su hogar o si está de visita en el área de Fort Worth/Denton la dirección del lugar donde se está quedando.

Nombre _____ (Teléfono) _____ - _____

Nº. de dirección _____ Dirección (NO PONGA P.O. BOX POR FAVOR) _____ Nº. de apto. _____

Cruce de Calle 1 _____ & Cruce de Calle 2 _____

Ciudad _____ Estado _____ CP _____

Todo la información personal se mantendrá en forma confidencial y NO será compartida o vendida.

Las siguientes preguntas son de ESTE VIAJE SENCILLO que está haciendo AHORA!

Ejemplo de un Viaje Sencillo: De Compras a Casa

COMPRAS (COMPLETO) → TRANSBORDO → AUTOBÚS → AUTOBÚS/CAMIÓN → CASA (COMPLETO)

Ejemplo de un Viaje Sencillo: De Casa al Trabajo

CASA (COMPLETO) → COCHE → AUTOBÚS → CAMIÓN → TRABAJO (COMPLETO)

Aviso: Su viaje puede ser diferente a nuestros ejemplos.

2. ¿De qué TIPO DE LUGAR VIENE EN ESTE MOMENTO? (COMIENZO de ESTE VIAJE SENCILLO) (Por favor rellene solamente un círculo)

Trabajo Compras Restaurante

Colegio/Universidad (sólo estudiantes) Visita social/Recreación Otro (especifique): _____

Escuela (K-12) (sólo estudiantes) Cita médica/Visita al hospital

Mi Hogar → Si ya proporcionó su dirección en la Pregunta 1 → **Vaya a la pregunta 3**

a. ¿Cuál es el NOMBRE del LUGAR, NEGOCIO o EDIFICIO del que VIENE? Ejemplo: GOLDIEN TRITANIGLE MALL

Nombre del lugar _____

b. ¿Cuál es la DIRECCIÓN? (Proporcione el CRUCE DE CALLES MÁS CERCAÑO si no conoce la DIRECCIÓN EXACTA.) Ejemplo: 121011511H 13151E

Dirección _____

Cruce de Calle 1 _____ & Cruce de Calle 2 _____

Ciudad _____ Estado _____ CP _____

Continúe adentro →

3. ¿Cómo LLEGÓ DE ESE LUGAR (COMIENZO) al PRIMER AUTOBÚS de ESTE VIAJE SENCILLO? (Por favor rellene solamente un círculo)

POR FAVOR NO DÉ INFORMACIÓN DE TRANSBORDOS

Caminé Bicicleta Otro (especifique): _____

(transbordo a otro autobús no es una respuesta válida)

Silla de ruedas Viaje en coche compartido y estacionamiento: Ubicación del estacionamiento? _____

Nombre del Lote de Estacionamiento/Cruce de Calles _____

Me dejaron Manejé solo/a y me estacioné: Ubicación del estacionamiento? _____

Nombre del Lote de Estacionamiento/Cruce de Calles _____

4. ¿A qué TIPO DE LUGAR SE DIRIGE EN ESTE MOMENTO? (DESTINO de ESTE VIAJE SENCILLO) (Por favor rellene solamente un círculo)

Trabajo Compras Restaurante

Colegio/Universidad (sólo estudiantes) Visita social/Recreación Otro (especifique): _____

Escuela (K-12) (sólo estudiantes) Cita médica/Visita al hospital

Mi Hogar → Si ya proporcionó su dirección en la Pregunta 1 → **Vaya a la pregunta 5**

a. ¿Cuál es el NOMBRE del LUGAR, NEGOCIO o EDIFICIO al que se DIRIGE? Ejemplo: M.A.Y.H.L.L.L.H.O.S.P.I.T.A.L

Nombre del lugar _____

b. ¿Cuál es la DIRECCIÓN? (Proporcione el CRUCE DE CALLES MÁS CERCAÑO si no conoce la DIRECCIÓN EXACTA.) Ejemplo: 2109-SI.M.A.Y.H.L.L.L.R.D

Dirección _____

Cruce de Calle 1 _____ & Cruce de Calle 2 _____

Ciudad _____ Estado _____ CP _____

5. ¿Cómo va a LLEGAR del ÚLTIMO AUTOBÚS a su DESTINO FINAL de ESTE VIAJE SENCILLO? (Por favor rellene solamente un círculo)

POR FAVOR NO DÉ INFORMACIÓN DE TRANSBORDOS

Caminando Bicicleta Otro (especifique): _____

(transbordo a otro autobús no es una respuesta válida)

Silla de ruedas Viaje en coche compartido y estacionamiento: Ubicación del estacionamiento? _____

Nombre del Lote de Estacionamiento/Cruce de Calles _____

Me van a recoger Manejaré solo/a y me estacionaré: Ubicación del estacionamiento? _____

Nombre del Lote de Estacionamiento/Cruce de Calles _____

6a. Incluyendo este autobús, ¿en TOTAL cuántos AUTOBUSES Y TRENES va a usar para hacer ESTE VIAJE SENCILLO?

Uno, solamente este autobús → **Vaya a la pregunta 7** Dos Tres Cuatro

6b. Registre todos las LÍNEAS de AUTOBÚS o LÍNEAS de FERROCARRIL en el orden exacto que las va usar en ESTE VIAJE SENCILLO.

PRIMERA - línea de autobús/ferrocarril que yo tomé: → **SEGUNDA** - línea de autobús/ferrocarril que yo tomé o tomaré: → **TERCERA** - línea de autobús/ferrocarril que yo tomé o tomaré: → **CUARTA** - línea de autobús/ferrocarril que yo tomé o tomaré: →

7. ¿Dónde se va a bajar de ESTE AUTOBÚS? (Nombre del lugar y el cruce de calles más cercano)

Nombre del lugar (Incluyendo Transit Center o Lake Park & Ride) _____

Cruce de Calle 1 _____ & Cruce de Calle 2 _____

8. ¿Cómo PAGÓ por ESTE VIAJE SENCILLO? (Por favor rellene solamente un círculo)

Viaje sin regreso Connect Viaje sin regreso Express Pase Express Anual

Pase Connect de Diez Viajes Pase Express de Veinte Viajes

Pase Connect Mensual Pase Express Mensual

9. ¿Por cuál tipo de TARIFA REDUCIDA califica?

Ninguna Persona de la tercera edad

Estudiante Discapacitado

10. ¿CUÁNTOS MINUTOS esperó al autobús en el que viaja en este momento?

Menos de 5 minutos 11 - 15 minutos 21 - 25 minutos Más de 30 minutos

6 - 10 minutos 16 - 20 minutos 26 - 30 minutos

11. ¿Cuántos AUTOMÓVILES, CAMIONETAS o MOTOCICLETAS registrados hay disponibles en su hogar?

Ninguno 1 2 3 4 o más

12. Incluyéndose usted, ¿cuántas PERSONAS viven en su hogar?

1 2 3 4 5 6 o más

13. ¿Tiene una LICENCIA DE CONDUCTOR válida?

Sí No

14. ¿Es usted... (Rellene el círculo o círculos que mejor lo describa)

Empleado (tiempo completo o medio tiempo) Persona que se queda en casa Estudiante - Colegio/Universidad

Desempleado Jubilado Estudiante - Otro

15. ¿Cuál es su EDAD?

15 - 24 25 - 34 35 - 44 45 - 54 55 - 64 65 o más

16. ¿Cuál es su ORIGEN ÉTNICO? (Rellene el círculo que mejor lo describa)

Asiático Hispánico Blanco

Negro/Afroamericano Nativo Americano Otro (especifique): _____

17. ¿Aproximadamente cuál fue el INGRESO TOTAL de su HOGAR en 2007 antes de impuestos?

Menos de \$10,000 \$15,000 - \$24,999 \$25,000 - \$49,999 \$75,000 o más

\$10,000 - \$14,999 \$25,000 - \$34,999 \$50,000 - \$74,999

25019-06-4-21020082

Por favor continúe al Otro lado →

NuStats a ptv group company

APPENDICES

Appendix B: 2007 General Population Statistics

2007 American Community Survey – Tarrant County, TX

Table B-1: Household Size (Total Households)

Household Size	2007 ACS	
	Count	Percent
One	151,172	25%
Two	189,582	31%
Three	98,259	16%
Four	95,945	16%
Five or more	68,707	11%
Total	603,665	100%

Table B-2: Household Income (Total Households)

Household Income	2007 ACS	
	Count	Percent
Less than \$10,000	36,842	6%
\$10,000-\$19,999	56,390	9%
\$20,000-\$34,999	100,698	17%
\$35,000-\$49,999	94,660	16%
\$50,000-\$69,999	91,712	15%
\$70,000 or more	223,363	37%
Total	603,665	100%

Table B-3: Vehicle Ownership (Total Households)

Vehicle Ownership	2007 ACS	
	Count	Percent
None	28,542	5%
One	207,682	34%
Two	255,293	42%
Three or more	112,148	19%
Total	603,655	100%

Table B-4: Employment Status (Population Age 16 years or Older)

Employment Status	2007 ACS	
	Count	Percent
Employed	1,024,215	80%
Unemployed	9,981	1%
Not in the Labor Force	238,112	19%
Total	1,272,308	100%

Table B-5: Age (Total Population)

Age	2007 ACS	
	Count	Percent
17 yrs and under	478,354	28%
18–24 yrs	157,482	9%
25–54 yrs	762,638	45%
55–64 yrs	159,270	9%
65+ yrs	142,581	8%
Total	1,700,325	100%

Table B-6: Race (Total Population)

Race	2007 ACS	
	Count	Percent
White	1,178,720	69%
African American	232,110	14%
Asian	77,271	5%
Native American	7,399	<1%
Other	204,825	12%
Total	1,700,325	100%

Table B-7: Means of Transportation to work (Total Population)

Means of Transportation	2007 ACS	
	Count	Percent
Car, truck, or van	757,218	93%
Bus, subway, rail, or streetcar	4,674	1%
Bicycle	706	<1%
Walk	8,276	1%
Work at home	33,820	4%
Other	11,082	1%
Total	815,776	100%

2007 American Community Survey – Denton County, TX

Table B-8: Household Size (Total Households)

Household Size	2007 ACS	
	Count	Percent
One	44,051	22%
Two	64,137	32%
Three	36,827	18%
Four	35,998	18%
Five or more	20,188	10%
Total	201,201	100%

Table B-9: Household Income (Total Households)

Household Income	2007 ACS	
	Count	Percent
Less than \$10,000	7,586	4%
\$10,000-\$19,999	10,140	5%
\$20,000-\$34,999	26,014	13%
\$35,000-\$49,999	25,539	13%
\$50,000-\$69,999	27,943	14%
\$70,000 or more	103,979	52%
Total	201,201	100%

Table B-10: Vehicle Ownership (Total Households)

Vehicle Ownership	2007 ACS	
	Count	Percent
None	5,036	3%
One	57,099	28%
Two	96,302	48%
Three or more	42,764	21%
Total	201,201	100%

Table B-11: Employment Status (Population Age 16 years or Older)

Employment Status	2007 ACS	
	Count	Percent
Employed	402,729	86%
Unemployed	2,772	1%
Not in the Labor Force	59,991	13%
Total	465,492	100%

Table B-12: Age (Total Population)

Age	2007 ACS	
	Count	Percent
17 yrs and under	163,970	27%
18–24 yrs	65,512	11%
25–54 yrs	292,483	48%
55–64 yrs	55,684	9%
65+ yrs	34,405	6%
Total	612,054	100%

Table B-13: Race (Total Population)

Race	2007 ACS	
	Count	Percent
White	493,706	81%
African American	43,821	7%
Asian	35,534	6%
Native American	1,452	<1%
Other	37,541	6%
Total	612,054	100%

Table B-14: Means of Transportation to Work (Total Population)

Means of Transportation	2007 ACS	
	Count	Percent
Car, truck, or van	290,966	91%
Bus, subway, rail, or streetcar	3,336	1%
Bicycle	769	<1%
Walk	3,691	1%
Work at home	17,649	6%
Other	2,528	1%
Total	318,939	100%

Appendix C: Service Types

This section presents the weighted distribution of the trips by routes that fall in each service type.

Table C-1: FWTa average weekday ridership by Route in each mode type

Service type	Route	Average weekday ridership
LOCAL	FWT-..1	3140
	FWT-..2	5834
	FWT-..3	992
	FWT-..4	1278
	FWT-..6	1263
	FWT-..7	425
	FWT-..9	294
	FWT-.10	213
	FWT-.11	224
	FWT-.12	51
	FWT-.13	82
	FWT-.14	616
	FWT-.16	79
	FWT-.17	115
	FWT-.21	872
	FWT-.22	592
	FWT-.23	71
	FWT-.24	479
	FWT-.25	2337
	FWT-.26	619
	FWT-.27	257
	FWT-.29	394
	FWT-.30	352
	FWT-.32	200
	FWT-.40	62
	FWT-.41	166
	FWT-.46	376
	FWT-.5A	657
	FWT-.5B	302
	FWT-.72	176
FWT-110	61	
FWT-993	27	

Service type	Route	Average weekday ridership
	FWT-994	5
	FWT-995	15
	FWT-996	41
EXPRESS	FWT-.60	133
	FWT-.61	130
	FWT-.62	35
	FWT-.65	165
	FWT-.66	73
	FWT-.67	37
	FWT-.68	73
	FWT-.69	66
Total		23382

Table C-2: DCTA average weekday ridership by Route in each mode type

Mode type	Route	Average weekday ridership
LOCAL	DCT-..1	64
	DCT-..2	164
	DCT-..3	124
	DCT-..4	51
	DCT-..5	160
	DCT-..6	106
	DCT-..7	145
	DCT-..8	104
	DCT-.20	78
	DCT-.21	74
	DCT-.22	11
SHUTTLE	DCT-.51	1512
	DCT-.52	2294
	DCT-.53	1487
	DCT-.54	861
	DCT-.55	946
	DCT-.56	2030
	DCT-.57	1338
EXPRESS	DCT-101	294
	DCT-102	216
Total		12796

Appendix D: Pilot Questionnaires

Figure D-1: DCTA/FWTA Pilot Questionnaire – Version A (English)

Please provide any comments you have regarding The T.

Thank you! Return the completed survey to the surveyor, OR drop it in any mailbox (no postage required).

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 5875
AUSTIN TX 78768-9907

206 WILD BASIN RD STE A300
AUSTIN TX 78768-9907

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

25019-06-4-21020081

© Printing by mail, please don't tape

On-Board Survey



Please take a minute to help us plan for YOUR public transit needs by filling out this survey. Return the completed survey to the surveyor.

