2015 Origin/Destination Study

Research Report for

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Summary of Findings

This report presents the results of a survey of 6,457 LTD passengers conducted in October 2015. The survey tracks many of the same factors addressed in previous riders surveys conducted since 1999. However, a significantly revised questionnaire was utilized in 2015 in order to provide improved origin/destination information for transportation modeling purposes. Therefore, direct comparisons with past surveys are not always possible.

Rider Profile

Frequency of Use

- LTD's ridership is dominated by commute-level riders – 49% say they ride 4 to 6 days per week and most of these (53%) make two one-way trips (one roundtrip) per day. Of all LTD riders in 2015, 15% make only one trip while 47% make two, and the balance, 37%, make more than two one-way trips per day.
- Just under one quarter of riders (24%) use the system intensively – 7 days a week and are most likely to be making three or more trips per day (56%). Hence this group contributes disproportionately to LTD's total boardings.

Transit Dependence

- Fewer than one half of LTD riders hold a valid driver's license (45%). Of this group, 12% live in households with no vehicle. Hence, 67% of LTD riders lack either a driver's license (55%) or a vehicle (12%) and are thus relatively transit dependent.
- Nearly two thirds (65%) of LTD riders reside in a household with at least one vehicle. In many cases the rider-respondent lacks a license to use the household's vehicle(s), but could possibly get a ride with other household members.
- In 20% of rider households, the rider has a license, but there are more licensed drivers than vehicles. This would indicate shared vehicle usage.

Age

- LTD's ridership continues to be dominated by young people –58% are age 30 or under.
- Only 10% of riders said they were over 60 years old. However, this represents an increase from 6% in 2011.

Income

- As in past surveys, the income level of LTD riders is much lower than that of the Lane County population overall.

- Most riders (65%) have incomes of less than $25,000. This is true of both the overall ridership and of the non-student ridership 20 years or older among whom 64% have household incomes of less than $25,000.
- 7% of all riders say they have household incomes of $75,000 or more.

Employment/Student Status

- Eight out of ten LTD riders (81%) are individuals who are students or employed, and therefore have a need to commute to work or school (either by bus or otherwise). This represents an increase over 2011 when the analogous figure was 73%.
- A large percentage of riders are students - 32% are students only and 13% are both students and employed.
- Another 37% of the riders are employed, non-students.
- The final 19% of the ridership are non-employed, non-students.

Travel Profile

Trip Purpose

- Most trips on LTD (73%) are for commute purposes – work or school.
- When surveyed, 37% of riders gave their trip purpose as getting to or from school, while 36% said they were going to or from work.

Transferring

- More than half of riders (58%) say they are able to complete their one-way trip with a single bus. This represents a major change since 2011 when only 47% indicated that their trip required only a single bus.
- Of those surveyed, 35% use two buses for their one-way trip.
- 7% say it requires three buses to reach their destination.

Mode to/from Bus Stop

- As in the past, most LTD riders walk to (89%) and from (92%) the bus stop.
- Four percent bike to and from the stop, while another 4% said they drive to the stop and 2% drive from the stop.

Trip Origin and Destination

- Most (62%) trips are made within Eugene.
- Twenty-three percent (23%) of trips are between Eugene and Springfield.
- Nearly 12% of trips are within Springfield.

Need for Assistance

- 6.3% of riders say they need some type of assistance in using the bus, a slight increase from 4.8% in 2011
- The most commonly needed types of assistance are stop announcements (2.6%) and lift or ramp (1.9%). Driver assistance or a personal assistant are each needed by approximately .5% to 1% of riders.

Fare Media Used

- The vast majority of LTD riders use some type of pre-paid fare medium. Only 14% pay with cash on the bus or an EmX ticket purchased from a fare machine.
- 44% ride with an employer or college pass.
- 25% use a monthly or three-month pass, 10% use a Day Pass and 5% ride fare free.

Communication

- Most LTD riders (92%) speak English at home while 96% say they speak English well or very well.
- The Riders Digest (43%) and the LTD website (32%) are the transit information sources used by the most riders. The mobile website (22%), info at stops (21%) and Google maps (17%) are also used by significant groups of riders.
- Younger riders (30 and under)are more likely to rely on the website and Google maps, while older riders (over 60) primarily use the Riders Digest.
- Most LTD riders (69%) carry a Smartphone. Another 22% have a conventional cell phone, while only 9% do not have a mobile phone. Among riders 30 and younger, 80% have Smartphones.

Rider Satisfaction

Satisfaction Ratings

- Asked to rate various aspects of LTD service and the system overall, riders were generally satisfied. Approximately two thirds (65%) gave the system overall a positive rating (6 or 7 on a scale of 1 to 7).
- 29% gave it the top rating of 7.
- The highest satisfaction ratings were for LTD employees –helpfulness of customer service employees (51% top score) and helpfulness of bus operators (46% top score).
- As in 2011, the lowest level of top ratings (7) was for comfort while waiting for the bus (25%).

- The highest negative score was for the LTD website which garnered 14% in the score level from 1 – 3 on the seven point scale. Comfort while waiting at the stop received the next largest negative rating (12% scored it 1-3).

Introduction

A survey of bus riders was conducted for Lane Transit District (LTD) in October 2015. Surveyors boarded buses operating on selected runs and provided self-administered questionnaires to every rider on those runs

Survey Method

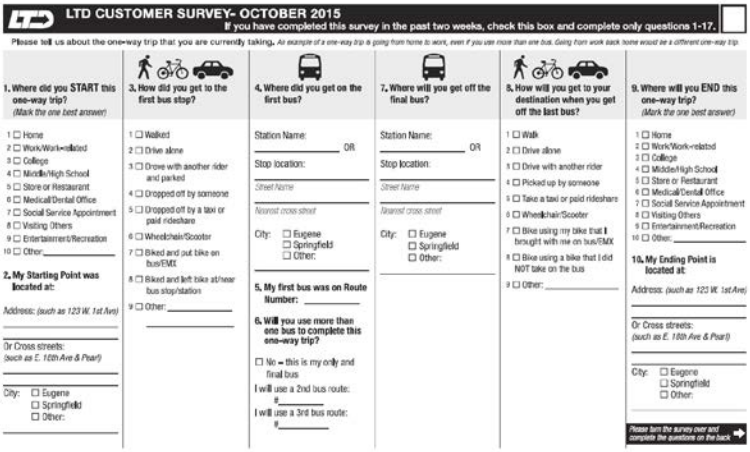
Sample Selection

The on-board survey was administered to riders on a random sampling of LTD buses. The sample of buses to be surveyed was selected in the following manner:

- The researcher began with a complete list of LTD schedule blocks for the day types of weekdays, Saturdays and Sundays for service bid for Fall 2015.
- For each day type, LTD schedule blocks were divided by time of day (peak and off-peak periods), plus optimal groups of route trips that could be assigned to surveyors. These potential survey assignments were assigned random identifiers and compiled into a table.
- The assignments were grouped by time of day (AM, midday, PM, and night). Assignments were then sorted by low to high random identification numbers. The lowest identification numbers were first selected within the time of day groups, until the number of assignments was reached, with total selected survey hours in proportion to service hours operated during that time of day. This time of day stratification met one of the requirements to build a survey database that could also be used in travel demand forecasting.
- A count of trips by route for each selected run was made to determine the level of coverage on each of the LTD routes. A number of survey assignments were replaced with the next lowest randomly selected assignment in order to provide full route coverage.
- Just over 376 weekday survey hours were assigned and completed. Surveyors worked 96 hours for the sampled Saturdays and just under 63 hours for Sundays. Total survey hours ended up just over 534 hours for entire survey period of 4 full weekdays, 2 partial, "make-up" weekdays, 2 Saturdays and 1 Sunday. Weekday hours were sampled at a higher rate to accommodate a larger sample size for travel demand forecasting.
- Sampled assignments are shown in an excel file provided separately.
- The sample was converted into the surveyor schedule, also included in the Excel file. It allowed for two surveyors on EmX runs which are operated with oversized vehicles.

Questionnaire

The questionnaire was developed by the consultants in collaboration with LTD and LCOG staff. The 2015 questionnaire differed from the 2011 questionnaire in two significant ways. The Origin-Destination questions were presented in a more graphic manner at the recommendation of LCOG staff. As a result, riders who were completing the questionnaire for a second or third time were asked to complete the front side of the questionnaire, plus a number of questions on the back.



LTD CUSTOMER SURVEY- OCTOBER 2015

If you have completed this survey in the past two weeks, check this box and complete only questions 1-17. ☐

Please tell us about the one-way trip that you are currently taking. *An example of a one-way trip is going from home to work, even if you use more than one bus. Going from work back home would be a different one-way trip.*

1. Where did you START this one-way trip? *(Mark the one best answer)*

1 ☐ Home
2 ☐ Work/Work-related
3 ☐ College
4 ☐ Middle/High School
5 ☐ Store or Restaurant
6 ☐ Medical/Dental Office
7 ☐ Social Service Appointment
8 ☐ Visiting Others
9 ☐ Entertainment/Recreation
10 ☐ Other: _____

2. My Starting Point was located at:

Address: *(such as 123 W. 1st Ave)*

Or Cross streets: *(such as E. 16th Ave & Pearl)*

City: ☐ Eugene ☐ Springfield ☐ Other:

3. How did you get to the first bus stop?

1 ☐ Walked
2 ☐ Drive alone
3 ☐ Drove with another rider and parked
4 ☐ Dropped off by someone
5 ☐ Dropped off by a taxi or paid rideshare
6 ☐ Wheelchair/Scooter
7 ☐ Biked and put bike on bus/EMX
8 ☐ Biked and left bike at/near bus stop/station
9 ☐ Other: _____

4. Where did you get on the first bus?

Station Name: _____ OR

Stop location:

Street Name

Nearest cross street

City: ☐ Eugene ☐ Springfield ☐ Other:

5. My first bus was on Route Number: _____

6. Will you use more than one bus to complete this one-way trip?

☐ No – this is my only and final bus
I will use a 2nd bus route: #_____
I will use a 3rd bus route: #_____

7. Where will you get off the final bus?

Station Name: _____ OR

Stop location:

Street Name

Nearest cross street

City: ☐ Eugene ☐ Springfield ☐ Other:

8. How will you get to your destination when you get off the last bus?

1 ☐ Walk
2 ☐ Drive alone
3 ☐ Drive with another rider
4 ☐ Picked up by someone
5 ☐ Take a taxi or paid rideshare
6 ☐ Wheelchair/Scooter
7 ☐ Bike using my bike that I brought with me on bus/EMX
8 ☐ Bike using a bike that I did NOT take on the bus
9 ☐ Other: _____

9. Where will you END this one-way trip? *(Mark the one best answer)*

1 ☐ Home
2 ☐ Work/Work-related
3 ☐ College
4 ☐ Middle/High School
5 ☐ Store or Restaurant
6 ☐ Medical/Dental Office
7 ☐ Social Service Appointment
8 ☐ Visiting Others
9 ☐ Entertainment/Recreation
10 ☐ Other: _____

10. My Ending Point is located at:

Address: *(such as 123 W. 1st Ave)*

Or Cross streets: *(such as E. 16th Ave & Pearl)*

City: ☐ Eugene ☐ Springfield ☐ Other:

Please turn the survey over and complete the questions on the back.