Please fill out this form even if you completed one on another one-way trip.

All personal information is confidential and WILL NOT be shared or sold.

Print letters/numbers clearly in upper case: A B C 1 2 3 Fill in bubble with: ●

1. REGISTER TO WIN ONE OF FIVE \$100 CASH PRIZES WHEN YOU ANSWER ALL QUESTIONS!
Please provide your name, telephone number, and home address or if you are just visiting, where you are staying in the Fort Worth/Denton area.

Name _____ Telephone _____

Street Number _____ Street Address (NO P.O. BOXES PLEASE) _____ Apt. # _____

City _____ State _____ Zip _____

The following questions are about THIS ONE-WAY TRIP you are making NOW!



2. What TYPE OF PLACE are you COMING FROM NOW? (START OF THIS ONE-WAY TRIP) (Please fill in one bubble only)

- Work
- Shopping
- Restaurant
- College/University (student only)
- Social/Recreational
- Other (specify): _____
- School (K-12) (student only)
- Medical appointment/Hospital visit
- My Home → If you gave your Home address in Question 1 → Go to Question 3

a. What is the NAME of the PLACE, BUSINESS OR BUILDING you are COMING FROM NOW? Example: F O R T W O R T H M I L I T A R Y

Place Name _____

b. What is the ADDRESS? (Provide the NEAREST INTERSECTION if you don't know the EXACT ADDRESS.) Example: 1 1 2 8 1 9 _ C O U N T Y _ I N _ T E X A S

Address _____

Cross Street #1 _____ & Cross Street #2 _____

City _____ State _____ Zip _____

Continue Inside →

3. How did you GET FROM THAT PLACE (START) to the VERY FIRST BUS on THIS ONE-WAY TRIP? (Please fill in one bubble only)
NO TRANSFER INFORMATION PLEASE

- Walked
- Bicycled
- Other (specify): _____
(transferring from another bus is not a valid response)
- Wheelchair
- Carpool and park: → Parking location? _____
Place Name/Address/Intersection _____
- Dropped off
- Drove alone and park: → Parking location? _____
Place Name/Address/Intersection _____

4. What TYPE OF PLACE are you GOING TO NOW? (END OF THIS ONE-WAY TRIP) (Please fill in one bubble only)

- Work
- Shopping
- Restaurant
- College/University (student only)
- Social/Recreational
- Other (specify): _____
- School (K-12) (student only)
- Medical appointment/Hospital visit
- My Home → If you gave your Home address in Question 1 → Go to Question 5

a. What is the NAME of the PLACE, BUSINESS OR BUILDING you are GOING TO NOW?

Place Name _____

b. What is the ADDRESS? (Provide the NEAREST INTERSECTION if you don't know the EXACT ADDRESS.)

Address _____

Cross Street #1 _____ & Cross Street #2 _____

City _____ State _____ Zip _____

5. How will you GET FROM the VERY LAST BUS to the END of THIS ONE-WAY TRIP? (Please fill in one bubble only)
NO TRANSFER INFORMATION PLEASE

- Walk
- Bicycle
- Other (specify): _____
(transferring to another bus is not a valid response)
- Wheelchair
- Carpool and park: → Parking location? _____
Place Name/Address/Intersection _____
- Get picked up
- Drive alone and park: → Parking location? _____
Place Name/Address/Intersection _____

6a. Including this bus, how many TOTAL BUSES AND TRAINS will you use to travel between your start and end locations?

One, only this bus → Go to Question 8 Two Three Four

6b. List all the BUS ROUTES or RAIL LINES you are using to travel between your start and end locations, in the exact order you use them.

FIRST - bus route/rail line I took: → **SECOND** - bus route/rail line I took or will take: → **THIRD** - bus route/rail line I took or will take: → **FOURTH** - bus route/rail line I took or will take:

7. Where will you get off THIS BUS? (Name of the place and nearest cross streets)

Place Name (including Transit Center or Park & Ride Lot) _____

Cross Street #1 _____ & Cross Street #2 _____

8. How did you PAY for THIS ONE-WAY TRIP today? (Please fill in one bubble only)

- Local One-way Ticket
- Premium One-way Ticket
- TCU Student Pass
- Local Day Pass
- Premium Day Pass
- MITS + 1 Card
- Local Weekly Pass
- Premium Monthly Pass
- None - I rode within the Downtown Free Zone only
- Local Monthly Pass
- Premium E-Pass
- Local E-Pass
- 9th Grade Pass

9. What type of REDUCED FARE did you qualify for?

- None
- Child 5-14 years with ID
- Disabled with ID or Medicare Card
- Over 65 with ID
- High school with student ID

10. HOW MANY MINUTES did you wait to get on THIS BUS?

- Less than 5 minutes
- 11 - 15 minutes
- 21 - 25 minutes
- 6 - 10 minutes
- 16 - 20 minutes
- 26 - 30 minutes
- More than 30 minutes

11. How many registered CARS, TRUCKS, or MOTORCYCLES are available to your household?

- None
- 1
- 2
- 3
- 4 or more

12. Including yourself, how many PEOPLE live in your household?

- 1
- 2
- 3
- 4
- 5
- 6 or more

13. Do you have a VALID DRIVER'S LICENSE?

- Yes
- No

14. Are you... (fill in the bubble that best describes you)

- Employed (full-time or part-time)
- Unemployed
- Homemaker
- Retired
- Student

15. What is your AGE?

- 15 - 24
- 25 - 34
- 35 - 49
- 50 - 64
- 65 + years of age

16. Are you...

- Female
- Male

17. What is your ETHNICITY? (fill in the bubble that best describes you)

- Asian
- Hispanic
- White
- Black/African American
- Native American
- Other (specify): _____

18. What was your estimated combined HOUSEHOLD INCOME in 2007 before taxes?

- Less than \$10,000
- \$15,000 - \$24,999
- \$35,000 - \$49,999
- \$75,000 or more
- \$10,000 - \$14,999
- \$25,000 - \$34,999
- \$50,000 - \$74,999

25019-06-4-21020082

Please continue on the back →

Figure D-2: DCTA/FWTA Pilot Questionnaire – Version A (Spanish)

Por favor proporcione comentarios adicionales acerca de los servicios de The T.

Encuesta de Usuarios de Transporte Público

Por favor tome un minuto y ayúdenos a planificar sus necesidades de tránsito completando esta encuesta. Regrese la encuesta a completa al encuestador.

Por favor llene esta forma inclusive si ya llenó una en otro recorrido.

2008

Toda la información personal se mantendrá en forma confidencial y NO será compartida o vendida.

Escriba las letras y números claramente en mayúsculas: A B C 1 2 3 Rellene el círculo con: ●

1. REGÍSTRESE PARA GANAR UNO DE CINCO PREMIOS EN EFECTIVO DE \$100 AL CONTESTAR TODAS LAS PREGUNTAS!
 Por favor proporcione su nombre, número de teléfono y la dirección de su hogar o si está de visita en el área de Fort Worth/Denton la dirección del lugar donde se está quedando.

Nombre _____ (Teléfono) _____
 Rta. de dirección _____ Calle PO BOX PO. BOX POR FAVOR: _____ Rta. de eqn. _____
 Ciudad _____ Estado _____ CP _____

Las siguientes preguntas son de **ESTE VIAJE SENCILLO** que está haciendo **AHORORA!**

Ejemplo de un Viaje Sencillo: De Compras a Casa:
 COMPRAS (COMERCIOS) → CAMIÓN → AUTOBUS → TRANSBORDO → AUTOBUS → CAMIÓN → CASA (DESTINO)

Ejemplo de un Viaje Sencillo: De Casa al Trabajo:
 CASA (COMERCIOS) → COCHE → AUTOBUS → CAMIÓN → TRABAJO (DESTINO)

2. ¿De qué TIPO DE LUGAR VIENE EN ESTE MOMENTO? (COMIENZO DE ESTE VIAJE SENCILLO) (Per favor rellene solamente un círculo)

Trabajo Compras Restaurante
 Colegio/Universidad (sólo estudiantes) Visita social/Recreación Otro (especifique): _____
 Escuela (K-12) (sólo estudiantes) Cita médica/Visita al hospital
 Mi Hogar → Si ya proporcionó su dirección en la Pregunta 1 → Vaya a la pregunta 3

a. ¿Cuál es el NOMBRE del LUGAR, NEGOCIO O EDIFICIO del que VIENE? Ejemplo: FORT WORTH TRANSIT CENTER

Nombre del lugar _____

b. ¿Cuál es la DIRECCIÓN? (Proporcione el cruce más cercano si no conoce la DIRECCIÓN EXACTA.) Ejemplo: 112 8191 COLONIA LL PLAZA WALKWAY

Dirección _____
 Cruce de Calle 1 _____ & Cruce de Calle 2 _____
 Ciudad _____ Estado _____ CP _____

NO POSTAGE
 NECESSARY
 IF MAILED
 IN THE
 UNITED STATES

POSTAGE WILL BE PAID BY ADDRESSEE

BUSINESS REPLY MAIL

POST OFFICE BOX 5187
 AUSTIN TX 78769-0518

206 WILD BASIN RD STE A300
 AUSTIN TX 78748-9907

NO POSTAGE
 NECESSARY
 IF MAILED
 IN THE
 UNITED STATES

25019-06-4-2102008

Continúe adentro →

3. ¿Cómo LLEGÓ DE ESE LUGAR (COMIENZO) al PRIMER AUTOBUS de ESTE VIAJE SENCILLO? (Per favor rellene solamente un círculo)
POR FAVOR NO DÉ INFORMACIÓN DE TRANSBORDOS

Caminé Bicielo Otro (especifique): _____
 (transbordo a otro autobús no es una respuesta válida)

Silla de ruedas Viaje en coche compartido y estacionamiento: → ¿Ubicación del estacionamiento? _____
 Nombre del lugar/Dirección/Cruce de Calles _____

Me dejaron Maneje solo/a y me estacioné: → ¿Ubicación del estacionamiento? _____
 Nombre del lugar/Dirección/Cruce de Calles _____

4. ¿De qué TIPO DE LUGAR VIENE EN ESTE MOMENTO? (Comienzo de ESTE VIAJE SENCILLO) (Per favor rellene solamente un círculo)

Trabajo Compras Restaurante
 Colegio/Universidad (sólo estudiantes) Visita social/Recreación Otro (especifique): _____
 Escuela (K-12) (sólo estudiantes) Cita médica/Visita al hospital
 Mi Hogar → Si ya proporcionó su dirección en la Pregunta 1 → Vaya a la pregunta 5

a. ¿Cuál es el NOMBRE del LUGAR, NEGOCIO O EDIFICIO al que se DIRIGE?

Nombre del lugar _____

b. ¿Cuál es la DIRECCIÓN? (Proporcione el cruce más cercano si no conoce la DIRECCIÓN EXACTA.)

Dirección _____
 Cruce de Calle 1 _____ & Cruce de Calle 2 _____
 Ciudad _____ Estado _____ CP _____

5. ¿Cómo va a LLEGAR del ÚLTIMO AUTOBUS a su DESTINO FINAL de ESTE VIAJE SENCILLO? (Per favor rellene solamente un círculo)
POR FAVOR NO DÉ INFORMACIÓN DE TRANSBORDOS

Caminando Bicielo Otro (especifique): _____
 (transbordo a otro autobús no es una respuesta válida)

Silla de ruedas Viaje en coche compartido y estacionamiento: → ¿Ubicación del estacionamiento? _____
 Nombre del lugar/Dirección/Cruce de Calles _____

Me van a recoger Manejaré solo/a y me estacionaré: → ¿Ubicación del estacionamiento? _____
 Nombre del lugar/Dirección/Cruce de Calles _____

6a. Incluyendo este autobús, ¿en TOTAL cuántos AUTOBUSES Y TRENES va a usar para viajar entre su lugar inicial y su destino final?
 Uno, solamente este autobús → Vaya a la pregunta 8 Dos Tres Cuatro

6b. Registre todas las LÍNEAS de AUTOBUS o LÍNEAS de FERROCARRIL que está usando para viajar entre su lugar inicial y su destino final en el orden exacto que las usa.

PRIMERA - línea de autobús/ferrocarril que yo tomé: → **SEGUNDA** - línea de autobús/ferrocarril que yo tomé o tomaré: → **TERCERA** - línea de autobús/ferrocarril que yo tomé o tomaré: → **CUARTA** - línea de autobús/ferrocarril que yo tomé o tomaré: →

7. ¿Dónde se va a bajar de ESTE AUTOBUS? (Nombre del lugar y el cruce de calles más cercanos)

Nombre del lugar (Incluyendo Transit Center o Lake Park & Ride) _____
 Cruce de Calle 1 _____ & Cruce de Calle 2 _____

8. ¿Cómo PAGÓ por ESTE VIAJE SENCILLO hoy? (Per favor rellene solamente un círculo)

Boleto local sin regreso Boleto de prima sin regreso Pase de estudiante de TCU
 Pase local de un día Pase de prima de un día Tarjeta MITS +1
 Pase local de una semana Pase de prima de un mes Ninguno - solamente viajé dentro de la zona gratis en el centro
 Pase local de un mes E-Pass de prima
 E-Pass local Pase de 9º grado

9. ¿Por cuál tipo de TARIFA REDUCIDA calificó?

Ninguna Niño/a de 5-14 años con identificación Discapacitado con identificación o tarjeta de Medicare
 Más de 65 con identificación Estudiante de secundaria con identificación

10. ¿CUÁNTOS MINUTOS esperó para abordar ESTE AUTOBUS?

Menos de 5 minutos 11 - 15 minutos 21 - 25 minutos Más de 30 minutos
 6 - 10 minutos 16 - 20 minutos 26 - 30 minutos

11. ¿Cuántos AUTOMÓVILES, CAMIONETAS O MOTOCICLETAS registrados hay disponibles en su hogar?

Ninguna 1 2 3 4 o más

12. Incluyéndose usted, ¿cuántas PERSONAS viven en su hogar?

1 2 3 4 5 6 o más

13. ¿Tiene una LICENCIA DE CONDUCTOR válida?

Sí No

14. Es usted... (rellene el círculo que mejor le describa)

Empleado (tiempo completo medio tiempo) Desempleado Persona que se queda en casa Jubilado Estudiante

15. ¿Cuál es su EDAD?

15 - 24 25 - 34 35 - 49 50 - 64 65 o más

16. Es usted...

Mujer Hombre

17. ¿Cuál es su ORIGEN ÉTNICO? (rellene el círculo que mejor le describa)

Asiático Hispano Blanco
 Negro/Afroamericano Nativo Americano Otro (especifique): _____

18. Aproximadamente cuál fue el INGRESO TOTAL de su HOGAR en 2007 antes de impuestos?

Menos de \$10,000 \$15,000 - \$24,999 \$35,000 - \$49,999 \$75,000 o más
 \$10,000 - \$14,999 \$25,000 - \$34,999 \$50,000 - \$74,999

25019-06-4-2102008

Por Favor Continúe al Otro lado →

Figure D-3: DCTA/FWTA Pilot Questionnaire – Version B (English)

COMMENTS

Please provide any comments you have regarding The T.

Thank you!

Return the completed survey to the surveyor,
OR drop it in any mailbox
(no postage required).

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 5478 AUSTIN TX

POSTAGE WILL BE PAID BY ADDRESSEE

NUSTATS
206 WILD BASIN RD STE A300
AUSTIN TX 78746-9907

If returning by mail, please show this mark.

On-Board Survey

Please help us plan for YOUR public transit needs by filling out this survey. Return the completed survey to the surveyor. Fill out this form even if you completed one on another one-way trip.

All personal information is confidential and WILL NOT be shared or sold.

Print letters/numbers clearly in upper case: A B C | 1 | 2 | 3
Fill in bubble with: ●

★ REGISTER TO WIN ONE OF FIVE \$100 CASH PRIZES!

When you answer all questions

Please provide your name, telephone number, and home address or if you are just visiting, where you are staying in the Fort Worth/Denton area.

Name _____

Street Address (NO P.O. BOXES PLEASE) _____

Apt. # _____
City _____ State _____

Zip _____
Telephone _____

★ How did you PAY for THIS ONE-WAY TRIP today? (fill in one bubble only)

<input type="radio"/> Local One-way Ticket	<input type="radio"/> Premium One-way Ticket	<input type="radio"/> TCU Student Pass
<input type="radio"/> Local Day Pass	<input type="radio"/> Premium Day Pass	<input type="radio"/> MITS + 1 Card
<input type="radio"/> Local Weekly Pass	<input type="radio"/> Premium Monthly Pass	<input type="radio"/> None - I rode w/in
<input type="radio"/> Local Monthly Pass	<input type="radio"/> Premium E-Pass	<input type="radio"/> the Downtown Free Zone only
<input type="radio"/> Local E-Pass	<input type="radio"/> 9th Grade Pass	

★ What type of REDUCED FARE did you qualify for?

<input type="radio"/> None	<input type="radio"/> Child 5-14 years with ID	<input type="radio"/> Disabled with ID or Medicare Card
<input type="radio"/> Over 65 with ID	<input type="radio"/> High school with student ID	

continue

Tell us about THIS ONE-WAY TRIP you are making NOW!
(like home to work, home to shopping, or work to lunch, etc.)

Remember: Your trip may be different from our example.

Example One-way Trip: Home to Work

START THIS ONE-WAY TRIP

★ TYPE OF PLACE: (Fill in one bubble only)

<input type="radio"/> Work	<input type="radio"/> Medical appointment/Hospital visit
<input type="radio"/> College/University (student only)	<input type="radio"/> Restaurant
<input type="radio"/> School (K-12) (student only)	<input type="radio"/> Other (specify): _____
<input type="radio"/> Shopping	
<input type="radio"/> Social/Recreational	
<input type="radio"/> My Home → If you already gave Home address → Go to #5 below	

★ PLACE NAME & ADDRESS OR CROSS STREETS

Place Name (Example: Fort Worth, Canyon Ridge Apts., etc.) _____

Address (Example: 1989 Colonial Parkway) _____

Cross Street #1 _____ & Cross Street #2 _____

City _____ State _____ Zip _____

GET TO TRANSIT

★ How did you get from your start location to the FIRST BUS/TRAIN on THIS ONE-WAY TRIP?

Wheelchair Bicyded

Walked Dropped off

Carpooled & parked: → Parking location? _____
Place Name & Address/Cross streets

Drove alone & parked: → Parking location? _____
Place Name & Address/Cross streets

Other (specify): _____

RIDE TRANSIT BETWEEN MY START & END LOCATIONS

★ Including this bus, how many TOTAL BUSES AND TRAINS will you use to travel between your start and end locations?

One, only this bus/train Two Three Four

★ List all the BUS ROUTES or RAIL LINES you are using to travel between your start and end locations, in the exact order you use them.

1st bus route/rail line I took: _____

2nd bus route/rail line I took or will take: _____

3rd bus route/rail line I took or will take: _____

4th bus route/rail line I took or will take: _____

END THIS ONE-WAY TRIP

★ TYPE OF PLACE: (Fill in one bubble only)

<input type="radio"/> Work	<input type="radio"/> Medical appointment/Hospital visit
<input type="radio"/> College/University (student only)	<input type="radio"/> Restaurant
<input type="radio"/> School (K-12) (student only)	<input type="radio"/> Other (specify): _____
<input type="radio"/> Shopping	
<input type="radio"/> Social/Recreational	
<input type="radio"/> My Home → If you already gave Home address → Go to #8 below	

★ PLACE NAME & ADDRESS OR CROSS STREETS

Place Name (Example: Fort Worth, Canyon Ridge Apts., etc.) _____

Address (Example: 1989 Colonial Parkway) _____

Cross Street #1 _____ & Cross Street #2 _____

City _____ State _____ Zip _____

GET FROM TRANSIT

★ How will you get from the LAST BUS/TRAIN on THIS ONE-WAY TRIP to your end location?

Wheelchair Bicycle

Walk Picked up

Carpool & park: → Parking location? _____
Place Name & Address/Cross streets

Drive alone & park: → Parking location? _____
Place Name & Address/Cross streets

Other (specify): _____

★ HOW MANY MINUTES did you wait at the bus stop for THIS BUS?

<input type="radio"/> 0-5 minutes	<input type="radio"/> 16-20 minutes	<input type="radio"/> More than 30 minutes
<input type="radio"/> 6-10 minutes	<input type="radio"/> 21-25 minutes	
<input type="radio"/> 11-15 minutes	<input type="radio"/> 26-30 minutes	

★ Where will you get off THIS BUS? (Name of the place and nearest cross streets)

Place Name (including Transit Center or Park & Ride Lot) _____

Cross Street #1 _____ & Cross Street #2 _____

★ How many registered CARS, TRUCKS, or MOTORCYCLES are available to your household?

None 1 2 3 4 or more

★ Including yourself, how many PEOPLE live in your household?

1 2 3 4 5 6 or more

★ Do you have a VALID DRIVER'S LICENSE?

Yes No

★ Are you ... (Fill the bubble the best describes you)

<input type="radio"/> Employed (full-time or part-time)	<input type="radio"/> Retired
<input type="radio"/> Unemployed	<input type="radio"/> Homemaker <input type="radio"/> Student

★ What is your AGE?

15-24 25-34 35-49 50-64 65+ years

★ What is your ETHNICITY? (Fill the bubble the best describes you)

<input type="radio"/> Asian	<input type="radio"/> Native American	<input type="radio"/> Other (specify): _____
<input type="radio"/> Black/Af. American	<input type="radio"/> White	
<input type="radio"/> Hispanic		

★ What was your estimated TOTAL HOUSEHOLD INCOME in 2007 before taxes?

<input type="radio"/> Less than \$10,000	<input type="radio"/> \$25,000 - \$34,999	<input type="radio"/> \$75,000 or more
<input type="radio"/> \$10,000 - \$14,999	<input type="radio"/> \$35,000 - \$49,999	
<input type="radio"/> \$15,000 - \$24,999	<input type="radio"/> \$50,000 - \$74,999	

Please continue on the back →

NuStats a ptv group company

APPENDICES

Figure D-4: DCTA/FWTA Pilot Questionnaire – Version B (Spanish)

COMENTARIOS

Por favor proporcione comentarios adicionales acerca de los servicios de The T.

¡Muchas gracias!

Regrese la encuesta completa al encuestador
o póngala en cualquier buzón
(sin gastos de envío).

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 5478 AUSTIN TX
POSTAGE WILL BE PAID BY ADDRESSEE

NUSTATS
206 WILD BASIN RD STE A300
AUSTIN TX 78746-9907

Encuesta de Transporte Público

Por favor ayúdenos a planificar **SUS** necesidades de tránsito completando esta encuesta. Regrese la encuesta completa al encuestador. Llene esta forma inclusive si ya llenó una en este u otro viaje sencillo.

Toda la información personal se mantendrá en forma confidencial y NO será compartida o vendida. Escriba las letras y números claramente en mayúsculas: A B C 1 2 3
Rellene el círculo con: ●

1. REGÍSTRESE PARA GANAR UNO DE CINCO PREMIOS EN EFECTIVO DE \$100! *Al contestar todas las preguntas*

Por favor proporcione su nombre, número de teléfono y la dirección de su hogar o si está de visita en el área de Ft. Worth/Denton la dirección del lugar donde se está quedando.

Nombre: _____
Dirección (NO PONGA P.O. BOX POR FAVOR): _____
No. de apto. _____ Ciudad _____ Estado _____
CP _____ Teléfono _____

2. ¿Cómo PAGÓ por ESTE VIAJE SENCILLO hoy? (Por favor rellene solamente un círculo)

Boleto local sin regreso Boleto de prima sin regreso Pasa de estudiante
 Pasa local de un día Pasa de prima de un día de TCU
 Pasa local de una semana Pasa de prima de un mes Tarjeta MITS +1
 Pasa local de un mes E-Pasa de prima Ninguno-solamente viaje dentro de la zona
 E-Pasa local Pasa de 9º grado gratis en el centro

3. ¿Por cuál tipo de TARIFA REDUCIDA calificó?

Ninguna Discapacitado con identificación o tarjeta de Medicare
 Más de 65 con identificación Niño/a de 5-14 años con identificación
 Estudiante de secundaria con identificación *Continúa en el reverso*

¡Díganos acerca de ESTE VIAJE SENCILLO que hace en ESTE MOMENTO!

(p. ej. de casa al trabajo, de casa a hacer compras, o del trabajo a comer, etc.)

Recuerde: Su viaje puede ser diferente a nuestro ejemplo.

Ejemplo de un Viaje Sencillo: De Casa al Trabajo

COMENZAR ESTE VIAJE SENCILLO

1. TIPO DE LUGAR: (Rellene solamente un círculo)
 Trabajo Cita médica/Visita al hospital
 Colegio/Universidad (sólo estudiantes) Restaurante
 Escuela (K-12) (sólo estudiantes) Otro (especifique): _____
 Compras
 Visita social/Recreación
 Mi Hogar → Si ya proporcionó su dirección → **Vaya a la #5 de abajo**

NOMBRE DEL LUGAR Y DIRECCIÓN O CRUCE DE CALLES

Nombre del Lugar (Ejemplo: Fort Worth Zoo, Canyon Ridge Apts., etc.) _____
 Dirección (Ejemplo: 1989 Colonial Parkway) _____
 Cruce de Calle #1 _____ & Cruce de Calle #2 _____
 Ciudad _____ Estado _____ CP _____

LLEGAR A TRANSPORTE PÚBLICO

5. ¿Cómo llegó de su lugar inicial al PRIMER AUTOBÚS/TREN de ESTE VIAJE SENCILLO?
 Silla de ruedas Bicicleta
 Caminé Me dejaron Me van a recoger
 Viaje en coche compartido y estacionamiento: ¿Ubicación del estacionamiento? _____
 Nombre del Lugar/Dirección/Cruce de Calle _____
 Manejé solo/a y me estacioné: ¿Ubicación del estacionamiento? _____
 Nombre del Lugar/Dirección/Cruce de Calle _____
 Otro (especifique): _____

VIAJAR EN TRANSPORTE PÚBLICO ENTRE MI LUGAR INICIAL Y MI DESTINO FINAL

6. Includiendo este autobús, con TOTAL cuántos AUTOBUSES Y TRENES va a usar para viajar entre su lugar inicial y su destino final?
 Uno, solamente este autobús Dos Tres Cuatro

7. Registre todas las LÍNEAS de AUTOBÚS o LÍNEAS de FERROCARRIL que está usando para viajar entre su lugar inicial y su destino final en el orden exacto que las usa.
 1º línea de autobús/ferrocarril que yo tomé: _____
 2º línea de autobús/ferrocarril que yo tomé o tomaré: _____
 3º línea de autobús/ferrocarril que yo tomé o tomaré: _____
 4º línea de autobús/ferrocarril que yo tomé o tomaré: _____

FIN DE ESTE VIAJE SENCILLO

8. TIPO DE LUGAR: (Rellene solamente un círculo)
 Trabajo Cita médica/Visita al hospital
 Colegio/Universidad (sólo estudiantes) Restaurante
 Escuela (K-12) (sólo estudiantes) Otro (especifique): _____
 Compras
 Visita social/Recreación
 Mi Hogar → Si ya proporcionó su dirección → **Vaya a la #8 de abajo**

NOMBRE DEL LUGAR Y DIRECCIÓN O CRUCE DE CALLES

Nombre del Lugar (Ejemplo: Fort Worth Zoo, Canyon Ridge Apts., etc.) _____
 Dirección (Ejemplo: 1989 Colonial Parkway) _____
 Cruce de Calle #1 _____ & Cruce de Calle #2 _____
 Ciudad _____ Estado _____ CP _____

LLEGAR DE TRANSPORTE PÚBLICO

8. ¿Cómo va a llegar del ÚLTIMO AUTOBÚS/TREN a su destino final de ESTE VIAJE SENCILLO?
 Silla de ruedas Bicicleta
 Caminando Me van a recoger Me dejaron
 Viaje en coche compartido y estacionamiento: ¿Ubicación del estacionamiento? _____
 Nombre del Lugar/Dirección/Cruce de Calle _____
 Manejé solo/a y me estacionaré: ¿Ubicación del estacionamiento? _____
 Nombre del Lugar/Dirección/Cruce de Calle _____
 Otro (especifique): _____

9. ¿CUÁNTOS MINUTOS esperó para abordar ESTE AUTOBÚS?

0-5 minutos 16-20 minutos Más de 30 minutos
 6-10 minutos 21-25 minutos
 11-15 minutos 26-30 minutos

10. ¿Dónde se va a bajar de ESTE AUTOBÚS? (Nombre del lugar y el cruce de calles más cercano)

Nombre del lugar (incluyendo Trans Center o Iste Park & Ride) _____
 Cruce de Calle #1 _____ Y Cruce de Calle #2 _____

11. ¿Cuántos AUTOMÓVILES, CAMIONETAS O MOTOCICLETAS registrados hay disponibles en su hogar?