The number of questions relating to customer satisfaction and desired improvements was reduced in order to shorten the overall questionnaire. Questions regarding information sources were added to provide critical information for marketing and communications.

The questionnaire was translated into Spanish and both English and Spanish versions were printed on card stock for ease of use on the bus. A copy of the questionnaire is included in the Appendix.

Survey Staff

The survey was conducted by temporary employees provided by Office Team Temporary Services. The surveyors underwent a two-hour training program prior to initiation of the project. Training was conducted and the survey was supervised by Selena Barlow, Pam Heller and Paul Zvonkovic.

Survey Data Collection

Trained survey staff rode the designated buses during the time periods shown on the schedule. They distributed a questionnaire to every passenger boarding the bus during their assigned period. A pencil was also provided to avoid bias induced by the tendency of certain populations to carry or not to carry writing instruments. Surveyors wore identifying smocks showing that their purpose was to conduct a transit survey.

Spanish language questionnaires were offered to non-English speaking riders. Passengers were asked to complete the questionnaire and return it to the surveyor before leaving the bus. Individuals who were not able to complete the questionnaire during the trip were asked to give the completed survey to their next bus driver

or turn it in to customer service at Eugene Station. Those with a disability that prevented them from completing the survey on the bus were provided with a business reply envelope for mailing the survey to the research firm.

Riders who had already completed the survey on a previous ride were asked to fill out only questions 1-18 in order to provide origin/destination information for the specific trip. Thus there were two types of responses – complete form for those completing it for the first time, and partial form for those completing it for the second or subsequent times.

The surveys collected on each route and trip were placed in a pre-coded envelope which included the day, run, route number, direction and trip time. This information was subsequently coded as part of each record.

Response Rate

All questionnaires were serially numbered and tracked to allow accurate estimation of the response rate. A separate log, independent of the questionnaires themselves, was provided to the on-board surveyors to record the number of completed surveys, and the serial numbers of the surveys handed out. This allowed computation of a response rate.

A total of 927 trips were covered. During those trips, 13,058 persons boarded, or an average of 14.09 per trip. Of those boarding, 942 were under the age of 16, as judged by survey staff, while 223 spoke a language other than English or Spanish. Neither of these groups was surveyed. A total of 2,344 simply refused to accept a survey, while 2,453 indicated they had completed it previously and did not wish to do so again[1].

Surveyors distributed 8,040 survey questionnaires (8.65 per trip) and received returns from 6,722 or eighty-four percent (84%) of those to whom they provided questionnaires. Of these, 265 indicated by checking a special box that they had previously completed the entire questionnaire, and they then completed it in part for a second time, but only through question 18. These secondary partial responses are excluded from the analysis in this report.

Only 1.2% of questionnaires were completed in Spanish. This is essentially the same as the 1.3% completed in Spanish in 2011.

The resulting sample contains 6,457 complete responses or sufficiently complete to be useful in the analysis. Sample error in a sample of this size, assuming an approximately 50:50-distribution of any given response, is +/-1% at the 95% level of confidence.

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[1] Respondents were asked to complete a portion of the survey more than once in order to bolster the sample for modeling purposes. However, the data in this report includes only the full initial responses – hence one response per rider.

Data Cleaning and Entry

Prior to submitting the completed questionnaires for data entry, they were reviewed by temporary employees under the supervision of Paul Zvonkovic. The purpose was to "clean" the origin/destination data (correct misspelled or incomplete responses) in order to increase the percent of geocodeable origin/destination pairs. Data entry was completed by a specialized contractor under the supervision of Dr. Hugh Clark and Paul Zvonkovic.

Analysis

Analysis was conducted using a combination of SPSS (Version 13) and Excel. The raw data was weighted and expanded to reflect the average annual ridership for each route.

Sample Size

The resulting random sample includes 6,457 riders who completed the full survey and provided data of sufficient quality to be included in the analysis. A random sample of this size drawn from LTD's ridership provides a sample error of +/- 1% at the 95% confidence level when 50% of the riders respond in the same manner to a question. When the distribution is more skewed the sample error is less. However, when the sample is sub-divided such that the total number of respondents in a sub-set is smaller, the corresponding sample error will be larger. With such a large original sample this tendency can be ignored for the most part.

Pilot Tablet Survey

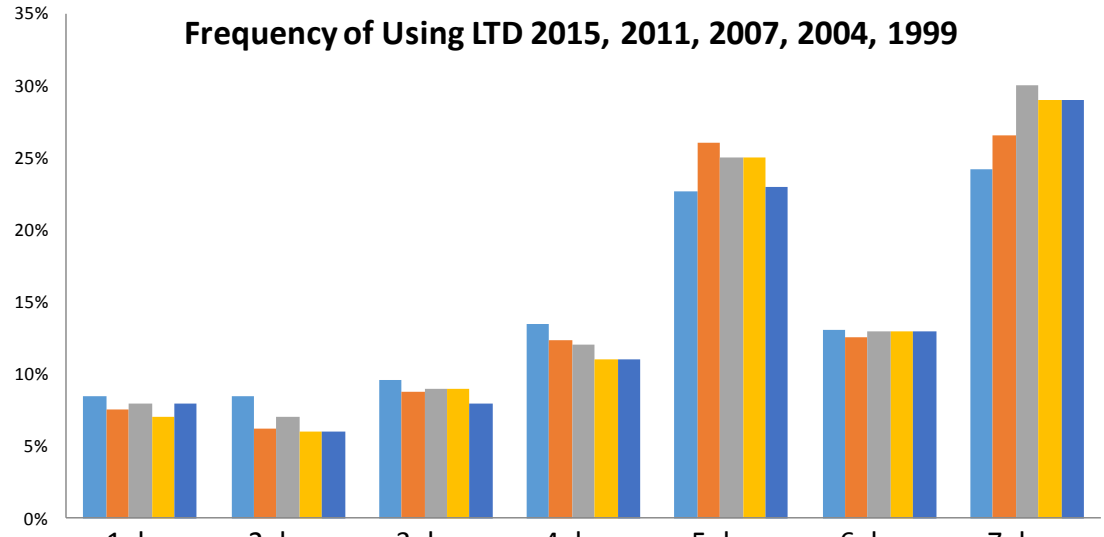
In addition to the system-wide on-board survey conducted as described above, a simultaneous pilot survey was conducted using tablet computers equipped with a customized program for use in collecting origin/destination data as well as basic demographics and satisfaction.

Trained surveyors conducted 266 interviews using the tablet program. Of those, 241 provided complete information for analysis including all four points of origin-destination information. The objective of the pilot survey was to compare the process and findings for a tablet survey to a traditional paper survey to determine if future surveys should be conducted in this way.

Findings and observations from the tablet survey are included in the final section of this report.

Frequency of Use

Figure 1 Frequency of using LTD



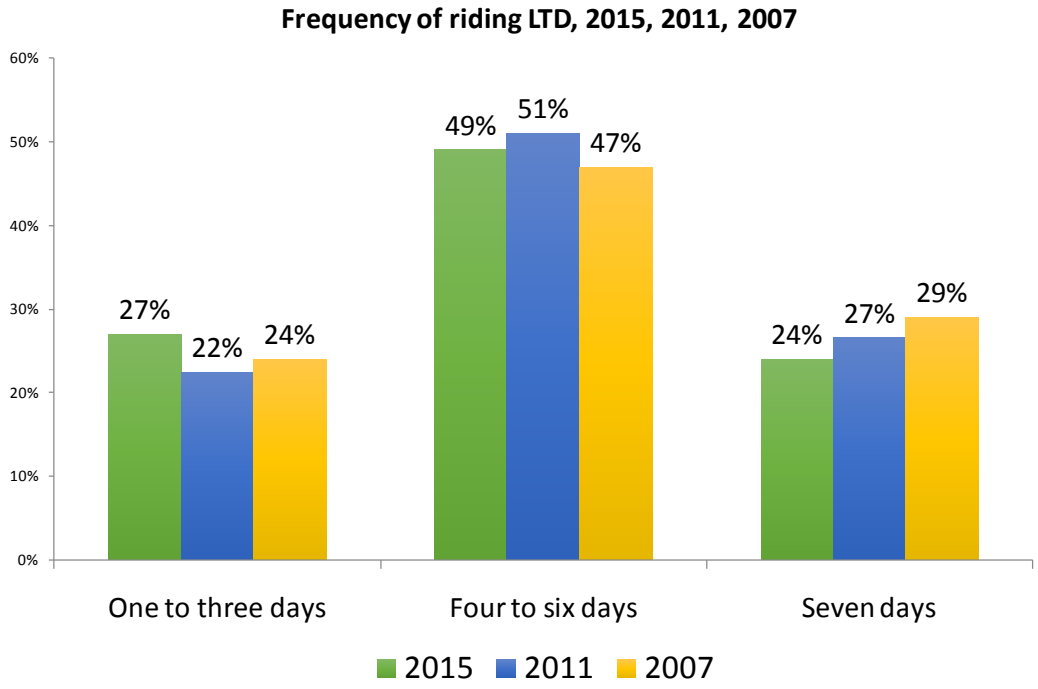
	1 day	2 days	3 days	4 days	5 days	6 days	7 days
2015	9%	8%	10%	13%	23%	13%	24%
2011	8%	6%	9%	12%	26%	13%	27%
2007	8%	7%	9%	12%	25%	13%	30%
2004	7%	6%	9%	11%	25%	13%	29%
1999	8%	6%	8%	11%	23%	13%	29%

Frequency of using LTD

As in previous years, most riders in 2015 use LTD rather intensively, from five to seven days a week. Approximately a quarter (24%) ride seven days a week, down very slightly from 2011 when 27% were riding that frequently. The 2% decline in the seven day riders may represent a trend in that it continues for a third survey period, a decline of 2% to 3% in each survey.

Another 13% ride six days a week, a percentage that has been consistent since 1999. Twenty three percent (23%) ride five days a week a slight decline from 26% in 2011. The four days per week riders have increased 2% since 2004, from 11% then to 13% in 2015 – a very small change indeed, but interesting in that it has occurred simultaneously with the 5% decline in the seven day riders.