Ninguna 1 2 3 4 o más

12. Incluyéndose usted, ¿cuántas PERSONAS viven en su hogar?

1 2 3 4 5 6 o más

13. ¿Tiene una LICENCIA DE CONDUCTOR válida?

Sí No

14. Es usted... (Rellene el círculo que mejor lo describa)

Empleado (tiempo completo o medio tiempo) Jubilado
 Desempleado Persona que se queda en casa Estudiante

15. ¿Cuál es su EDAD?

15-24 25-34 35-49 50-64 65 o más

16. ¿Cuál es su ORIGEN ÉTNICO? (Rellene el círculo que mejor lo describa)

Asiático Nativo Americano Otro (especifique): _____
 Negro/Afroamericano Blanco
 Hispano

17. ¿Aproximadamente cuál fue el INGRESO TOTAL DE SU HOGAR en 2007 antes de impuestos?

Menos de \$10,000 \$25,000 - \$34,999 \$75,000 o más
 \$10,000 - \$14,999 \$35,000 - \$49,999
 \$15,000 - \$24,999 \$50,000 - \$74,999

(Por favor continúe al Otro lado →)

Appendix E: Wait Time Questionnaire

Surveyor Name: _____
NCTCOG (DART/TRE) On-Board Wait Time Survey

Survey Date: _____

Assignment #: _____ Route #: _____ Time: _____ AM PM

1) Did you transfer from another bus/train to get to THIS VEHICLE: No Yes

2) How many minutes did you have to wait at the bus/train stop for THIS VEHICLE:

5 or less 6-10 11-15 16-20 More than 20

3) What type of place are you COMING FROM NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

4) What type of place are you GOING TO NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

Assignment #: _____ Route #: _____ Time: _____ AM PM

1) Did you transfer from another bus/train to get to THIS VEHICLE: No Yes

2) How many minutes did you have to wait at the bus/train stop for THIS VEHICLE:

5 or less 6-10 11-15 16-20 More than 20

3) What type of place are you COMING FROM NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

4) What type of place are you GOING TO NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

Assignment #: _____ Route #: _____ Time: _____ AM PM

1) Did you transfer from another bus/train to get to THIS VEHICLE: No Yes

2) How many minutes did you have to wait at the bus/train stop for THIS VEHICLE:

5 or less 6-10 11-15 16-20 More than 20

3) What type of place are you COMING FROM NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

4) What type of place are you GOING TO NOW:

Home Work College / University Student K-12th Grade Student Shopping
 Social / Recreation Medical / Hospital Restaurant (not for work) Other _____

Appendix F: Wait Time Study Sampling

WAIT-TIME STUDY SAMPLING METHODOLOGY SUMMARY

(by North Central Texas Council of Governments, 08/2009)

INTRODUCTION

The current practice in transit modeling is to consider that the passenger initial wait-time at a transit stop is equal to half the service headway. However, this can create problems with the ridership forecast since a rather large wait-time will be assigned to the stops associated with the express bus or commuter rail services that have longer headways and negatively affect the ridership on those routes. A simple solution to this is to cap the initial wait-time to the smaller of half the headway and at a fixed constant.

This issue has been addressed in some studies by incorporating the variability in the service headway and passenger arrivals into the calculations [1]. The service headway variability is mostly contributed to the transit service reliability and the unknown traffic conditions. However, the passenger arrival variability is mostly contributed to the fact that some passengers actually plan their trip to minimize their initial wait-time at the transit stop. These trips are normally associated with the passengers that use services with longer headways or are regular users of the system. These passengers seldom start their journey on a spur of the moment and have a non-random arrival at the transit stop. On the other hand, the passengers of services that run on a shorter headway know that there will always be a service vehicle available at their transit stop within a couple of minutes of their arrival time. Therefore, they do not have to plan their journey as matriculate as of the first group of passengers. This group of passengers will randomly arrive at the transit stops. Some previous studies indicate that the break point in the service headway that causes non-random passenger arrivals is in the range of 10 to 13 minutes [2].

SAMPLING METHODOLOGY

The goal of this study was to verify whether or not the initial passenger wait-time at transit stops is a function of the transit service headway. This study was done for the Dallas Area Rapid Transit (DART) area of coverage since the recent onboard survey in the Fort Worth Transportation Authority (FWTA) system had already addressed this question. Therefore, the sampling universe was defined as the DART transit system of buses and light rail transit (LRT), including the Trinity Railway Express (TRE) commuter rail. The sample size selection steps are described below.

Sample Size

The sample sizes were calculated for seven groups of service headways: 0-5, 5-10, 10-15, 15-20, 20-30, 30-45, and 45-60 minutes. This ensured that we obtained sufficient samples based on the potential variances in the initial wait-times in each group. This range covers the possible service scenarios in the DART system.

1. Share of Random Arrivals

The share of random passenger arrivals in each headway group was defined based on a recent study performed in Australia by Booz Allen Hamilton (BAH) consultants [4].

2. Service Headway Variation
The Coefficient of Variance (CV) of the service headway for each of the groups was calculated based on the results of the study outlined in reference [3].
3. Expected Random Wait-Time
The expected wait-time for the random passengers was calculated as follows:
 $0.5 * \text{Average Headway of each group} * [1 + (CV^2)]$
4. Share of Non-Random Arrivals
This share is equal to : $1 - (\text{Share of Random Arrivals})$
5. Expected Non-Random Wait-Time
This was taken from the study in reference [4] for each of the groups.
6. Expected Wait-Time
The expected wait-time for each group is equal to the weighted average of the expected value of the wait-times of the random and non-random arrivals.
7. Maximum Wait-Time
The maximum wait-time has been set equal to the average headway of each group.
8. Wait-Time Variance
It has been assumed that the initial wait-times follow a normal distribution and hence the maximum wait-time is 3.5 times the standard deviation from the mean.
9. Wait-Time Coefficient of Variance
This is calculated through dividing the wait-time standard deviation by the mean wait-time for each group.
10. Uncorrected Sample Size
The uncorrected sample size was calculated for all possible combinations of the transit services.

Formula:

$$CV^2 * Z^2 / E^2$$

where:

CV = wait-time coefficient of variance for each group (from step 9);

Z = standard normal variable at 90% confidence interval (1.95);

E = margin of error (5.00%)

The sample sizes were then corrected based on the number of first boardings of each of the service combinations.

Route Selection

The LRT and TRE have average peak-hour model service headways of 13 and 20 minutes, respectively. Therefore, the number of initial wait-time samples needed for these services were 65 for the LRT and 170 for the TRE. The surveyors boarded the LRT and TRE and collected data during one whole day that covered all the peak and off-peak periods.

The total samples needed for the DART bus service, with an overall average headways of 32.5 minutes (including the express buses), was 500. The bus routes were then selected based on their ridership and geographical service area to ensure that the sample is a representation of the system and that enough ridership is available to produce the required sample size.

REFERENCES

- [1] Turnquist, Mark A., "A Model for Investigating The Effects of Service Frequency and Reliability on Bus Passenger Wait Time", Transportation Research Record, Publication 663, pages 70-73, Transportation Research Board, Washington, D.C., 1978.
- [2] Fan, Wei, Machemehl, Randy B., "Do Transit Users Just Wait or Wait with Strategies for the Bus? Some Numerical Results You Should See as a Transit Planner". Submitted for Publication in the 2009 Transportation Research Record and Presentation at the 88th Annual Meeting of the TRB, Washington, D.C., January 2009. (Reference obtained directly from the corresponding author.)
- [3] Mishalani, Rabi G., McCord, Mark M., Wirtz, John, "Passenger Wait Time Perceptions at Bus Stops: Empirical Results and Impact on Evaluating Real-Time Bus Arrival Information", Journal of Public Transportation, Vol. 9, No.2, 2006.
- [4] Booz Allen Hamilton, "Measurement Valuation of Public Transport Reliability", Land Transport New Zealand Research Report 339, 2007.

Appendix G: Wait Time Study Analysis

Table G-1 shows the routes selected to represent each headway group in the wait time study. For non-rail headway groups, each route considered had to have all alignments of the route fall into the same headway group. Two routes were chosen for each headway group with consideration of largest ridership and coverage of the entire DART transit system.

Table G-1: Wait Time Study Routes

Headway Group	Type	Line	Bus Route
TRE	TRE	TRE	TRE
LRT	LRT	RED	RED LINE
LRT	LRT	BLUE	BLUE LINE
>45 min	Local	553	LEDBTR STA/TREE TOP/CEDAR VALLEY
>45 min	Local	52	WALNUT HILL/BICKERS
30-45 min	Local	415	LEDBETTER/SOUTHWEST CENTER MALL
30-45 min	Local	19	ANN ARBOR/BAYLOR HOSPITAL
20-30 min	Local	21	PARK LANE-MOCK. STA/KIEST BLVD.
20-30 min	Local	50	BUCKNER/COCKRELL HILL
15-20 min	Express	202	NORTH IRVING/DFW EXPRESS
15-20 min	Local	428	S GARLAND/MED CTR/NORTH IRVING
10-15 min	Express	204	N CARROLLTON/ADDISON/F BRANCH
10-15 min	Express	206	GLENN HEIGHTS EXPRESS

Initial Wait Time

In the wait time survey, the respondent was asked to classify his wait time in one of 5 categories: 0-5 minutes, 6-10 minutes, 11-15 minutes, 16-20 minutes, and greater than 20 minutes. As a way of estimating the average wait time among the surveys, each record in one of the first four wait time ranges was multiplied by the median of the wait time range; for example, a record with a specified wait time of 0-5 minutes was assigned a wait time of 2.5 minutes. An average wait time of 25 minutes was assigned to all users specifying a wait time of greater than 20 minutes.

Tables G-2, G-3, G-4, G-5, and G-6 display the breakdown of initial wait time ranges by combinations of Trip Purpose, Time of Day, and Headway Group. Using this allows analysts to see trends in the data and determine the number of records that support the average initial wait time.

Table G-2: Initial Wait Time by Trip Purpose and Time of Day

Trip Purpose	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBW	AM	116	23	3	1		143	3.71
HBW	NOON	15	9	3		1	28	6.20
HBW	OP	83	37	13	3	3	139	5.77
HBW	PM	98	47	13	8	6	172	6.30
HBW TOTAL		312	116	32	12	10	482	5.37
HBNW	AM	48	25	10	1	1	85	5.80
HBNW	NOON	40	25	13	4	3	85	7.25
HBNW	OP	88	45	14	5	12	164	7.02
HBNW	PM	41	32	11	2	5	91	7.28
HBNW TOTAL		217	127	48	12	21	425	6.88
NHB	AM	1	3				4	6.63
NHB	NOON	6	5	2	1	3	17	10.24
NHB	OP	14	11	4		3	32	7.81
NHB	PM	11	6	2			19	5.34
NHB TOTAL		32	25	8	1	6	72	7.67
TOTAL		561	268	88	25	37	979	6.20

Table G-3 presents the breakdown of initial wait time ranges by Headway Group and Time of Day.

Table G-3: Initial Wait Time by Headway Group and Time of Day

Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
10-15	AM	30	7	1			38	3.79
10-15	NOON	4	1				5	3.60
10-15	OP	20	9	3		6	38	8.18
10-15	PM	39	16	5	3	1	64	5.77
10-15 TOTAL		93	33	9	3	7	145	5.81
15-20	AM	14	2				16	3.19
15-20	NOON	20	9	1	2	3	35	7.03
15-20	OP	18	10	3	1		32	5.69
15-20	PM	27	14	2	1		44	5.08
15-20 TOTAL		79	35	6	4	3	127	5.53
20-30	AM	28	13	5		1	47	5.62
20-30	NOON	10	3	3		1	17	6.65
20-30	OP	39	12	2	1	1	55	4.77
20-30	PM	20	15	1	1	5	42	7.76
20-30 TOTAL		97	43	11	2	8	161	6.00
30-45	AM	33	7	2	2		44	4.56
30-45	NOON	7	9	5	2	2	25	9.62
30-45	OP	38	20	3	3	3	67	6.31
30-45	PM	12	3	1	1	1	18	6.11
30-45 TOTAL		90	39	11	8	6	154	6.32
> 45	AM	10	11	3			24	6.33
> 45	NOON	13	6	2	1	1	23	6.50
> 45	OP	24	16	7	2	7	56	8.75
> 45	PM	27	11	8	2	2	50	6.91
> 45 TOTAL		74	44	20	5	10	153	7.43
LRT	AM	41	7	1			49	3.50
LRT	NOON	5	6	3			14	7.11
LRT	OP	29	16	8	1		54	5.97
LRT	PM	10	20	6	1		37	7.59
LRT TOTAL		85	49	18	2	0	154	5.68
TRE	AM	9	4	1			14	4.82
TRE	NOON	2	5	4			11	8.82
TRE	OP	17	10	5		1	33	6.44
TRE	PM	15	6	3	1	2	27	7.13
TRE TOTAL		43	25	13	1	3	85	6.70
TOTAL		561	268	88	25	37	979	6.20

Tables G-4, G-5, and G-6 present the breakdown of initial wait time ranges for Trip Purpose by Headway Group and Time of Day. Tables G-4, G-5, and G-6 display Home-Based Work, Home-Based Non-Work, and Non-Home-Based Trip Purposes, respectively.

Table G-4: Home-Based Work Initial Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBW	10-15	AM	24	6	1	0	0	31	3.90
HBW	10-15	NOON	1	0	0	0	0	1	2.50
HBW	10-15	OP	10	6	1	0	2	19	7.16
HBW	10-15	PM	38	15	3	3	1	60	5.55
HBW 10-15 TOTAL			73	27	5	3	3	111	5.34
HBW	15-20	AM	12	1	0	0	0	13	2.92
HBW	15-20	NOON	3	2	1	0	1	7	8.79
HBW	15-20	OP	6	0	2	0	0	8	5.13
HBW	15-20	PM	24	5	2	1	0	32	4.50
HBW 15-20 TOTAL			45	8	5	1	1	60	4.74
HBW	20-30	AM	19	5	0	0	0	24	3.65
HBW	20-30	NOON	5	0	0	0	0	5	2.50
HBW	20-30	OP	15	6	0	1	0	22	4.70
HBW	20-30	PM	7	9	1	1	2	20	8.53
HBW 20-30 TOTAL			46	20	1	2	2	71	5.27
HBW	30-45	AM	15	1	0	1	0	17	3.74
HBW	30-45	NOON	0	1	0	0	0	1	8.00
HBW	30-45	OP	11	4	0	1	0	16	4.84
HBW	30-45	PM	4	1	0	1	0	6	6.00
HBW 30-45 TOTAL			30	7	0	3	0	40	4.63
HBW	> 45	AM	5	2	1	0	0	8	5.19
HBW	> 45	NOON	3	2	0	0	0	5	4.70
HBW	> 45	OP	9	7	3	1	1	21	7.64
HBW	> 45	PM	12	3	3	1	1	20	6.80
HBW > 45 TOTAL			29	14	7	2	2	54	6.69
HBW	LRT	AM	32	4	0	0	0	36	3.11
HBW	LRT	NOON	2	1	0	0	0	3	4.33
HBW	LRT	OP	21	7	3	0	0	31	4.76
HBW	LRT	PM	4	9	3	1	0	17	8.18
HBW LRT TOTAL			59	21	6	1	0	87	4.73
HBW	TRE	AM	9	4	1	0	0	14	4.82
HBW	TRE	NOON	1	3	2	0	0	6	8.75
HBW	TRE	OP	11	7	4	0	0	22	6.16
HBW	TRE	PM	9	5	1	0	2	17	7.38
HBW TRE TOTAL			30	19	8	0	2	59	6.46
HBW TOTAL			312	116	32	12	10	482	5.37

Table G-5: Home-Based Non-Work Initial Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBNW	10-15	AM	6	1	0	0	0	7	3.29
HBNW	10-15	NOON	2	1	0	0	0	3	4.33
HBNW	10-15	OP	10	3	1	0	3	17	8.06
HBNW	10-15	PM	0	1	2	0	0	3	11.33
HBNW 10-15 TOTAL			18	6	3	0	3	30	6.90
HBNW	15-20	AM	2	1	0	0	0	3	4.33
HBNW	15-20	NOON	16	5	0	2	2	25	6.64
HBNW	15-20	OP	10	8	1	1	0	20	6.00
HBNW	15-20	PM	2	7	0	0	0	9	6.78
HBNW 15-20 TOTAL			30	21	1	3	2	57	6.32
HBNW	20-30	AM	9	7	5	0	1	22	7.66
HBNW	20-30	NOON	5	3	3	0	0	11	6.86
HBNW	20-30	OP	23	4	1	0	1	29	4.40
HBNW	20-30	PM	12	6	0	0	3	21	7.29
HBNW 20-30 TOTAL			49	20	9	0	5	83	6.32
HBNW	30-45	AM	17	4	2	1	0	24	4.94
HBNW	30-45	NOON	6	6	3	1	1	17	8.53
HBNW	30-45	OP	23	14	3	2	3	45	7.10
HBNW	30-45	PM	8	1	1	0	1	11	6.00
HBNW 30-45 TOTAL			54	25	9	4	5	97	6.69
HBNW	> 45	AM	5	9	2	0	0	16	6.91
HBNW	> 45	NOON	10	4	2	1	0	17	5.94
HBNW	> 45	OP	10	8	4	1	5	28	10.14
HBNW	> 45	PM	12	6	5	1	1	25	7.44
HBNW > 45 TOTAL			37	27	13	3	6	86	7.92
HBNW	LRT	AM	9	3	1	0	0	13	4.58
HBNW	LRT	NOON	1	4	3	0	0	8	9.19
HBNW	LRT	OP	6	5	3	1	0	15	7.47
HBNW	LRT	PM	4	10	1	0	0	15	6.87
HBNW LRT TOTAL			20	22	8	1	0	51	6.82
HBNW	TRE	NOON	0	2	2	0	0	4	10.50
HBNW	TRE	OP	6	3	1	0	0	10	5.20
HBNW	TRE	PM	3	1	2	1	0	7	8.50
HBNW TRE TOTAL			9	6	5	1	0	21	7.31
HBNW TOTAL			217	127	48	12	21	425	6.88

Table G-6: Non-Home-Based Initial Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
NHB	10-15	NOON	1	0	0	0	0	1	2.50
NHB	10-15	OP	0	0	1	0	1	2	19.00
NHB	10-15	PM	1	0	0	0	0	1	2.50
NHB 10-15 TOTAL			2	0	1	0	1	4	10.75
NHB	15-20	NOON	1	2	0	0	0	3	6.17
NHB	15-20	OP	2	2	0	0	0	4	5.25
NHB	15-20	PM	1	2	0	0	0	3	6.17
NHB 15-20 TOTAL			4	6	0	0	0	10	5.80
NHB	20-30	AM	0	1	0	0	0	1	8.00
NHB	20-30	NOON	0	0	0	0	1	1	25.00
NHB	20-30	OP	1	2	1	0	0	4	7.88
NHB	20-30	PM	1	0	0	0	0	1	2.50
NHB 20-30 TOTAL			2	3	1	0	1	7	9.57
NHB	30-45	AM	1	2	0	0	0	3	6.17
NHB	30-45	NOON	1	2	2	1	1	7	12.50
NHB	30-45	OP	4	2	0	0	0	6	4.33
NHB	30-45	PM	0	1	0	0	0	1	8.00
NHB 30-45 TOTAL			6	7	2	1	1	17	8.24
NHB	> 45	NOON	0	0	0	0	1	1	25.00
NHB	> 45	OP	5	1	0	0	1	7	6.50
NHB	> 45	PM	3	2	0	0	0	5	4.70
NHB > 45 TOTAL			8	3	0	0	2	13	7.23
NHB	LRT	NOON	2	1	0	0	0	3	4.33
NHB	LRT	OP	2	4	2	0	0	8	7.88
NHB	LRT	PM	2	1	2	0	0	5	7.80
NHB LRT TOTAL			6	6	4	0	0	16	7.19
NHB	TRE	NOON	1	0	0	0	0	1	2.50
NHB	TRE	OP	0	0	0	0	1	1	25.00
NHB	TRE	PM	3	0	0	0	0	3	2.50
NHB TRE TOTAL			4	0	0	0	1	5	7.00
NHB TOTAL			32	25	8	1	6	72	7.67

Transfer Wait Time

In the wait time survey, the respondent was asked to classify his wait time in one of 5 categories: 0-5 minutes, 6-10 minutes, 11-15 minutes, 16-20 minutes, and greater than 20 minutes. As a way of estimating the average wait time among the surveys, each record in one of the first four wait time ranges was multiplied by the median of the wait time range; for example, a record with a specified wait time of 0-5 minutes was assigned a wait time of 2.5 minutes. An average wait time of 25 minutes was assigned to all users specifying a wait time of greater than 20 minutes.

Tables G-7, G-8, G-9, G-10, and G-11 display the breakdown of transfer wait time ranges by combinations of Trip Purpose, Time of Day, and Headway Group. Using this allows analysts to see trends in the data and determine the number of records that support the average transfer wait time.

Table G-7 presents the breakdown of transfer wait time ranges by Trip Purpose and Time of Day.

Table G-7: Transfer Wait Time by Trip Purpose and Time of Day

Trip Purpose	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBW	AM	54	21	18	6		99	6.52
HBW	NOON	17	21	5	2	1	46	7.32
HBW	OP	59	57	26	9	16	167	9.00
HBW	PM	70	36	13	7	8	134	7.15
HBW TOTAL		200	135	62	24	25	446	7.72
HBNW	AM	19	15	7	5	1	47	7.95
HBNW	NOON	34	18	14	7	7	80	8.90
HBNW	OP	78	52	23	11	16	180	8.38
HBNW	PM	36	27	17	5	7	92	8.61
HBNW TOTAL		167	112	61	28	31	399	8.48
NHB	AM	1	4	1			6	7.92
NHB	NOON	9	12	6	2	3	32	9.61
NHB	OP	17	9	4	2	4	36	8.40
NHB	PM	19	12	2	1	1	35	6.07
NHB TOTAL		46	37	13	5	8	109	7.98
TOTAL		413	284	136	57	64	954	8.07

Table G-8 presents the breakdown of transfer wait time ranges by the Headway Group and Time of Day.

Table G-8: Transfer Wait Time by Headway Group and Time of Day

Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
10-15	AM	4	2				6	4.33
10-15	NOON	1	1	4			6	10.42
10-15	OP	5	5	10	4	2	26	11.71
10-15	PM	12	3	4	1		20	6.20
10-15 TOTAL		22	11	18	5	2	58	8.91
15-20	AM	9	4	3			16	5.84
15-20	NOON	18	5	5	2	8	38	10.16
15-20	OP	35	5	7	3	11	61	8.98
15-20	PM	22	6	2		3	33	6.18
15-20 TOTAL		84	20	17	5	22	148	8.32
20-30	AM	4	8	11	4		27	10.70
20-30	NOON	6	9	4	1	1	21	8.67
20-30	OP	9	34	15	2	4	64	9.77
20-30	PM	16	20	10	1	2	49	8.12
20-30 TOTAL		35	71	40	8	7	161	9.28
30-45	AM	13	7	3			23	5.54
30-45	NOON	5	5	2	2	1	15	9.30
30-45	OP	27	15	9	8	5	64	8.96
30-45	PM	10	6	2	3		21	7.29
30-45 TOTAL		55	33	16	13	6	123	8.08
> 45	AM	8	3	2			13	5.38
> 45	NOON	9	8	2	2	1	22	7.89
> 45	OP	19	12	4	3	8	46	9.77
> 45	PM	10	5	9	7	7	38	12.71
> 45 TOTAL		46	28	17	12	16	119	9.88
LRT	AM	33	13	5	6	1	58	6.63
LRT	NOON	13	13	7	3		36	7.82
LRT	OP	32	34	4	1		71	5.94
LRT	PM	46	27				73	4.53
LRT TOTAL		124	87	16	10	1	238	5.96
TRE	AM	3	3	2	1		9	8.39
TRE	NOON	8	10	1	1		20	6.55
TRE	OP	27	13	4	1	6	51	7.68
TRE	PM	9	8	5	1	4	27	9.98
TRE TOTAL		47	34	12	4	10	107	8.11
TOTAL		413	284	136	57	64	954	8.07

Tables G-9, G-10, and G-11 present the breakdown of transfer wait time ranges for Trip Purpose by Headway Group and Time of Day. Tables G-9, G-10, and G-11 display Home-Based Work, Home-Based Non-Work, and Non-Home-Based Trip Purposes, respectively.

Table G-9: Home-Based Work Transfer Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBW	10-15	AM	2	2				4	5.25
HBW	10-15	NOON	1	1	2			4	9.13
HBW	10-15	OP	3	2	5	1	1	12	10.96
HBW	10-15	PM	10	1	1			12	3.83
HBW 10-15 TOTAL			16	6	8	1	1	32	7.34
HBW	15-20	AM	5	2	3			10	6.75
HBW	15-20	NOON	3	2	2	1	1	9	10.28
HBW	15-20	OP	11	4	5	1	4	25	9.70
HBW	15-20	PM	12	3	2		1	18	5.83
HBW 15-20 TOTAL			31	11	12	2	6	62	8.19
HBW	20-30	AM	3	3	8	1		15	10.23
HBW	20-30	NOON	1	4	1			6	7.92
HBW	20-30	OP	3	15	7	2	1	28	9.98
HBW	20-30	PM	8	12	5	1	2	28	8.89
HBW 20-30 TOTAL			15	34	21	4	3	77	9.47
HBW	30-45	AM	8	4	1			13	5.00
HBW	30-45	NOON	1	2				3	6.17
HBW	30-45	OP	7	6	3	2	1	19	8.71
HBW	30-45	PM	5	1		1		7	5.50
HBW 30-45 TOTAL			21	13	4	3	1	42	6.85
HBW	> 45	AM	7	3	1			11	4.95
HBW	> 45	NOON	3	4				7	5.64
HBW	> 45	OP	4	3	1	2	4	14	13.07
HBW	> 45	PM	4	3	3	4	2	16	12.19
HBW > 45 TOTAL			18	13	5	6	6	48	9.83
HBW	LRT	AM	26	4	3	4		37	5.62
HBW	LRT	NOON	4	1		1		6	6.00
HBW	LRT	OP	14	16	3			33	6.12
HBW	LRT	PM	25	9				34	3.96
HBW LRT TOTAL			69	30	6	5	0	110	5.28
HBW	TRE	AM	3	3	2	1		9	8.39
HBW	TRE	NOON	4	7				11	6.00
HBW	TRE	OP	17	11	2	1	5	36	8.32
HBW	TRE	PM	6	7	2	1	3	19	10.00
HBW TRE TOTAL			30	28	6	3	8	75	8.41
HBW TOTAL			200	135	62	24	25	446	7.72

Table G-10: Home-Based Non-Work Transfer Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
HBNW	10-15	AM	2					2	2.50
HBNW	10-15	NOON			2			2	13.00
HBNW	10-15	OP	1	1	3	3		8	12.94
HBNW	10-15	PM	1	1	3	1		6	11.25
HBNW 10-15 TOTAL			4	2	8	4	0	18	11.22
HBNW	15-20	AM	4	1				5	3.60
HBNW	15-20	NOON	11	1	2	1	7	22	11.57
HBNW	15-20	OP	20	1	1	2	5	29	8.00
HBNW	15-20	PM	8	1			1	10	5.30
HBNW 15-20 TOTAL			43	4	3	3	13	66	8.45
HBNW	20-30	AM	1	4	3	3		11	11.59
HBNW	20-30	NOON	4	3	3	1		11	8.27
HBNW	20-30	OP	5	18	8		3	34	9.87
HBNW	20-30	PM	7	6	5			18	7.25
HBNW 20-30 TOTAL			17	31	19	4	3	74	9.25
HBNW	30-45	AM	5	3	1			9	5.50
HBNW	30-45	NOON	2	3	2	1		8	9.13
HBNW	30-45	OP	18	9	6	4	3	40	8.55
HBNW	30-45	PM	2	4	2	2		10	9.90
HBNW 30-45 TOTAL			27	19	11	7	3	67	8.41
HBNW	> 45	AM			1			1	13.00
HBNW	> 45	NOON	6	3	2	2		13	7.77
HBNW	> 45	OP	13	6	2	1	4	26	8.63
HBNW	> 45	PM	6	2	5	2	5	20	12.85
HBNW > 45 TOTAL			25	11	10	5	9	60	9.93
HBNW	LRT	AM	7	7	2	2	1	19	8.45
HBNW	LRT	NOON	8	7	3	1		19	7.00
HBNW	LRT	OP	13	15	1	1		30	6.12
HBNW	LRT	PM	10	12				22	5.50
HBNW LRT TOTAL			38	41	6	4	1	90	6.64
HBNW	TRE	NOON	3	1		1		5	6.70
HBNW	TRE	OP	8	2	2		1	13	6.69
HBNW	TRE	PM	2	1	2		1	6	10.67
HBNW TRE TOTAL			13	4	4	1	2	24	7.69
HBNW TOTAL			167	112	61	28	31	399	8.48