Figure 2 Defining the Rider Frequency Segments

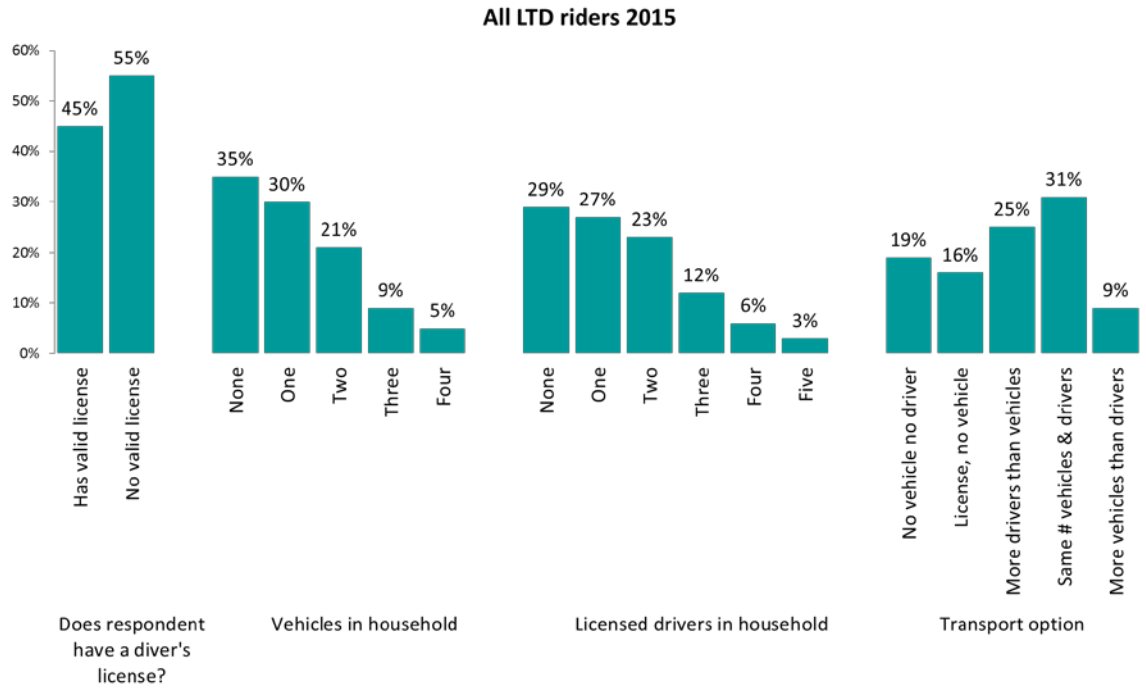


Rider frequency segments

To compare ridership segments in the balance of the study, we create "rider frequency segments" by breaking the respondents down into three groups: those who ride occasionally (one to three days a week, 27%), those who ride regularly, (four to six days a week, 49%), and those who use LTD intensively, (seven days a week, 24%). We will examine how the three rider frequency segments vary in terms of demographics, travel profile and attitudes.

Demographics

Figure 3 Levels of Transit Dependence at the Household Level



Vehicle Options within the household

Often transit dependency is reported based simply on having a vehicle in the household. Actual dependency is more complex than that, involving the rider having a driver's license, and there being a number of vehicles in the household sufficient for the rider to have access to one. For some, access is a matter of degree (sharing a vehicle), not an absolute.

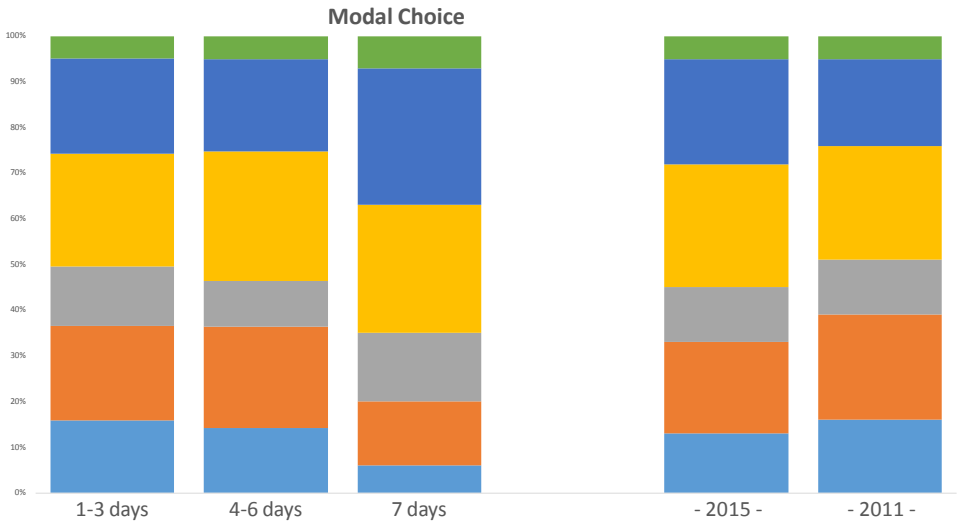
The survey asked about the number of vehicles and licensed drivers in the household and whether the rider responding to the survey had a driver's license. Here we examine two dimensions to the matter of reliance on transit – the household and the individual rider.

- Somewhat fewer than half (45%) of LTD riders have a driver's license (down from 49% in 2011).
- Although only 45% of riders hold a license, 71% of LTD riders live in households in which at least one person is a licensed driver (down markedly from 82% in 2011).
- Of the rider households, 65% have one or more vehicles available to the household (down slightly from 68% in 2011). Whether or not the individual rider was licensed and thus could access the vehicle is another matter.

Combining these results, we see that:

- 19% of riders have neither a driver's license nor a vehicle in the household (up from 16% in 2011)
- 16% have a license but no vehicle in the household (unchanged from 16% in 2011).
- 25% have more drivers than vehicles in the household and thus must share (down from 28% in 2011).
- 31% have an equal number of vehicles and drivers (essentially unchanged from 2011 when 30% fell into this category).
- 9% have more vehicles than drivers (unchanged from 2011).

Figure 4 Personal Vehicle Options, by Frequency Segments



	1-3 days	4-6 days	7 days	- 2015 -	- 2011 -
No License, others share car	5%	5%	7%	5%	5%
No License, no car in household	21%	20%	30%	23%	19%
No License, but car available	25%	28%	28%	27%	25%
License, no car	13%	10%	15%	12%	12%
License, shared car	21%	22%	14%	20%	23%
License, car	16%	14%	6%	13%	16%

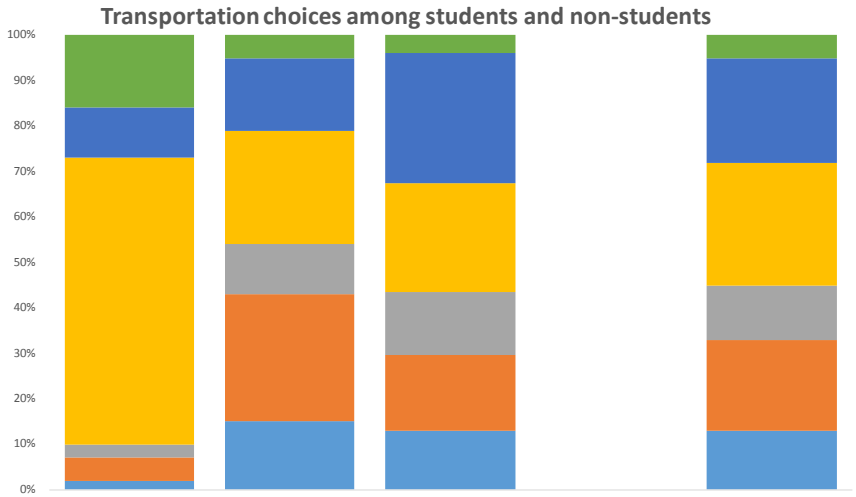
Personal Vehicle Options, by Frequency Segments

Figure 4 looks at the various degrees of transportation options, by frequency segment and compares the findings for 2011 and 2015.

Transit dependency is a product of having a license and having access to a vehicle. In the case of LTD in 2015, a total of 67% have either no license or no car or neither, while 20% have shared access, and 13% have full access. The results in 2011 were very similar within each category, although when combined, dependency was significantly lower, at 61%.

As one would expect, the seven day riders are more likely (80%) to be transit dependent than others (1-3 day riders, 64% and 4-6 day riders, 63%). The reasons are they are more likely to have neither a license nor a vehicle, and are also less likely to be licensed but only share access to a vehicle.

Figure 5 Personal Vehicle Options among Student and Non-student Riders



	MS HS Student (8%*)	College student (35%)	Not a student (57%)	All respondents
No License, others share car	16%	5%	4%	5%
No License, no car in household	11%	16%	29%	23%
No License, although car available	63%	25%	24%	27%
License, no car	3%	11%	14%	12%
License, shared car	5%	28%	17%	20%
License, car available to respondent	2%	15%	13%	13%

* % indicates the percent of all riders in this category

Personal Vehicle Options among Student and Non-student Riders

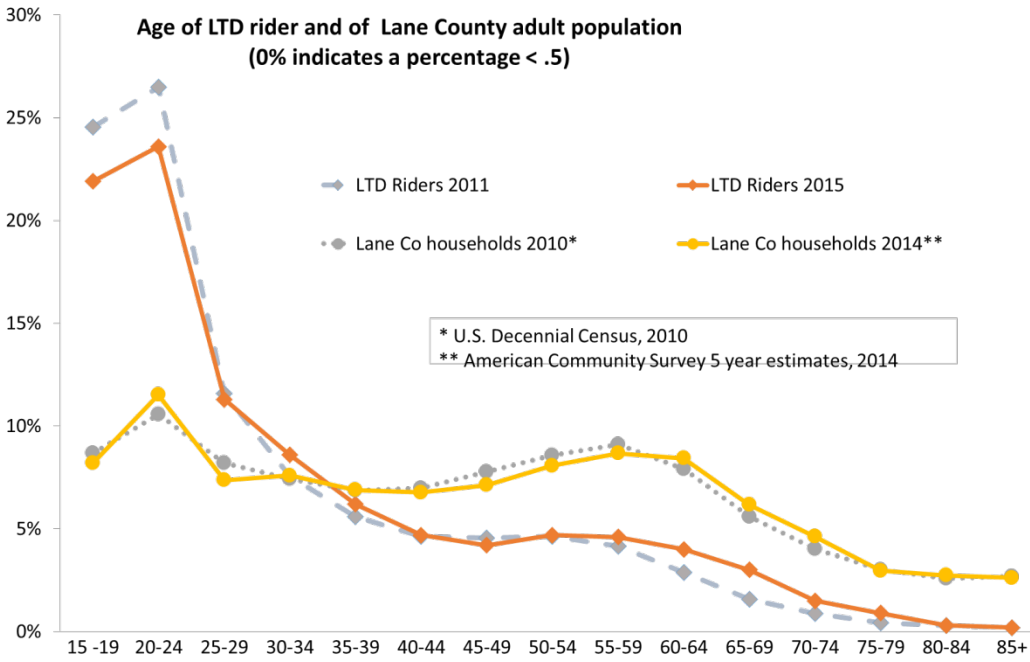
The level of transit dependency is, in part, a function of the rider's student status. The younger students, attending middle or high school (who comprise a relatively small portion, 8%, of the sample) are highly likely to report that although a car is available in the household, they themselves have no license. Thus, 63% of middle and high school riders say they have no license although a car is available in the household for every licensed driver, and another 16% say that they themselves lack licenses and those in the household who are licensed must share the car. A total of 79% of this group, then, could have some access to a vehicle, but they lack a license.