Table G-11: Non Home Based Transfer Wait by Headway Group and Time of Day

Trip Purpose	Headway Group	Time of Day	0-5	6-10	11-15	16-20	>20	Record Count	Avg Initial Wait (min)*
NHB	10-15	OP	1	2	2		1	6	11.58
NHB	10-15	PM	1	1				2	5.25
NHB 10-15 TOTAL			2	3	2	0	1	8	10.00
NHB	15-20	AM		1				1	8.00
NHB	15-20	NOON	4	2	1			7	5.57
NHB	15-20	OP	4		1		2	7	10.43
NHB	15-20	PM	2	2			1	5	9.20
NHB 15-20 TOTAL			10	5	2	0	3	20	8.30
NHB	20-30	AM		1				1	8.00
NHB	20-30	NOON	1	2			1	4	10.88
NHB	20-30	OP	1	1				2	5.25
NHB	20-30	PM	1	2				3	6.17
NHB 20-30 TOTAL			3	6	0	0	1	10	8.05
NHB	30-45	AM			1			1	13.00
NHB	30-45	NOON	2			1	1	4	12.00
NHB	30-45	OP	2			2	1	5	13.20
NHB	30-45	PM	3	1				4	3.88
NHB 30-45 TOTAL			7	1	1	3	2	14	10.18
NHB	> 45	AM	1					1	2.50
NHB	> 45	NOON		1			1	2	16.50
NHB	> 45	OP	2	3	1			6	7.00
NHB	> 45	PM			1	1		2	15.50
NHB > 45 TOTAL			3	4	2	1	1	11	9.86
NHB	LRT	AM		2				2	8.00
NHB	LRT	NOON	1	5	4	1		11	10.23
NHB	LRT	OP	5	3				8	4.56
NHB	LRT	PM	11	6				17	4.44
NHB LRT TOTAL			17	16	4	1	0	38	6.33
NHB	TRE	NOON	1	2	1			4	7.88
NHB	TRE	OP	2					2	2.50
NHB	TRE	PM	1		1			2	7.75
NHB TRE TOTAL			4	2	2	0	0	8	6.50
NHB TOTAL			46	37	13	5	8	109	7.98

Appendix H: Non-Response Questionnaire

NCTCOG (The T) On-Board Non-Response Survey

Assignment #: _____ **Trip #:** _____ **Route #:** _____

1) Reason for not taking/completing a survey:

- Never participate Too many questions Not interested/Don't Care Conditions on bus not suitable
 No time to complete it on this trip / trip too short Other (specify): _____

2) How many minutes will you be traveling on THIS BUS for THIS TRIP?

- 5 or less 6-10 11-15 16-20 21-25 26-30 More than 30

- 3) Age** 15 - 24 25 - 34 35 - 44 44 - 54 55-64 65+

- 4) Ethnicity** White African American Hispanic Asian Native American

Other (specify): _____

- 5) HH Income 2007** <10K 10K-14.9K 15K-24.9K 25K-34.9K 35K-49.9K 50K-75.9K 75K+

NCTCOG (The T) On-Board Non-Response Survey

Assignment #: _____ **Trip #:** _____ **Route #:** _____

1) Reason for not taking/completing a survey:

- Never participate Too many questions Not interested/Don't Care Conditions on bus not suitable
 No time to complete it on this trip / trip too short Other (specify): _____

2) How many minutes will you be traveling on THIS BUS for THIS TRIP?

- 5 or less 6-10 11-15 16-20 21-25 26-30 More than 30

- 3) Age** 15 - 24 25 - 34 35 - 44 44 - 54 55-64 65+

- 4) Ethnicity** White African American Hispanic Asian Native American

Other (specify): _____

- 5) HH Income 2007** <10K 10K-14.9K 15K-24.9K 25K-34.9K 35K-49.9K 50K-75.9K 75K+

NCTCOG (The T) On-Board Non-Response Survey

Assignment #: _____ **Trip #:** _____ **Route #:** _____

1) Reason for not taking/completing a survey:

- Never participate Too many questions Not interested/Don't Care Conditions on bus not suitable
 No time to complete it on this trip / trip too short Other (specify): _____

2) How many minutes will you be traveling on THIS BUS for THIS TRIP?

- 5 or less 6-10 11-15 16-20 21-25 26-30 More than 30

- 3) Age** 15 - 24 25 - 34 35 - 44 44 - 54 55-64 65+

- 4) Ethnicity** White African American Hispanic Asian Native American

Other (specify): _____

- 5) HH Income 2007** <10K 10K-14.9K 15K-24.9K 25K-34.9K 35K-49.9K 50K-75.9K 75K+

Appendix I: Non-Response Study Analysis

Table I-1 displays the response rate to each question in the Non-Response Survey. Over 90% of respondents answered the questions for reason for refusal, age, and ethnicity.

Table I-1: Response Rate to Non-Response Survey Questions

Response to:	# Responded	% Response
Reason for Refusal	1424	98.27%
# Minutes Traveled	903	62.32%
Age	1332	91.93%
Ethnicity	1366	94.27%
Income	500	34.51%
Total	1449	100.00%

Table I-2 and Figure I-1 display the breakdown of the reasons specified for refusing to fill out the on-board survey. Respondents were permitted to give up to three reasons for refusing to fill out the on-board survey.

Evaluating the first reason listed, 49% of respondents stated they were not interested in taking the on-board survey or never complete surveys. Thirty-four percent gave the reason other; these surveys need to be reviewed further to examine the description specified with the other response. Only 3% of users stated that too many questions precluded them from responding to the survey.

Table I-2: Breakdown of Reasons for Refusing the On-Board Survey

Reason Description	Reason 1	Reason 2	Reason 3	%Count
Never Complete	60			4.14%
No Time/Trip too short	165	2		11.39%
Too Many Questions	47	7		3.24%
Not Interested	645	4		44.51%
Conditions not suitable	17	1		1.17%
Other	490	48	2	33.82%
DK/Refused	25			1.73%
Total	1449	62	2	100.00%

Figure I-1: Breakdown of Reasons for Refusing the On-Board Survey

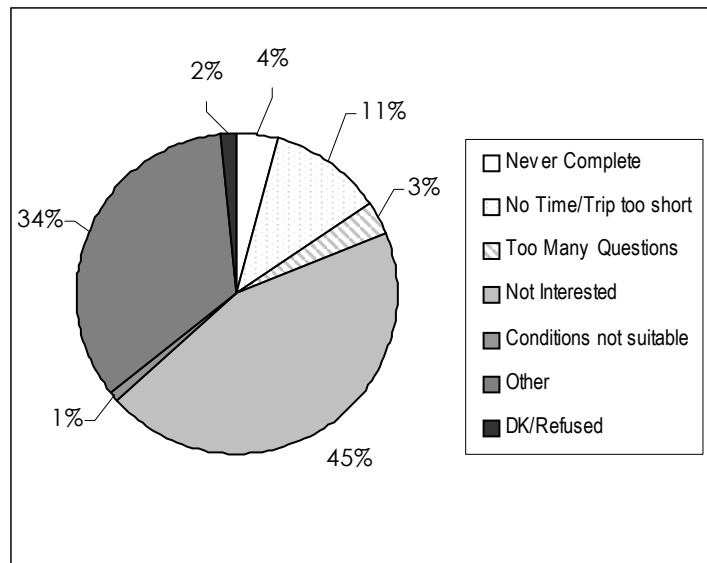


Table I-3 displays the number of minutes spent on the survey route, as reported by the respondents in the non-response survey. Of the 903 respondents that answered the question, 44% had trips on the survey route of 0-5 minutes.

Table I-3: Number of Minutes on Surveyed Route in the Non-Response Survey

Minutes	Count	% Count	Cumulative %
0-5	394	27.19%	27.19%
6-10	147	10.14%	37.34%
11-15	119	8.21%	45.55%
16-20	145	10.01%	55.56%
21-25	62	4.28%	59.83%
26-30	22	1.52%	61.35%
31+	14	0.97%	62.32%
DK/RF	546	37.68%	100.00%
Total	1449	100.00%	

Figure I-2: Number of Minutes on Surveyed Route in the Non-Response Survey

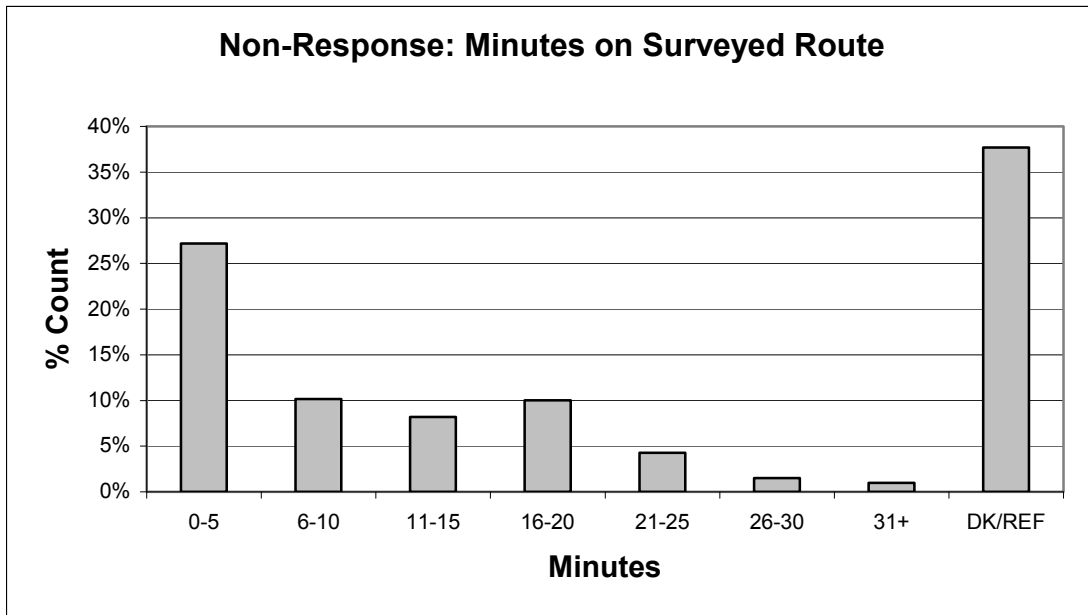


Table I-4 displays the distribution of survey respondents by ethnicity. African American constitutes the largest portion of all respondents with 43%, followed by White (30%).

Table I-4: Ethnicity

Ethnicity	Count	% Count
White	441	30.43%
African-American	627	43.27%
Hispanic	204	14.08%
Asian	65	4.49%
Native American	6	0.41%
Multi-Racial	9	0.62%
Other	83	5.73%
DK/RF	14	0.97%
Total	1449	100.00%

Figure I-3: Ethnicity

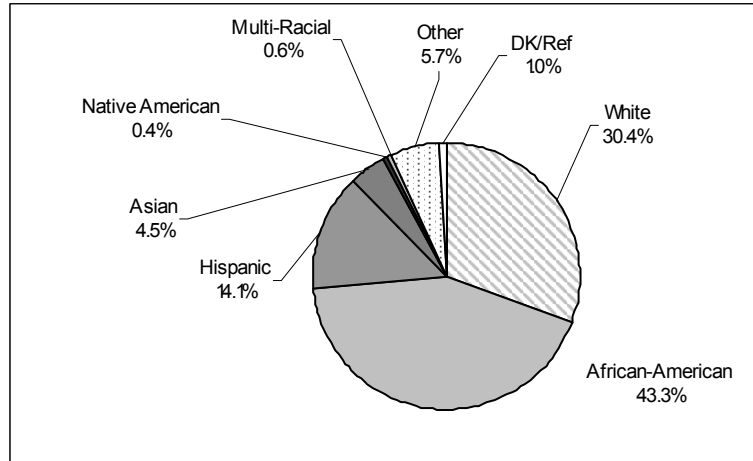


Table I-5 displays the distribution of survey respondents by age. Nearly 38% of non-response survey respondents were young riders aged between 15-34.

Table I-5: Age

Age Range	Count	% Count	Cumulative %
15-24	163	11.25%	11.25%
25-34	384	26.50%	37.75%
35-44	343	23.67%	61.42%
45-54	254	17.53%	78.95%
55-64	121	8.35%	87.30%
65+	67	4.62%	91.93%
DK/RF	117	8.07%	100.00%
Total	1449	100.00%	

Figure I-4: Age

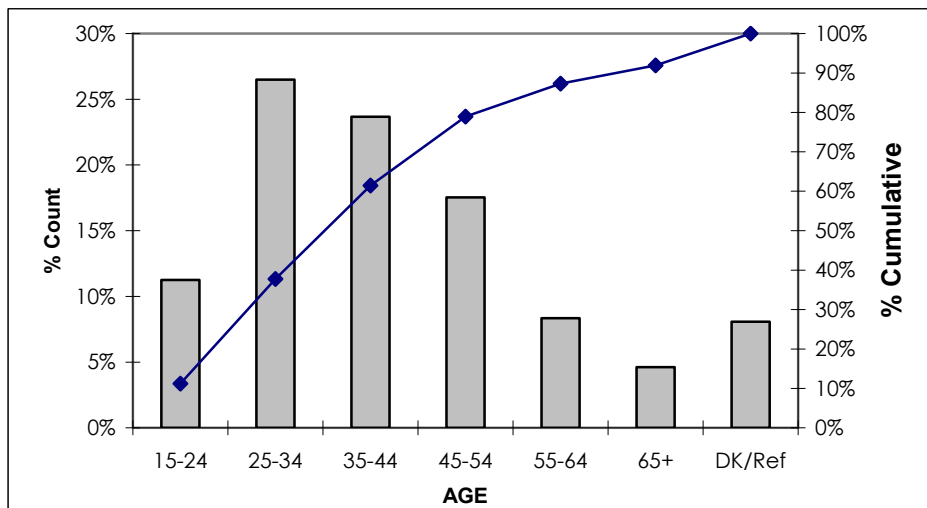
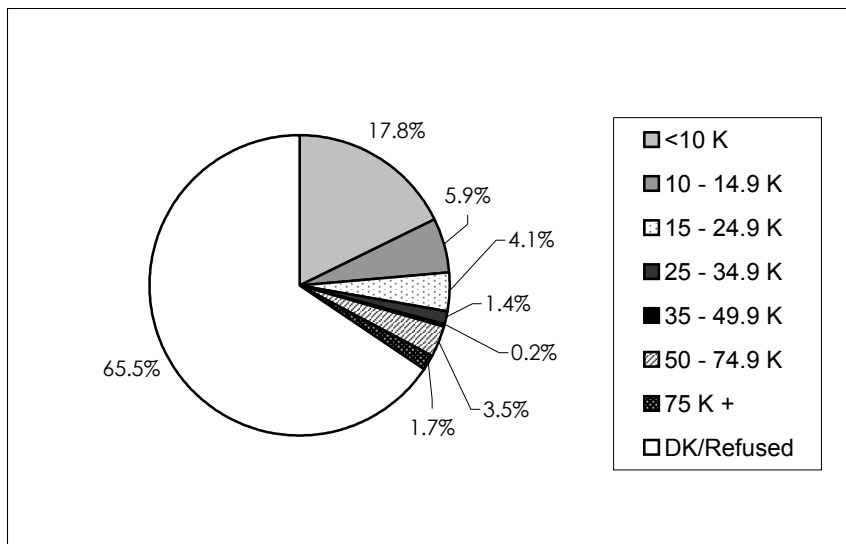


Table I-6 displays the distribution of survey respondents by income. The response rate for this question was low; only about 35% of respondents answered the income category question. Among those who answered, low-income earners (less than 25K) constitute the largest portion with nearly 28% of the total.

Table I-6: Income

Income Range	Count	% Count
<10 K	258	17.81%
10 - 14.9 K	85	5.87%
15 - 24.9 K	59	4.07%
25 - 34.9 K	20	1.38%
35 - 49.9 K	3	0.21%
50 - 74.9 K	50	3.45%
75 K +	25	1.73%
DK/RF	949	65.49%
Total	1449	100.00%

Figure I-5: Income



Appendix J: Cognitive Interview Report

North Central Texas Council of Governments

Transit On-Board Study Interviews *Draft Summary Report*

October 2008



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Introduction

Background

NuStats conducted a series of in-person interviews with transit riders in the Fort Worth area to gain insight and suggestions for improving the on-board survey instrument. The interviews were designed to assess how easy or not easy it would be for respondents to complete a self-administered questionnaire asking about transit trips, addresses, and other information. The main goal of the interviews was to evaluate the effectiveness of the survey instrument and make suggestions for improvements to enhance the quality of the data collected.

Methods

NuStats recruited riders at the transfer center in downtown Fort Worth on Monday and Tuesday, October 6 and 7, 2008. Recruitment took place during all hours of the day, with concentration on the morning and afternoon rush hour peak times. A copy of the recruitment script is in Appendix A.

One of our senior research experts developed the interview guide – a copy of the English guide is in Appendix B. She and another experienced interviewer from NuStats conducted interviews using an approved interview guide. A Spanish speaking member of the NCTCOG staff recruited participants at the transfer center and conducted three interviews in Spanish. He also translated the interview guide.

On October 8 and 9, 2008, NuStats conducted a total of 28 interviews at the Embassy Suites hotel in downtown Fort Worth. Interviews lasted approximately 50 minutes and each person received \$100 for their time. (Three non-recruited volunteers, included in the count above, were also interviewed and paid \$30 each; they learned about the interviews from a male respondent recruited by NuStats.) One female was paid and sent home due to multiple interview scheduling.

Findings

The basic structure for the interviews was to provide an introduction and goal of the interview, then present one of the versions of the survey instrument and ask the respondent to complete it, then present the second version and have them complete that one as well. We alternated the version shown first each time to minimize order bias.

During the introduction, it was important to try to get the respondent to think back to his or her most recent bus trip, whether it was on their way to the hotel for the interview, or earlier in the day or within the past few days. We understand that testing of this nature introduces an artificial element since participants are not on a bus, and agreed to attend the interview knowing they would receive \$100 as compensation for their time. However, the real value in conducting in-person interviews with actual transit riders even under false conditions is the ability to probe on the various issues encountered and more importantly to learn about their ideas for how to improve the instrument, thus increasing participation rates as well as the quality of the data. We concentrated our efforts on gaining insight about preferred elements of each version rather than an overall preference for one versus the other. We discuss this in more detail below.

Preferences

With the exception of four individuals, respondents preferred the second version of the questionnaire regardless of which order the two versions were presented. NuStats structured the testing in such a way as to eliminate order bias by alternating the order in each interview. As expected, most respondents had a tendency to prefer the second version they saw; likely because the second version would be easier to complete since they already knew what to expect but possibly also because it was new and different to them. We concentrated our testing on the specific items, elements, text and other parts of the questionnaire that they liked about both versions of the instrument; for example, even if Version #2 was preferred, the questions we asked were designed to elicit what they did like about Version #1. In many ways, we attempted to get the best of both worlds relative to finding what works, what does not work, and how to improve the questionnaire design and ultimately, the value and quality of the data collected during the on-board survey.

We believe the preference for the second shown version is less important than the preferred elements from each of the two survey instruments; therefore, our findings and recommendations are based on a synthesis of the insight learned during the interviews. Below are the preferred elements in each version.

Version 1 Preferences:

- 1) Questions are written out, not short phrases, so they are more detailed and easier to understand
- 2) More room to write because of the larger size
- 3) More white space and not as cluttered
- 4) Two examples of a one-way trip with different start and end locations made it easier to comprehend
- 5) Looked simple and easy to fill out
- 6) Bus routes side by side look more like a trip so easier to fill out
- 7) Not as confusing in black and white
- 8) More self-explanatory
- 9) Larger size is better for older riders with vision problems

- 10) More clear and understandable
- 11) More time to think

Version 2 Preferences:

- 1) Smaller size is better for holding on a bus
- 2) Color was more appealing
- 3) Pictures / icons were helpful
- 4) Preferred listing buses down a list rather than left to right on same line
- 5) Example was not shaded and was easier to see
- 6) Seemed easier to fill out
- 7) Easier to write place names and addresses because there were no lines between letters (e.g., one letter per box in Version #1)
- 8) Friendly feel; was more attractive

Issues/Problems Encountered

Completing an on-board questionnaire is no doubt slightly confusing for all respondents, in part because they are asked to do so under less than optimal conditions (e.g., low light, limited cognitive comprehension, literacy challenges, crowded conditions, bumpy ride, sight/vision impairments, children in tow, short bus ride / not enough time). Yet the data collected in such studies is critical for transit planners. NuStats testing brought attention to several issues respondents had in completing the questionnaire, even under much more optimal surroundings. The problems they encountered – regardless of the version – included:

Did not know addresses – Many participants simply did not know exact addresses; in some cases, they left that information blank.

Did not know cross streets – Even more so than addresses, many respondents were unable to provide cross streets. Many simply left that information blank.

Did not understand what to write for Place Name – This caused quite a bit of confusion for many respondents. They were unsure of what to write, even if they looked at the corresponding example. Most would leave those questions unanswered or give incorrect information.

Concept of a one-way trip was confusing – for example, some had questions about start and end points, such as can a transfer point be the beginning of a trip? In addition, several respondents attempted to provide round trip information. A few started and ended a trip at the same location. Another woman started completing the instrument about one trip then switched to another. We had one female who gave examples of different types of bus trips she has taken. Interestingly, when one of the interviewers had respondents draw/write out their one-way trip, it seemed to make more sense.

Did not read instructions – Several people said they went straight to the questions and did not read the introductory/explanatory information. Upon reflection later, they said reading the instructions would have been helpful, but felt they should just start answering the questions on the survey.

Did not look at visual examples – While some respondents said they found the visual example of a one-way trip helpful, many admitted to skipping over the examples.

Instructions were not clear – For the few respondents who actually read the instructions, some felt they just were not very clear in terms of helping them understand the type of information to write. Comments included “What do you want here?” “I’m not sure what to put.”

Time waited for bus was not clear – Several people asked if we wanted to know how long they typically wait for a bus, though the question intent is learning how long a rider waited for the bus they are currently riding. One person noted the difference between weekday and weekend wait times, so there was obviously confusion about this question.

Skip if home address provided – A few respondents missed the skip early in the questionnaire (i.e., if home address already provided)

Motivation and Encouragement to Take the Survey

We know from experience, and even the mini-pilot test conducted by NCTGOC, that some respondents simply will not complete an on-board survey questionnaire. However, we thought it was important to use the cognitive testing to probe a bit deeper on attitudes, motivations and barriers with the goal of uncovering useful insight that would help increase survey participation rates.

Nearly all of the respondents we interviewed said they would complete a questionnaire on the bus (and we take this with a grain of salt, knowing that they likely felt obligated to say yes), though notably, a few said they would not, or it would depend on several factors such as how crowded the bus was at the time, the length of their trip, and even their mood at the time. Reasons for not taking the survey also included not wanting to share personal information, but this was limited to a only a very few individuals. Some respondents said there will be riders who will not take the survey no matter what.

The interviewers asked what respondents recommended in terms of getting more people to take the survey. Some ideas included:

1. Offer something for free, such as food, gift cards, t-shirts, bottled water, coupons.
2. Give out a free buss ticket.
3. Give out cash.
4. Several people felt it was important to encourage riders to share their opinions. Some suggested wording was “It will make riding the bus better,” “Your suggestions could help,” “We want your opinions.”

The drawing for \$100 was interesting but not a major appeal to most participants, although only one person said it was not necessary to include. Respondents felt it was too much like a lottery with little chance of actually winning. Several people suggested using a monthly bus pass for the drawing prizes as opposed to money. A handful of respondents did not see the drawing while they filled out the survey, which indicates that either it was not well placed or it was not appealing enough to catch their attention. We suspect it more to do with not reading the introduction/instruction section than not being appealing.

Recommended Edits

NuStats recommended changes to the survey instrument, based on the input of transit riders, are as follows (note, while we are suggesting edits, not all will be practical or able to be implemented):

- 1) Use the larger survey instrument
- 2) Design the instrument in color (similar to the graphic version used in testing); do not use stars around the question numbers
- 3) Move the line about information being confidential from the introductory text off to the right, next to the home address
- 4) Q2 – use a larger size font for the skip if they select “My Home”
- 5) Q2a. Use Name of Place instead of Place Name (make this change on Q4a and Q7 as well)
- 6) Q6b. “List the bus routes or rail lines in the exact order you are using them to make this one-way trip.”
- 7) Q10. “How many minutes did you wait for the bus you are on now?”
- 8) Q12. Add the word ‘total’ in front of PEOPLE.
- 9) Q18. Use “estimated total income”, not “combined income”
- 10) Use cross street, not intersection, throughout instrument to be consistent
- 11) Put the word “Example” above the pictures to set it off and have it stand out from the rest of the text.
- 12) Consider offering 10 monthly passes instead of five \$100 drawings

Appendix A – Recruitment Script

Hi, I'm talking to folks who use the T to ask their opinions about an upcoming survey. It's a great way to share your input with the T and earn \$100 for your time. This Wednesday and Thursday, we're inviting people to participate in an hour-long interview at the Embassy Suites hotel on Commerce Street.

There are only a few interviews each day. What time would work best for you? **SHOW THE SCHEDULE AND GET THEM TO DECIDE WHICH TIME SLOT IS BEST.**

Appendix B – Interview Guide

Introduction

2 minutes

- Interviewer introduces self
- Statement of purpose / Study objectives: We want your opinions about the survey questionnaire, mention that survey is for the T.
- Ground rules – honesty, don't be afraid to ask questions or speak your mind.
- Audio taping our conversation to write the report.

Past experience with transit surveys (ice breaker)

5 minutes

As a transit rider, can you recall a time when someone asked you to complete a survey while riding on the bus or train?

How did you react? Did you take the survey?

What do you recall about what kinds of questions were asked?

Completing the Questionnaire

20 minutes

Did you take the bus to get here today; if not, then think about the most recent bus trip you took in the past few days or week.

ROTATE QUESTIONNAIRES FOR EACH RESPONDENT: HALF SHOULD START WITH ORIGINAL, HALF SHOULD START WITH REVISED

I'd like you to pretend you're on the bus and someone just handed you this questionnaire. I'd like you to take a few minutes to fill out the survey, but as you're doing this, tell me out loud what you're thinking. I want to hear about what's going through your mind as you fill it out.

PAY ATTENTION TO THE FOLLOWING: DID THEY LOOK AT THE PHOTO EXAMPLE? DID THEY READ THE INSTRUCTIONS? DID THEY HAVE A PUZZLED LOOK AT ANY POINT DURING THE TIME THEY FILLED IT OUT?

WHEN THEY'RE DONE ASK: Were the instructions clear? Was there anything confusing about the survey?

GO THROUGH THEIR ANSWERS WITH THEM, POINT OUT AREAS THAT ARE INCOMPLETE OR MISSING AND DISCUSS

Examples: I noticed this section is blank. Let's talk about this.

It seemed like you had a puzzled look when you completed this section. I'd like to hear your thoughts about it.

Now I have a second questionnaire. It has the same basic questions but looks a little different from the other one. I'd like you to please take a few minutes to complete this survey, and again, tell me out loud what's happening in your head as you read through and answer it.

AGAIN PROBE ON AREAS OF CONFUSION

Tell me about this version compared to the other one. Are there things you preferred? Things you didn't like as much? Were the instructions clear?

GET SPECIFICS: language choices, visual appeal, confusing terms, size, etc.

WE REALLY WANT TO GET THE BEST OF BOTH WORLDS: WHAT WORKS, WHAT DOESN'T

IV. Motivation for Taking Survey

15 minutes

If someone handed you a survey while you were riding a bus or train, how might you react? Would you take the questionnaire? Would you fill it out?

YES, THERE WOULD BE A FREE RIDE COUPON.

WHAT ABOUT THE CHANCE TO WIN \$100 IN A DRAWING? LIKELIHOOD OF WINNING IS 1 IN ABOUT 3,000 – WOULD THAT BE APPEALING?

WHAT OTHER IDEAS/SUGGESTIONS FOR INCENTIVES

If you wouldn't want to take the survey, help me understand what more that person could do to get your participation. PROBE: What would you want to know? Do you have any concerns? We're trying to get at whether or not people are opposed to surveys, or if it's more of a time factor, or something else.

VI. Conclusion and Thank you.

5 minutes

Now after you've gone through all of this, why do you think the survey is being done? What do you think is going to be done with your responses? Does any of this affect the answers you give?

Last question...Do you recommend any changes to the survey? Graphics? Format? Text?

Thank respondent(s) for participating...have them sign for their incentive.

Appendix C – Detailed Findings Matrix

This section provides a detailed matrix showing specific preferences and comments about the two survey instruments.