College students, in contrast (35% of the sample) are less likely than non-students to have neither license nor car (16% to 29%) and are more likely (28% to 17%) to have a license and share a car.

The bottom line is that of middle or high school students only 7% have a license and some access to a vehicle, while 43% of college students have both. In contrast to the college students, only 30% of non-students riders have a license and full or shared access to a vehicle.

Figure 6 Age of LTD Riders and of Lane County Population

(Only those 15 years old or older for both statistics)



	15 -19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
LTD Riders 2011	25%	26%	12%	8%	6%	5%	5%	5%	4%	3%	2%	1%	0%	0%	0%
LTD Riders 2015	22%	24%	11%	9%	6%	5%	4%	5%	5%	4%	3%	2%	1%	0%	0%
Lane Co households 2010*	9%	11%	8%	7%	7%	7%	8%	9%	9%	8%	6%	4%	3%	3%	3%
Lane Co households 2014**	8%	12%	7%	8%	7%	7%	7%	8%	9%	8%	6%	5%	3%	3%	3%

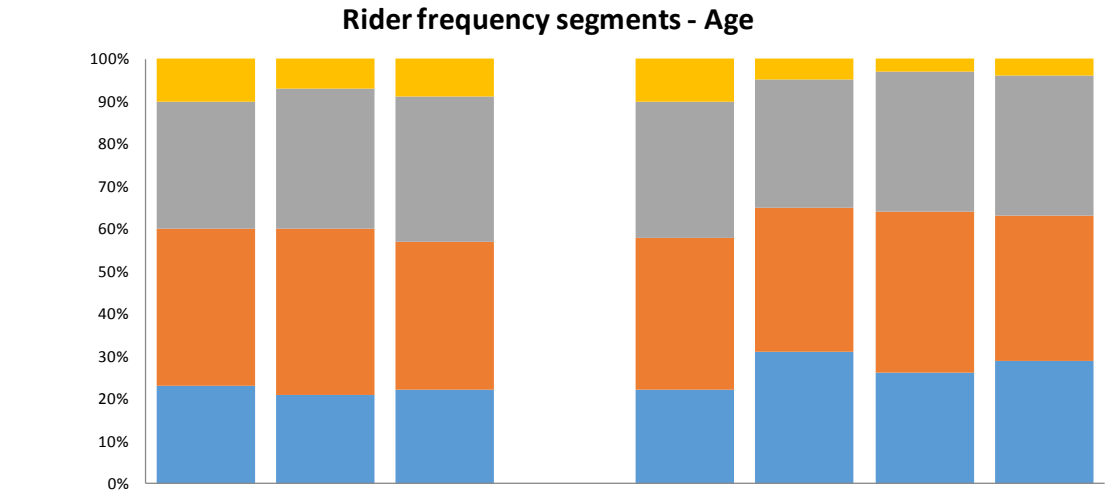
Age of LTD riders and age of the Lane County population

When we compare the age distribution of the total population (15 years of age and over) of Lane County to that of the LTD Ridership, we find that in 2015 as in 2011, the riders are:

- More likely than the general population to be between 15 and 24, though somewhat less-so than in 2011.
- Especially likely to fall in the 20 – 24 year old group (largely because of the strong use by college students).
- Less likely to be in all age groups over 35.

There is great continuity here. What we said in 2004, 2007, and 2011 continues to hold true in 2015: *"The skew of riders' age distribution toward the younger population is similar to that of transit ridership in most mid-sized cities. Public transit tends to be used more heavily by the young. However, in the case of LTD, the skew toward the youthful population is even more pronounced than we generally see in transit surveys in similarly sized cities. This is presumably a result of the heavy college student ridership."*

Figure 7 Rider Frequency Segments – Age



	1-3 days	4-6 days	7 days	2015	2011	2007	2004
Over 60	10%	8%	9%	10%	6%	4%	4%
31 to 60	30%	33%	34%	32%	30%	33%	33%
20 to 30	37%	39%	35%	36%	34%	38%	34%
Under 20	23%	21%	22%	22%	31%	26%	29%

Age

If we divide riders under the age of 60 into age groups as shown in Figure 7, and then separate a fourth age group of the riders aged sixty and older, we find the pattern shown above.

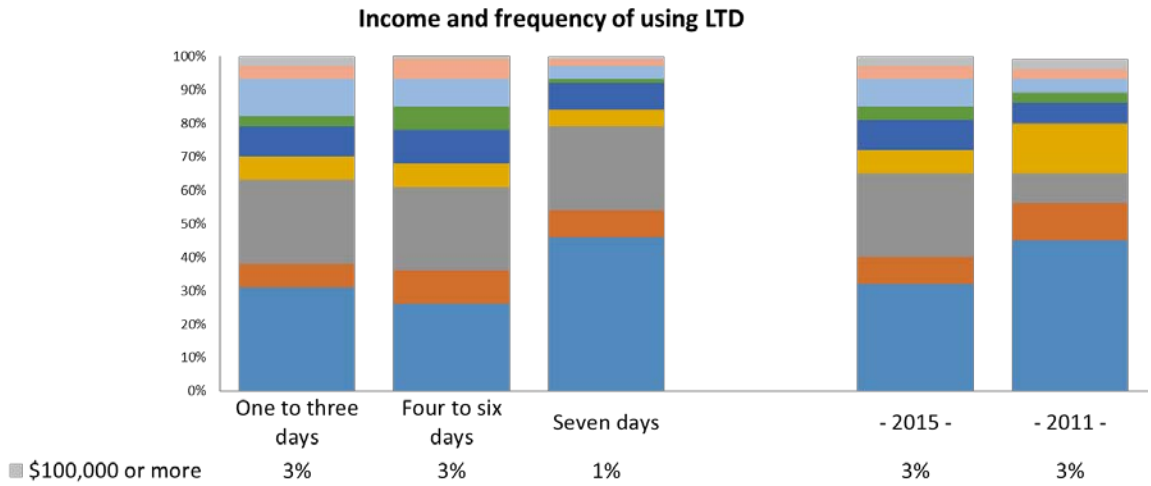
The rider frequency segments are very similar in terms of age. The LTD ridership tends to fall in a relatively younger, economically active age group. That is, riders are primarily in age groups that are employed or preparing for employment. In 2011, only 6% of all LTD riders were over 60. That percentage rose slightly to 10% in 2015 while the percent under the age of 20 declined markedly from 31% in 2011 to 22% in 2015.

Note: This chart, like several charts in this report which track characteristics over time, displays the data in two sets:

- At the left, in the first three columns, are the results from the 2015 survey broken down by rider frequency segments.
- At the right, in the last four columns are the results for the entire rider samples from 2004 to 2015.

This approach enables the reader to compare results of the current and most recent surveys and to compare the rider frequency segments within the current data.

Figure 8 Household Income, by Rider Frequency Segments



	One to three days	Four to six days	Seven days	- 2015 -	- 2011 -
$100,000 or more	3%	3%	1%	3%	3%
$75,000 to $99,999	4%	6%	2%	4%	3%
$55,000 to $74,999	11%	8%	4%	8%	4%
$45,000 to $54,000	3%	7%	1%	4%	3%
$35,000 to $44,999	9%	10%	8%	9%	6%
$25,000 to $34,000	7%	7%	5%	7%	15%
$15,000 to $24,999	25%	25%	25%	25%	9%
$10,000 to $14,999	7%	10%	8%	8%	11%
Less than $10,000	31%	26%	46%	32%	45%

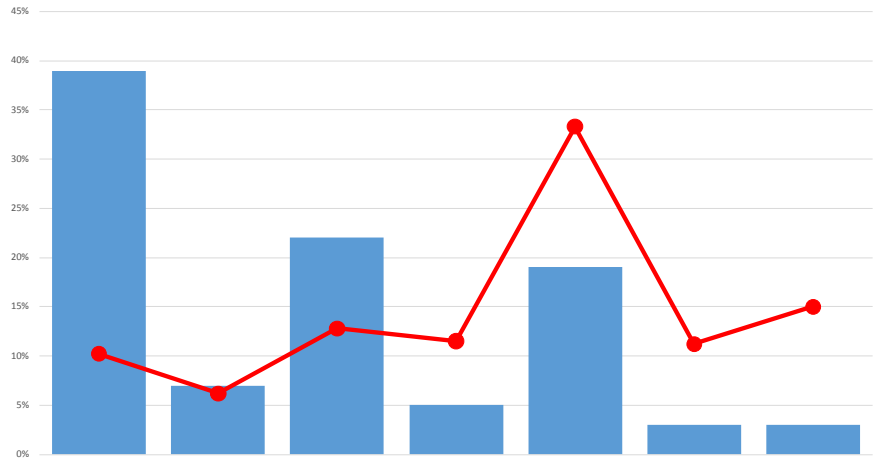
Household Income, by Rider Frequency Segments

Not surprisingly, LTD's most intensive riders, those who ride 7-days per week, are the most likely to have incomes under $10,000. However, every ridership frequency group includes a majority with household incomes of less the $25,000.

Since 2011, the percent of riders with incomes under $10,000 has declined, while those with incomes in the $15,000 to $25,000 range has increased.

Figure 9 Income of LTD Rider Households and the Lane County Population

Current household incomes of all LTD riders, compared to ACS estimate of household income distribution for Lane County, based on ACS combined data, 2009-2014. Read percentages left to right.