Table 3: Detailed Findings

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Samantha	F	45	AA	V2	V1	V1 - questions written out, more room to write, white space	V2 - not enough room, too crowded	Didn't understand what to put for addresses, confused about bus routes, took a long time to complete - said she'd take it with her and complete later	Money, food (like small bags of candy), free bus pass
Reginald	M	30s	AA	V1	V2	V2 - smaller; more apt to fill out. Easier to understand even w/ more concise wording. Color looks better. "I like simple."	V1 - no dislikes, just preferred V2	No real problems, just preferred V2; might not have filled out income	Money, t-shirts; liked free bus pass idea
Mary	F	37	H	V2	V1	V1 - wording seems clearer; has more examples, looked simple even though it seems plain. It was "pretty quick" to fill out. V2 - likes color, likes that it's smaller and seems shorter, plus easier to hold on bus	V2 - graphic; could be different color/shade of blue to stand out	Place name and address - left blank "What does this mean?" "I'm confused." When ask about bus wait time, which bus? Might not fill out if short ride Did not read instructions or visual example Is a transfer point the start of a trip?	"People like freebies." coupons/discounts for free bus ride is good. She didn't notice drawing.
Michelle	F	40s	Native Indian & Lebanese	V1	V2	V2- makes more sense. "I understand it better, it's more easily comprehended." Pictures are good, color was better, liked condensed wording, easier to fill out (smaller).	V1 - "looks to complicated, like a test."	Unsure how to complete place name and address; didn't understand cross streets (no suggestions for better term)	Free single ride; good to include drawing - didn't see that on V1
John	M	60s	Anglo	V2	V1	V1 - liked this better; "it's more clear and simple."	V2 - reverse text (white on blue) hard to read; white on black not as hard to read. Too small	Doesn't know addresses, didn't fill in cross streets, not sure what bus route to put; is one-way ticket same as \$1.50?	Let people know it will make riding the bus better; free pass is a good idea; put drawing right at the top so people see it

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Santos	M	40s	H	V1	V2	V2 - "more plain." "I like it already, it looks simpler." "It's more informative." Pictures help: "that's a plus" "Definitely better." "Blue color is better" "Size is better and it looks more friendly."	V1 - too long; people won't fill out, too much to think about; questionnaire made him think a lot - had to read closely; it was confusing. "It looks dull, and Plain Jane."	V1 - how get from that place (start) was confusing; Instructions were not clear; does not know exact addresses; type of place unclear	
Monica	F	20s	AA	V2	V2	V2 - example would make it easier for people to understand, but didn't look at it while completing; smaller size is better; color is goodV1 - question #5 made more sense; Likes bus routes size by side, not a list	V1 - larger size; showing two examples	Place name and cross street 'What should I do?' - how get from start confusing; instructions not clearDid not read instructions at topAre we asking about the last bus of the day, or the last one she will catch?Between start and end locations - not sure what we're askingQ10 (V1) - are we asking how long waited that day, or how long typically wait?	Free day pass; win monthly bus pass instead of \$100 "I'm not gonna win"
Troy	M	50s	Anglo	V2	V2	V2 - color, easier to handle, "more entertaining to the mind's eye"	He would not fill out if on bus; didn't give any personal information	Instructions not clear, "had to think" to determine what we wanted; wait time for buses different between weekdays and weekends	Free bus pass, cash, candy (drawing not needed)
Cynthia	F	30s	AA	V1	V2	V2 - color, instructions seemed clear, liked icons; preferred listing out each bus down rather than across as in V1	V1 - instructions "could have been better"	One-way trip: what do we want? Suggestion: "Fill out this survey about your bus trip" "Examples didn't do much for me"	free ticket/ ride, let people know their voice could be heard "Your suggestions could help"
Beverly	F	late 20s	H	V2	V1	V1 - looks easier to fill out, simpler; B&W not as confusing as blue ("blue threw me off"); it's bigger so it's easier to see, more readable, very simple	V2 - color, stars	Place address - not clear Didn't know addresses Went straight to questions; didn't read instructions One-way trip not clear; thought we wanted her whole day and all buses	Free bus pass; coupons "We want your opinion"

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Sharon	F	30s	Anglo	V1	V2	V2- color, would take it more seriously; simple, likes bus route list going not (not across); liked example not being shaded; smaller size easier on bus; better overall presentation		Not sure of intersection/cross street; doesn't know addresses; how long she waited for this bus or in general; instructions not clear; example not big enough - skipped it and went right to questions	Drawing for monthly bus pass (instead of \$100); free day pass good idea for immediate gift
Michael	M	20s	Anglo	V2	V1	V1 - B&W, spaced out - looks easier to fill out; liked detailed questions rather than phrases	V2 - small size looks cluttered; short phrases (wants detailed questions written out)	Confused on Q10 (V2) - 1st or 2nd bus? Not sure what we're asking. Did not read instructions or examples (on either version)	Free bus pass, bottle of water, coupons, gift cards
Dianne	F	60s	AA	V1	V2	V2 - blue, easier to fill out/seems shorter, more appealing "This is it." Smaller size is better, but would like a larger font size. "I'd rather read this [version]."	V1 - too much white background	Q3 (V1) "Not sure what to put." "This could confuse a person." Said average rider would not understand how to fill out.	Money, free bus pass; drawing is good, but cash is better
Lee	M	35-49	AA	V2	V1	V1 is bigger. V2 has the blue color. V1 seemed more self explanatory and easier to fill out.	On V2, the R said q10 should have come before q7. "The way it's worded is kind of trippy." On V1, the R suggested the home to work one-way trip graphic should be placed first.	V2 - was confused and didn't answer 4a & b, For 7a gave the place name as the cross streets for his home address, not the hotel (which was correct destination), confused at 8 and answered 'bus' instead of 'walk' was thinking how he would get home. V1 - R answered all of the buses he would use for the day's round trip. Answered Q7 as home location at end of day.	Chance to win \$100 is better than the pass. Cash always works.
Billy	M	25 - 34	Anglo	V1	V2	V2 is very explanatory, pinpoints what you're answering. The trifold is more convenient, more helpful to understand.	The black and white one does not 'set the eye'. The 'color blue, or any color, sets the eye.'	Was not familiar with the word "ethnicity". Said, "I don't know that one." but he could easily answer the question. He did skip Q16 Gender on V1 - I think because he was distracted by the word "ethnicity"	Says he would have done the survey anyway, so the chance to win or a pass are not necessary to motivate him. In his opinion some of his fellow passengers will never fill out a survey like this, so don't even give it to them.

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Wanda	F	35 - 49	AA	V2	V1	V1 is bigger so it's easier for older people to see. Liked V1 because it's bigger and understood more of it but maybe because she did the first one already.	Nothing really	V1 - 4a. She meant to do trip from home to work, but at 4a she answered work instead of home (probably because she already wrote her home address in q1.) At 4b she only wrote "Calhone" for street name -- no place name or cross street. At 7b she wrote 'home' instead of work and gave the intersection of the bus stop near her home. At q12, she answered 3; she did not include herself. For V1 - wrote her home intersection for q2b because she did not see the SKIP TO Q3 in Q2. She answered V1 more correctly but it was also second qre she saw. Q13 is item missing in V1.	Money, gifts and money.
Bertela	F	15 - 24	H	V1	V2	Likes the colors and the logo on V2. V1 is too big. Liked the T graphic. Trifold is easier to understand. It looks easier.	Wondered what the serial number was for and why we ask for telephone number, ethnicity, income. Why do we need to know addresses? Asked why TCU has a discount by TCC does not.	V1 -- didn't see skip on Q4=home, so thought she had to rewrite the address (made it confusing for her) V2 - Q1- Wrote her address on the name line and name on address line, Q10- she does not know the cross streets (v1 she skipped q7 because only one bus at 6a)	She said it's likely she would do it for a free ticket or a chance to win \$100 but it depends on the hour of the day. Early in the morning, she would look at it, but after work, she is tired. Suggests free passes and prizes.
Kenneth	M	35 - 49	AA	V2	V1	V1 is bigger and can write more. It's easier to see. V2 is more convenient because it's smaller, but prefers the big one. Can see the V2 but V1 is easier because 'my eyesight is poor'		V2 - R started and ended trip at same location (the Embassy Hotel). Did not fully complete 4b or 7b -- did not understand "Place Name". On V1 - Q2 was confusing to R because he didn't see the skip on Q2= home, so at q2a and q2b he wrote his destination	Prefers chance to win \$100 but both the chance to win and the free ticket is best.

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Mitch	M	50 - 64	AA	V1	V1	V1 - "more clear to understand"		R was confused about the concept of the one-way trip to get to the hotel on both versions of the questionnaire.	Would probably throw out the survey unless he had a complaint that day. He has a monthly pass (possibly free) because he is disabled, so a free ticket is not an incentive. A chance of winning \$100 is "not a sure thing" so not motivating. If cash, he said it has to be "something I could use" - \$1, \$2, or \$5 are not enough. \$10 would be good. (Per earlier conversation, this R has very little money, and Income < \$10,000)
Cliff	M	35 - 49	AA	V2	V1	V1 was easier to read, more spread out. V2 seems more repetitious. More time to think with V1 and a little easier. "It's self explanatory."	At the end of the interview: "Pretty maxed out on it"	Thought both surveys kept asking the same thing over and over because he gave same answer for 4, 7, and 10 on V2. On V1 he reversed the trip for 6b and 7 (maybe it's the artificial setting of the cognitive interview).	Chance to win \$100; 'don't need a free ride.' (R does not have a monthly pass and income is under \$10,000). Tell people a survey is being done and ask them to submit their opinions.

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
Lilian	F	15 - 24	Anglo	V1	V2	<p>V2 - verbal examples of one-way trip and the graphics, icons q5 because it made "dropped off" easier to understand (from car rather than dropped off by the bus). Q6a & b seemed to more clearly include rail lines.</p> <p>V2 was more clear: the wording, visuals, smaller form, color, more pictures. Wouldn't take as long to fill out. Easier to write when you don't have boxes for each letter. Liked the formatting into different sections, made it easier to understand. Better graphics on the V2 one-way trip and liked the phrase "Remember: Your trip may be different from our example." Thought V2 had a friendly feel, informal, detailed but simple.</p>	<p>V1 - Thought the term "one-way trip" might add to the confusion because she wasn't sure if she should include transfers. She found the graphic a little confusing (R is studying for a master's degree in English at TCU).</p>	<p>She wondered about the "Fort Worth/Denton area -- does it include Dallas"?</p> <p>V1 - 5, 6a, and 6b were answered for round trip, not one-way trip</p> <p>R thought some people might have privacy concerns about disclosing the data. R did not see the phrases saying that 'information is confidential and will not be shared or sold' on either version.</p>	<p>Would probably fill out on the bus without incentive, but did notice the chance to win \$100. The free ticket isn't as appealing because she has a pass, but would probably take it to give to someone else. Suggests a coupon for food or some % off of something.</p>
Keith	M	35 - 49	AA	V2	V1	<p>V1 - understand it better, can fill this out better, just like it better. V2 might be easier on the bus.</p>	<p>nothing I didn't like about V2, V1 just caught my eye.</p>	<p>R was confused because he had a long chained trip and wasn't sure where to start and stop the one-way trip.</p> <p>V1 - did not see the skip on q2. Item missing on q9. q10 - not sure if it was asking how long before the bus arrived at the stop, or before it pulled away (the bus waited at the stop for about 5 minutes).</p>	<p>Would do the survey for a free one-way ticket or chance to win \$100.</p>
RH	F	25 - 34	Anglo	V1	V2	<p>Likes V2 because we filled out V1 first. V2 is more compact and the shape is better.</p>	<p>Nothing.</p>	<p>No problems</p>	<p>Depends on the person handing them out. Should be cheerful but not too cheerful.</p>

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
DH	M	25 - 34	Anglo	V1	V2	V2 is brighter and the colors stand out.	<p>Asked if V2 7b is the final destination then why is q10 asked after 7b?</p> <p>Dislikes filling out the ovals in either version.</p>	<p>V1 - q2 selected work but should have been home, then wrote home at 2a, and gave address at 2b. Q12 - he counted adults in hhld only, not kids</p> <p>V2 - R flipped survey back and forth between q4a and q1.</p> <p>R was thinking of a 'normal' trip, not most recent. R had item missing on 2a, 2b, 9. R did not include self on q12.</p>	<p>Morning is a harsh time to ask someone to fill it out. Might do it in the afternoon.</p> <p>"A chance to win is not motivating because I have the worst luck. I never win."</p>
RM	M	35 - 49	AA	V1	V2	Easier to write on V2	<p>Didn't say he had any dislikes.</p>	<p>V2 - R had item missing on 7b and barely answered 7a. "Forgot to answer" 7b.</p> <p>Answered q10 for where he will get off on trip home.</p>	
Keith	M	25 - 34	Anglo	V2	V1	V1 'seemed easier than the other one but maybe just because I already did the other one first'	<p>At 4b he wrote out the city name instead of the place name, and then wrote the intersection. Ended up with "7th and Houston" three times in 7b</p>	<p>V1 Examples are confusing to R on q4b and q7b</p>	<p>R said he would only complete the survey if there was an incentive. Suggested a free monthly pass or \$100. When asked if he would complete for a free ticket, he said he probably, if time allowed. The chance to win \$100 sounds good but wouldn't think he had much chance. Doesn't gamble or play the lottery. Prefers one-way ticket.</p>

Name	Gender	Age	Eth	Saw first	Prefers	Likes	Dislikes	Problems	How encourage
James J.	M	50 - 64	AA	V1	V2	V2 looks easier, compact, more attractive. "Not into color, but it is conforming to the spirit of the age." More modern, more technological. Size is more amenable and appealing. It catches the eye with color.	"Unusual for me to so readily give up information as a warrior." (R previously disclosed he is a Vietnam combat veteran suffering from PTSD.	R did not bring his glasses and could not read either questionnaire so interviewer orally administered the surveys. R was confused on the one-way trip concept and wanted to report his round trip.	Said he would fill out the survey because he agreed to do it. He would not need compensation. Probably not fill it out on the bus because his PTSD causes him to be hyper-vigilant and filling out a survey would be too distracting on the bus. He thinks most riders would fill it out for a one-way ticket.
James E.	M	35 - 49	Anglo	V2	V2	V2 - more pleasing to the eye, more user-friendly V1 is more business; could get bored. V2 - icons "help you understand what you're looking at." Smaller, easier to handle, don't need a huge folder to write on, a small book would do	Nothing	V2 - gave name of train station at 4b instead of name of business	Would fill it out without incentive because it's important to vocalize opinion so the bus system knows. Free one-way pass would motivate people who are less fortunate. Choosing between the one-way ticket and a chance to win \$100, he picks chance for \$100.