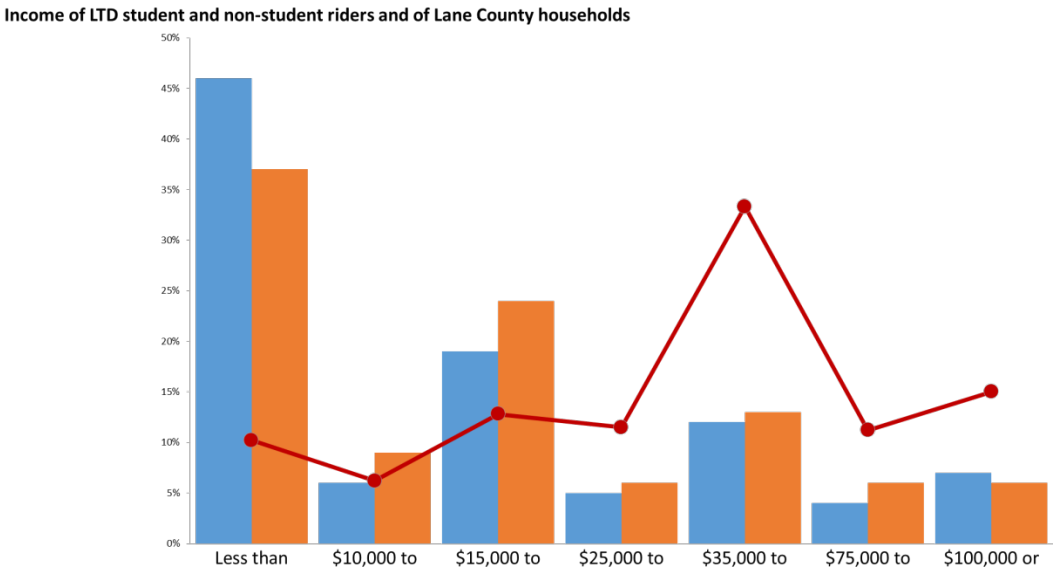
	Less than $10,000	$10-$14,999	$15-$24,999	$25-$34,999	$35-$74,999	$75-$99,999	$100,000 or more
All LTD Riders	39%	7%	22%	5%	19%	3%	3%
Lane County households (ACS, 5 Year estimate, 2014*)	10%	6%	13%	12%	33%	11%	15%

Income of LTD non-student Riders and of Lane County households

The total household income of LTD riders continues to be quite low in 2015 in absolute terms and in relation to all households in Lane County. Among all riders, 39% report household incomes of less than $10,000. This contrasts with all households in Lane County (10% at that income level), as shown by the red line which indicates the household income distribution as measured by the American community survey of 2014 (5 year compilation).

Notice also that while the ridership is uniformly lower in income than the total Lane County population, it follows a similar pattern of peaks and valleys of income. In part the peaks are an artificial result of the fact that the ACS reports household income in different groupings than are used in the survey form, and thus the sizes of the income segments are not uniform across the horizontal axis. But it is nonetheless interesting that patterns are similar.

Figure 10 Incomes of student and non-student households

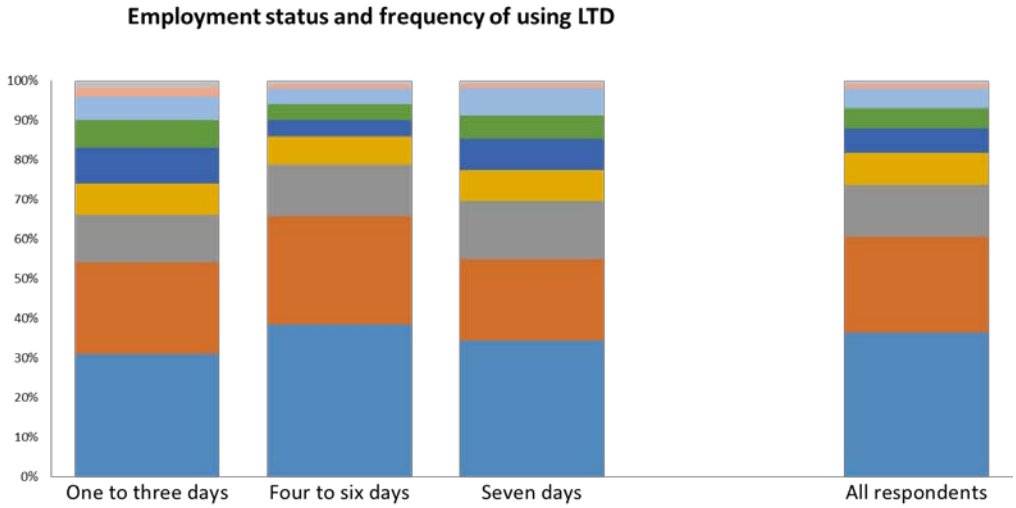


	Less than $10,000	$10,000 to $14,999	$15,000 to $24,999	$25,000 to $34,999	$35,000 to $74,999	$75,000 to $99,999	$100,000 or more
Student riders 20 and older	46%	6%	19%	5%	12%	4%	7%
Non-student riders, 20 or older	37%	9%	24%	6%	13%	6%	6%
Lane County households (ACS 2014 5 Year est*)	10%	6%	13%	12%	33%	11%	15%

Incomes of student and non-student households

In a transit system like LTD with a high proportion of student riders, there is always a question of the degree to which the student riders may tend to depress the overall measurement of the income of riders as a whole. Figure 10 indicates that the student riders do indeed tend to report lower household income than non-student rider households. However, the tendency to have income of less than $25,000 is similar in both groups. In short, the low income of the ridership is not caused by the large number of student riders.

Figure 11 Rider Frequency Segment – Employment & Student Trips



	One to three days	Four to six days	Seven days	All respondents
Employed at home	2%	1%	1%	1%
Homemaker	2%	1%	1%	1%
Disabled	6%	4%	7%	5%
Retired	7%	4%	6%	5%
Unemployed	9%	4%	8%	6%
Middle or HS or Other student	8%	7%	8%	8%
Student and employed	12%	13%	15%	13%
College student	23%	27%	21%	24%
Work outside home	31%	38%	35%	36%

Employment of the rider frequency segments

The great majority of the LTD ridership (81%) is either employed or a student, or both[2].

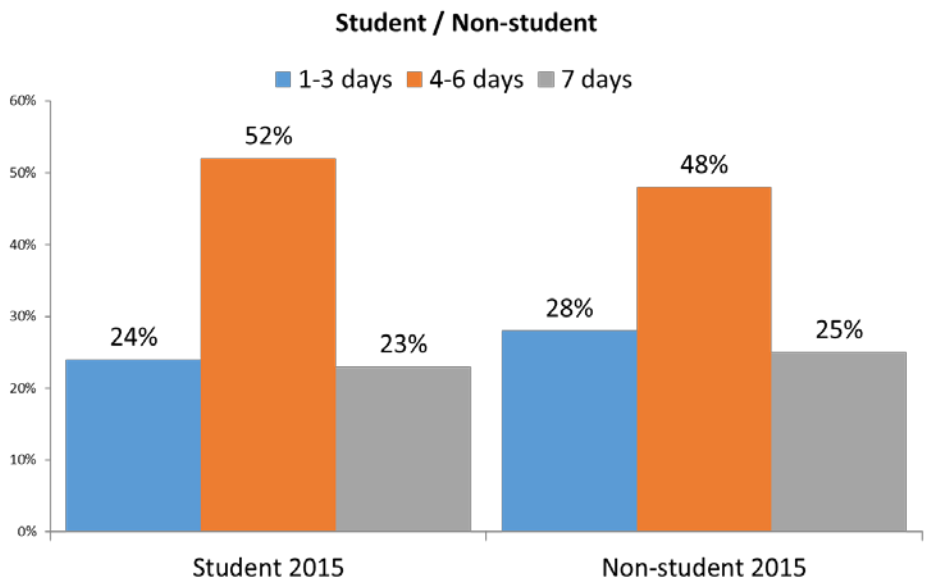
Of all LTD riders:

- 18% are neither employed nor a student
- 32% are only students
- 50% are employed (Including 1% employed at home and 13% who are both employed and students).

The four to six day riders have the highest proportion of students who are not also employed (34%) and of employed persons (52%), and the fewest persons who are neither students nor employed (14%).

[2] Data from the 2011 survey are not strictly comparable except at a very general level. Unlike in 2015, riders in the 2011 survey were not asked to identify their employment characteristics directly. Instead their employment was inferred from their origins, destinations, trip purpose, and the types of fare media used. Any difference could too easily result from the methodological difference to report it.

Figure 12 How is Student Status Related to Frequency of Riding?



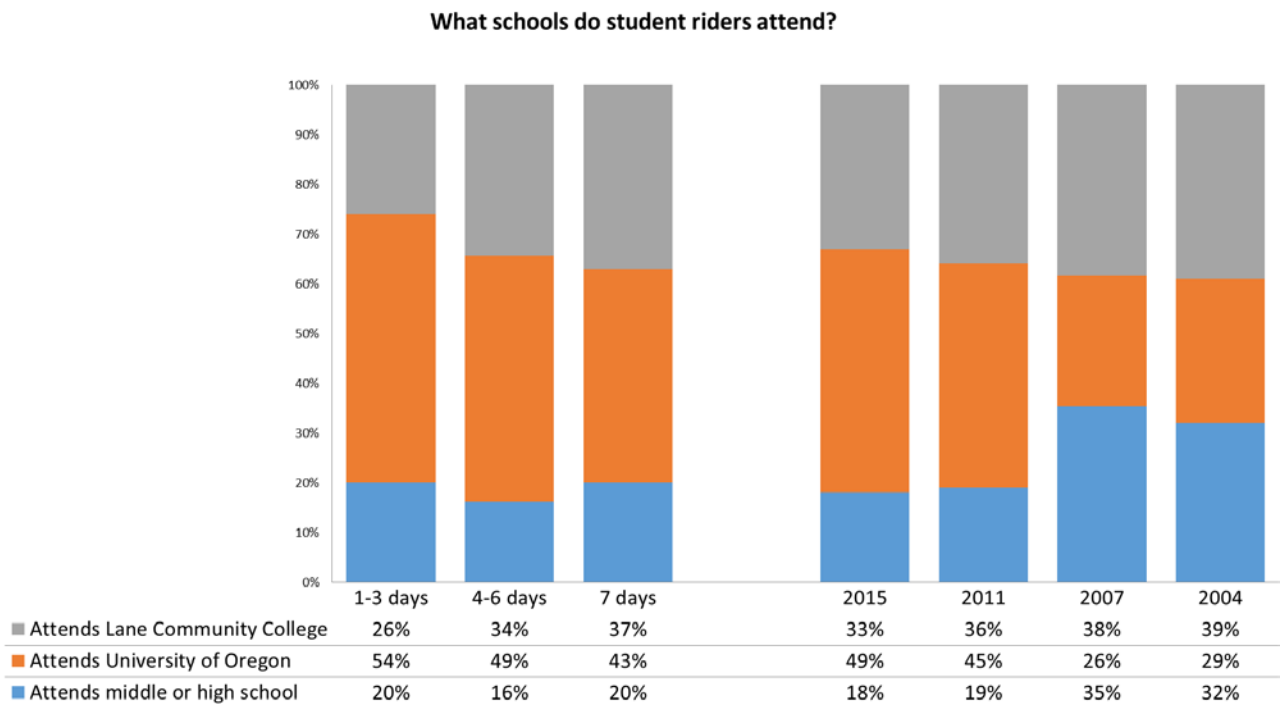
How is Student Status Related to Frequency of Riding?

A substantial proportion of LTD riders (43%) are students[3]. Their riding tendencies would therefore affect the total usage tendencies of the system if they differ substantially from the usage patterns of others. However, while there are differences, they are minimal. Students tend to use LTD slightly more frequently than non-students. While 52% of student riders travel on LTD 4 to 6 days a week, 48% of non-students use LTD from 4 to 6 days a week. There is only a 2% difference in the seven day usage, with 25% of non-students using LTD seven days a week, and 23% of students using it that often. In addition, more non-students (28%) use LTD only one to three days a week than students (24%).

Figure 13 Percentage of LTD Riders Who Are Students and Non-Students 2015

[3] In the 2011 survey, respondents were not asked directly whether they were students. Student status was derived from a combination of origin, destination, and type of bus pass used. In 2015, respondents were asked directly. The results are not comparable and thus the comparison is not reported.

Figure 14 What school student riders attend

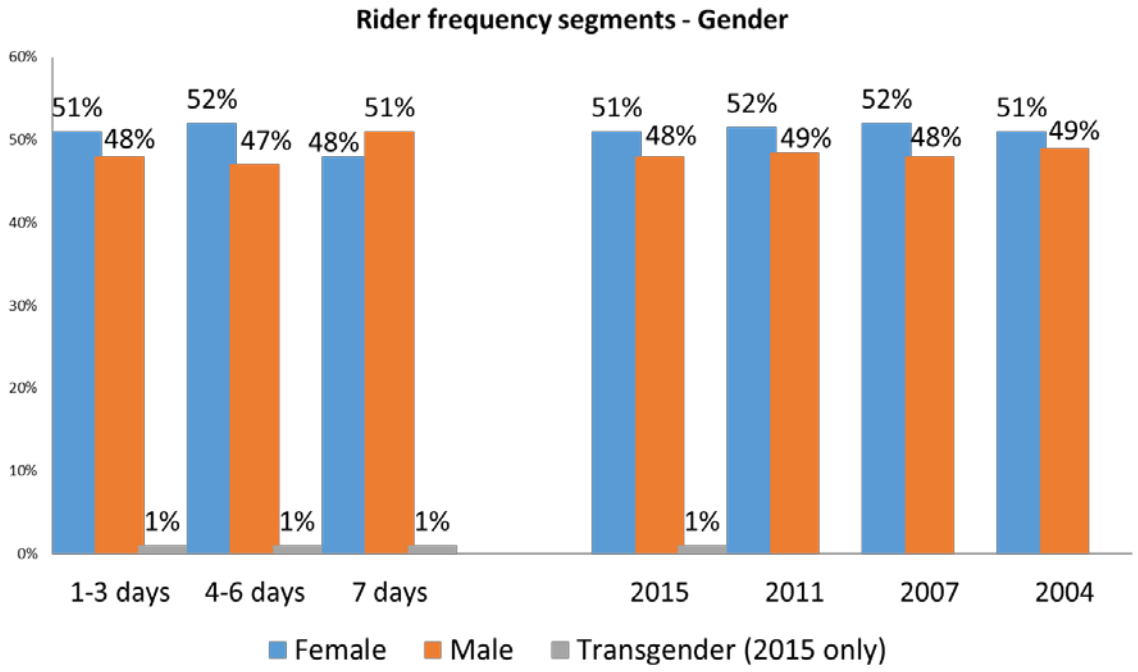


	1-3 days	4-6 days	7 days	2015	2011	2007	2004
Attends Lane Community College	26%	34%	37%	33%	36%	38%	39%
Attends University of Oregon	54%	49%	43%	49%	45%	26%	29%
Attends middle or high school	20%	16%	20%	18%	19%	35%	32%

What school student riders attend

The employment/student status question included specific responses for Middle/High School students, LCC students and UO Students. The chart above shows the distribution of school attendance among the 47% of respondents who said they were students.

Figure 15 Rider frequency segments - Gender



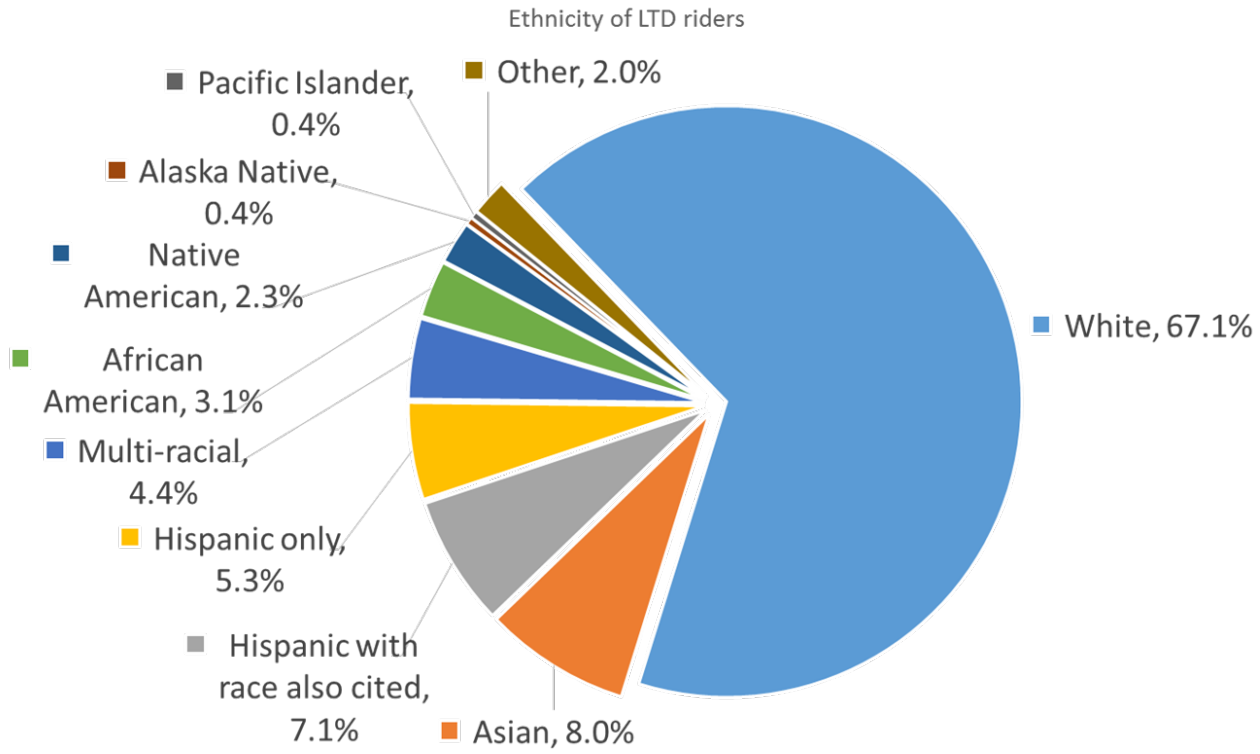
Gender

The percentages of riders who are male and who are female are statistically unchanged since 2004. The category "Transgender" was added in 2015.

The proportions of male and female riders are fairly consistent among the rider frequency groups. However, while the one to three day and four to six day riders are majority female by 3% and 5% respectively, the seven day riders are majority male by 3%. This is an interesting change from 2011, when the seven day riders were 51% female and 49% male.

2010 census data shows that 50.8% of Lane County's population is female.

Figure 16 How riders identify themselves in terms of race and ethnicity



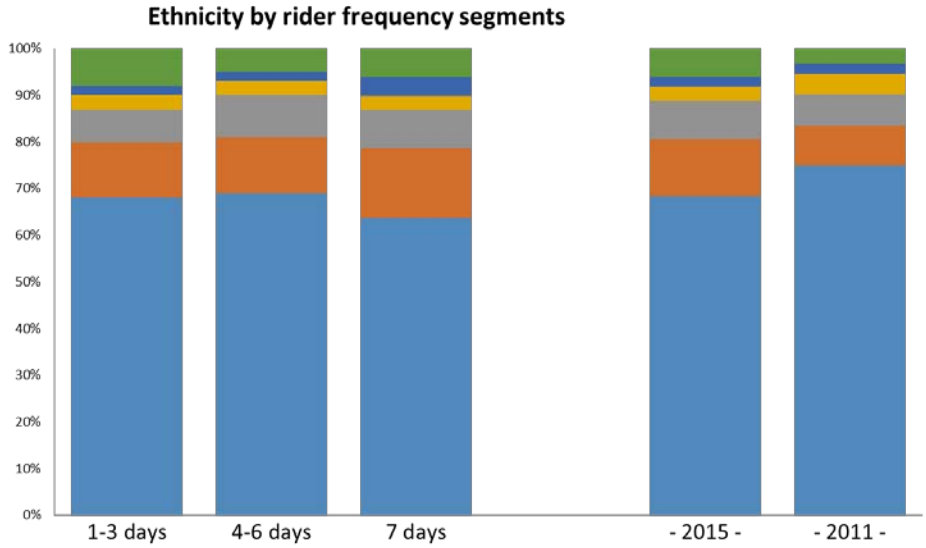
How riders identify themselves in terms of race and ethnicity

Figure 14 displays in detail how LTD riders identify themselves in terms of race and Hispanic ethnicity. Slightly more than two thirds of LTD riders identify themselves as Caucasian or white.

About 12.5% identified as Hispanic. Some who identified themselves as Hispanic, also identified with a racial category, while others simply said they consider themselves Hispanic and left it at that.

Taken as whole, the ridership is comprised of approximately two thirds Caucasian and one third of various minority groups.

Figure 17 Rider Frequency Segments - Ethnicity



	1-3 days	4-6 days	7 days	- 2015 -	- 2011 -
Other	8%	5%	6%	6%	3%
Native American Indian	2%	2%	4%	2%	2%
African American/Black	3%	3%	3%	3%	4%
Asian/Pacific Islander*	7%	9%	8%	8%	7%
Hispanic/Latino**	12%	12%	15%	12%	9%
Caucasian/White	68%	69%	63%	67%	75%

*"Asian" makes up 99.9% of this category. ** Hispanic identity was asked as a separate question in 2015, a technique that, compared to 2011, results in greater detail and increases positive response.

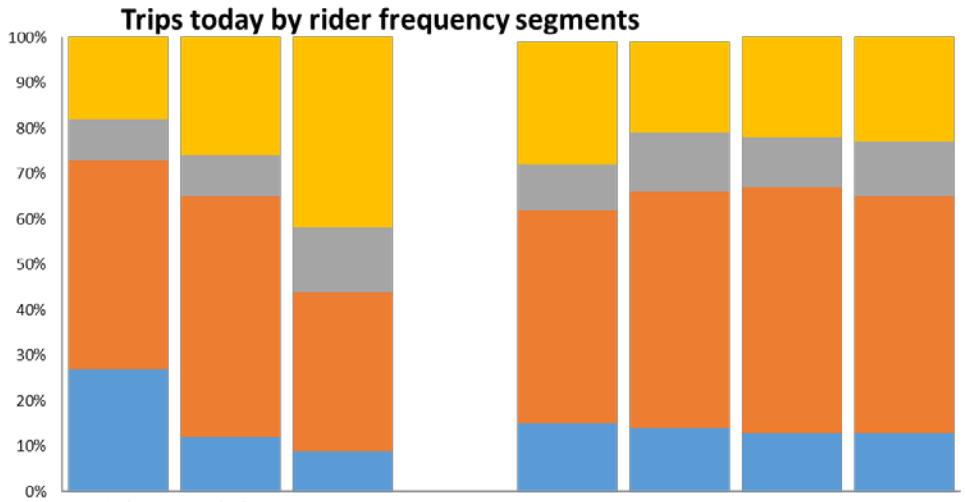
Ethnicity of Rider Frequency Segments

Two thirds of LTD riders identify themselves as Caucasian in 2015. This represents a decline from 75% in 2011. The remaining 33% have a variety of origins, as we saw in Figure 14.

The 2010 census reports the following ethnic profile for Lane County: White/Non-Hispanic 84.7%, Hispanic 7.4%, Asian 2.4%, Native American 1.2%, Black 1%, persons reporting 2 or more races 4.2%. LTD riders are considerably more likely to be of minority ethnicity than the general population.

Travel Profile – How Riders Use LTD

Figure 18 Trips per Day by Rider Frequency Segments, 2015, 2011, 2007 and 2004



	1-3 days	4-6 days	7 days	2015	2011	2007	2004
4 or more trips	18%	26%	42%	27%	20%	23%	24%
3 trips	9%	9%	14%	10%	13%	11%	12%
2 trips	46%	53%	35%	47%	52%	54%	52%
1 trip	27%	12%	9%	15%	14%	13%	13%

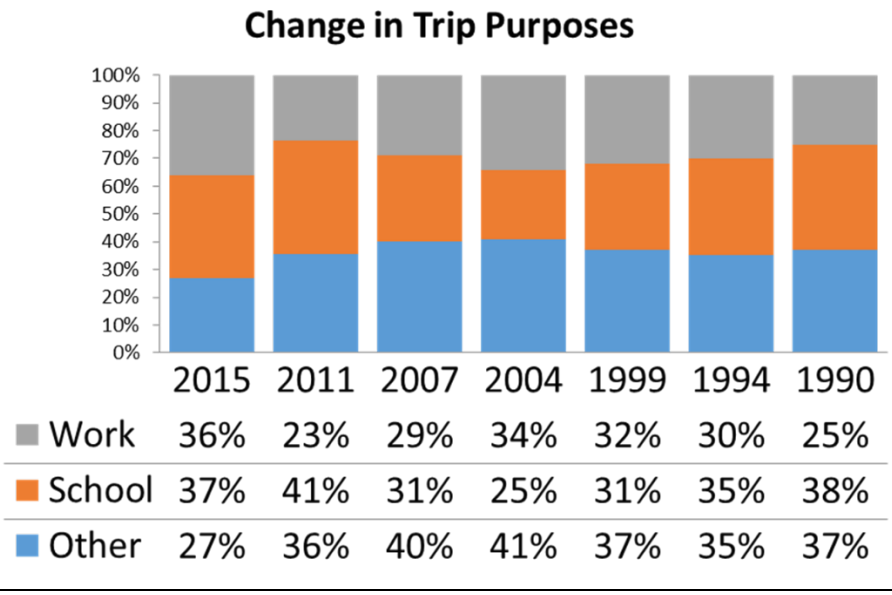
Trips per day by rider frequency segments

Riders were asked how many one-way trips they would make on the day they were surveyed.

Close to half (47%) of riders make two one-way trips per day (essentially a round trip), down somewhat from previous years. The percentages making each given number of trips (i.e., one, two, three, four or more) had been very stable from 2004 to 2011. However, in 2015 the number making four or more trips increased from 20% in 2011 to 27% in 2015, while those making two trips declined from 52% to 47%.

The chart above also shows how the frequency of using transit is a compound function of trips per day and the days per week transit is used. For example, not only are the seven-day-a-week riders heavy users in the sense of using transit daily, but also in the sense of making several trips per day. Specifically, 42% of those using LTD seven days a week said they make four or more trips per day, and this is up from 33% in 2011. Thus it is clear that the seven-day-a-week riders contribute disproportionately to LTD's overall ridership. However, the increase in trips per day also occurred among those who use LTD from one to three days a week also. They went from 12% making four or more such trips to 18%. Similarly, those using LTD four to six days a week went from 18% making four or more trip to 26%.

Figure 19 Consistency of Trip Purposes since 1990



Consistency of trip purposes 1990-2015

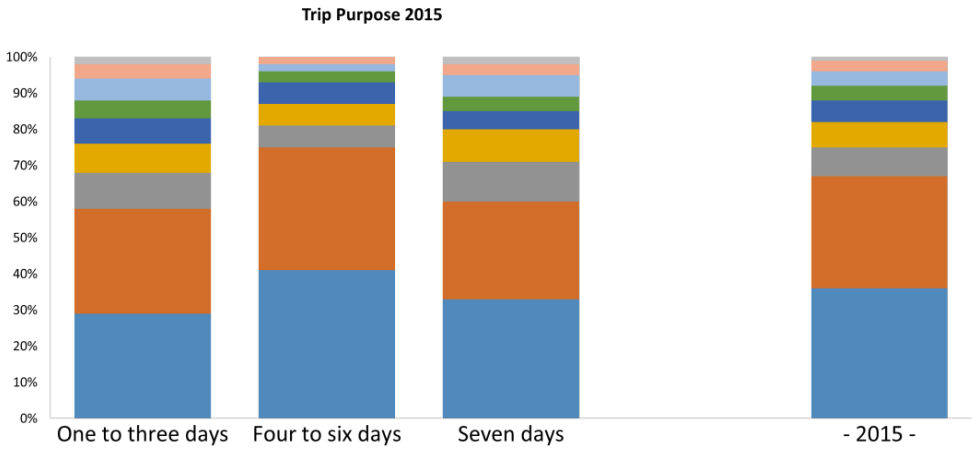
LTD rider surveys have been conducted since 1990. The format of asking trip purpose has changed several times, but it has been consistent enough to track three general types of trip purpose over time.

Figure 20 Unemployment in Oregon

Labor Force Statistics from the Current Population Survey. Bureau of Labor Statistics, Dec. 2015

Trip purposes have been quite stable over time, but there have been fluctuations. For example, the 2015 trip purpose results (shown at the left of the chart) are more similar to those of 2004 than to those of 2007 or 2011. This may have to do with the fact that the economy was improving in 2004, an improvement that continued until 2008, although unemployment had begun to increase very slightly by the fall of 2007. Unemployment remained high in 2011, but by the time of the survey in 2015 unemployment had returned to 6%, almost to the 2007 level of 5.4%. In the intervening years it has been widely reported that many people dropped out of the job market and went to school. This shift might account for at least some of the fluctuations between work and school trip-purposes in that period.

Figure 21 Trip Purpose



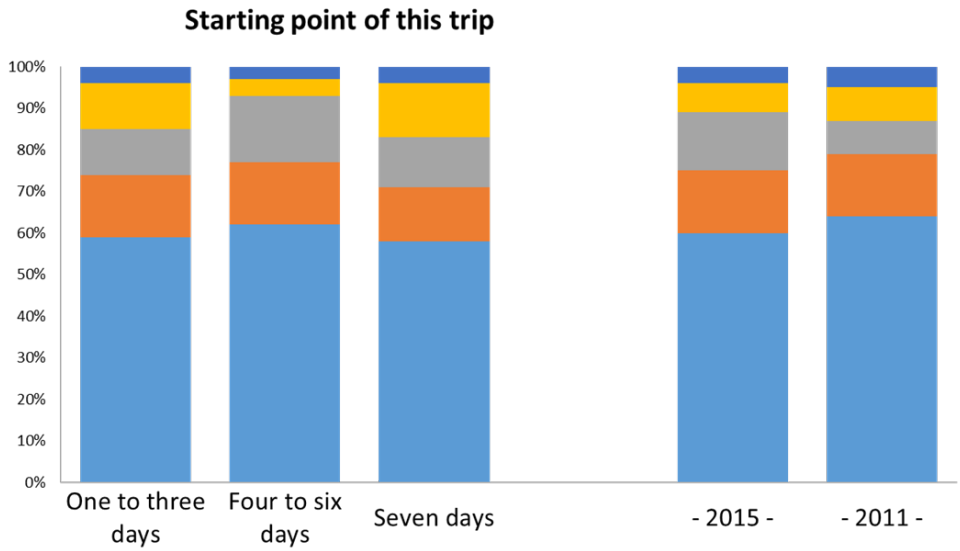
	One to three days	Four to six days	Seven days	- 2015 -
Social service aptmt	2%	1%	2%	2%
Medical/Dental	4%	2%	3%	3%
Other	6%	2%	6%	4%
Entertainment/recreation	5%	3%	4%	4%
Middle/HS	7%	6%	5%	6%
Visiting others	8%	6%	9%	7%
Store or restaurant	10%	6%	11%	8%
College	29%	34%	27%	31%
Work	29%	41%	33%	36%

Trip Purpose in Detail, 2015 Only

As one would expect, those who use LTD buses from four to six days a week are the riders most likely to say they are making work trips (36%) or school trips (college or lower grades, 37%).

In 2011 the category "Get home" was added to the trip purposes to accommodate the transportation modeling function. That response was also included in the 2015 survey questionnaire. In both surveys, some people, unfortunately, gave only that "home" response as point of both origin and destination, and gave no further clue as to their real purpose. They included 20% in 2011 and 13% in 2015. They have been dropped from the chart above because that response is not useful to understanding rider motivations.

Figure 22 Where LTD Trips Begin



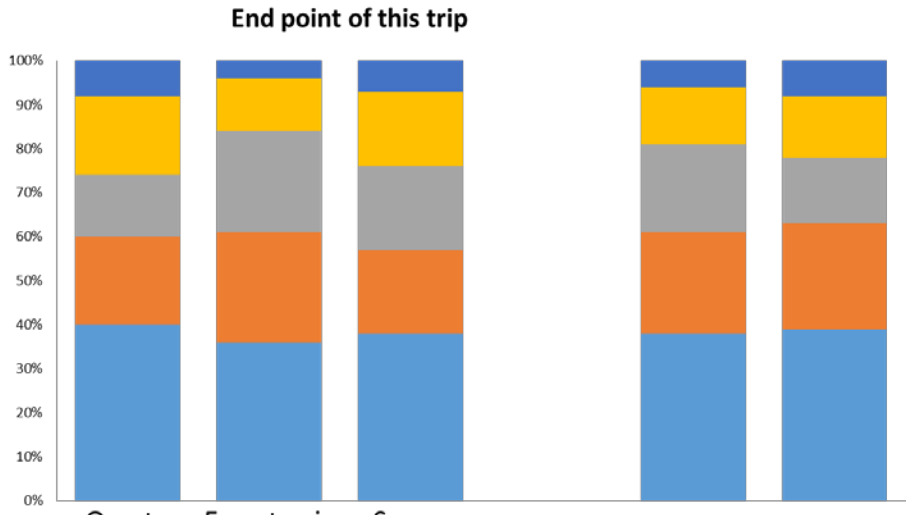
	One to three days	Four to six days	Seven days	- 2015 -	- 2011 -
Shops/stores/restaurant	4%	3%	4%	4%	5%
Other	11%	4%	13%	7%	8%
Work	11%	16%	12%	14%	8%
School/college	15%	15%	13%	15%	15%
Home	59%	62%	58%	60%	64%

Where LTD Trips Begin

Sixty percent (60%) of LTD trips begin at the riders' homes. The other common points of origin are school (15%) and work (14%).

There are only minor and ignorable variations in this pattern among the rider frequency segments.

Figure 23 Type of Destination



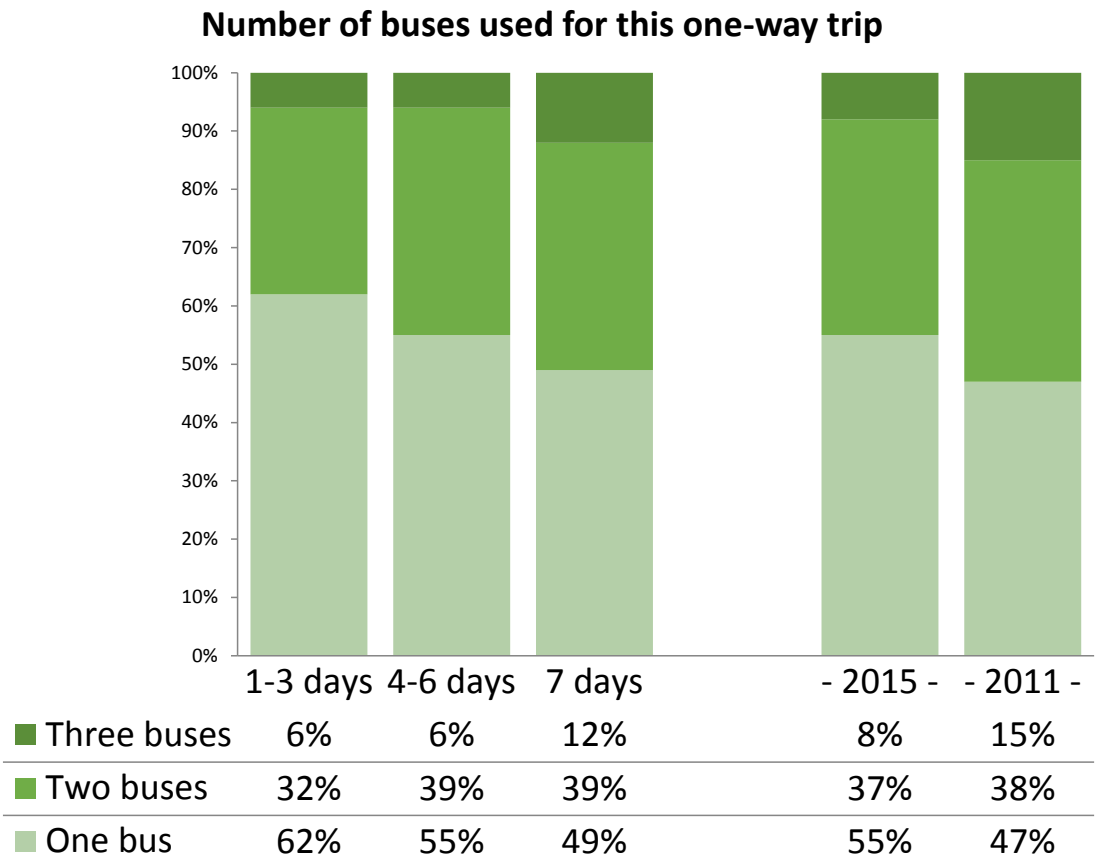
	One to three days	Four to six days	Seven days	- 2015 -	- 2011 -
Shops/ Stores/ Restaurants	8%	4%	7%	6%	8%
Other	18%	12%	17%	13%	14%
Work	14%	23%	19%	20%	15%
School/College	20%	25%	19%	23%	24%
Home	40%	36%	38%	38%	39%

Type of destination for this trip

Trip destinations have not changed substantially since 2011 except in one respect: the percentage of trips involving getting to or from work increased from 15% to 20%. This is consistent with the observations made previously regarding changes in employment since 2011.

Notice that in 2015, 38% of riders indicated that their destination was "home." Apparently they had completed their initial trip, and were then on their way home. Approximately one fourth (23%) indicated that their destination was a school or college. Another 6% were heading for shops, stores, restaurants, while 13% named a miscellaneous designation.

Figure 24 Number of Buses Used for One-Way Trip



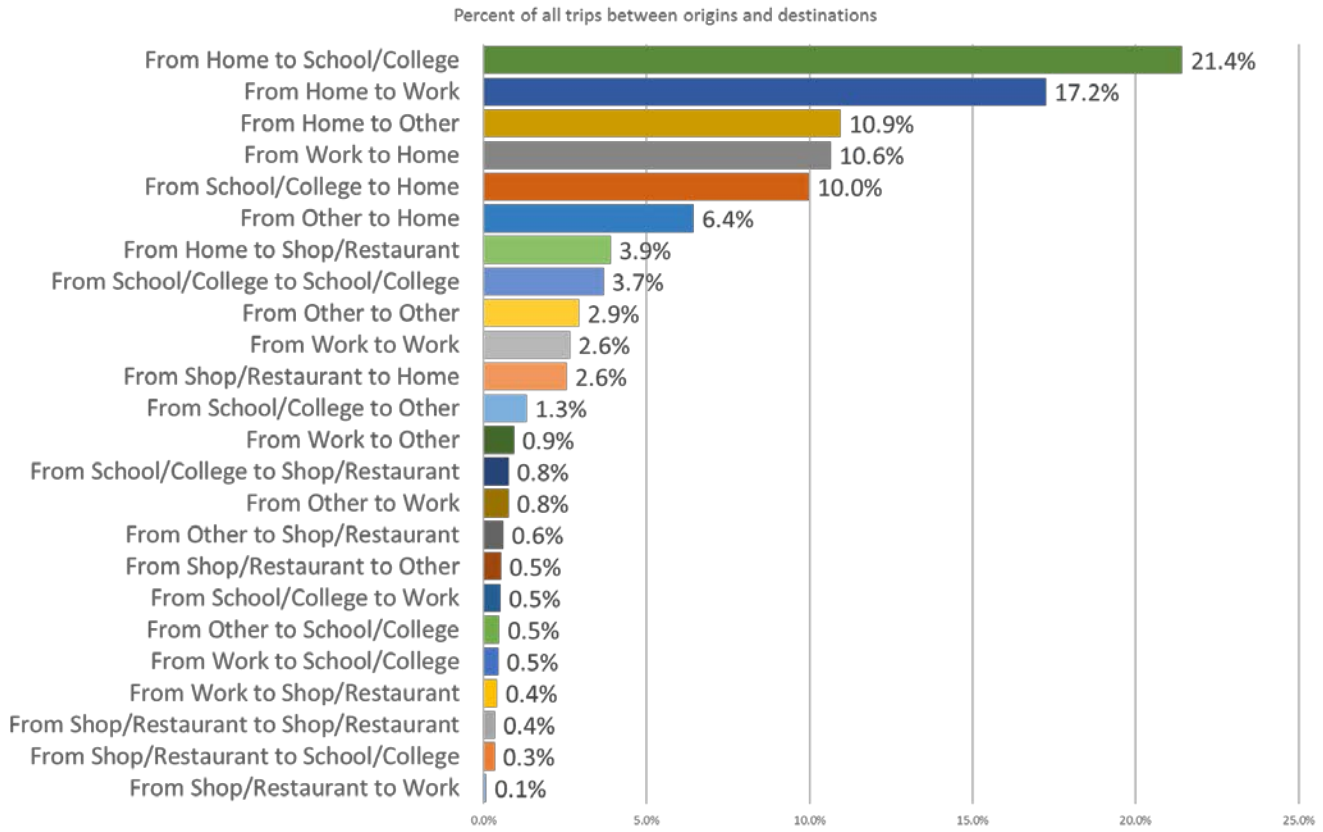
How Many Buses Do LTD Riders Use to Make One Trip?

There has been a major change in the rate of transfers – i.e., the use of multiple buses to complete a one-way trip. In 2015, more than half of riders (55%) say they are able to complete their one-way trip with a single bus, while 37% use two buses. Another 8% say it requires three buses to reach their destination. These percentages represent a major change from 2011 when the comparable figures were 47% using a single bus, 38% using two buses, and 15% using three.

Change in the number of buses used

	1-3 days		4-6 days		7 days		All respondents	
	- 2015 -	- 2011 -	- 2015 -	- 2011 -	- 2015 -	- 2011 -	- 2015 -	- 2011 -
Three buses	6%	12%	6%	13%	12%	21%	8%	15%
Two buses	32%	36%	39%	39%	39%	39%	37%	38%
One bus	62%	52%	55%	48%	49%	40%	55%	47%

Figure 25 Origin/Destination pairs - functional, not geographic



Function Origin/ Destination Pairs

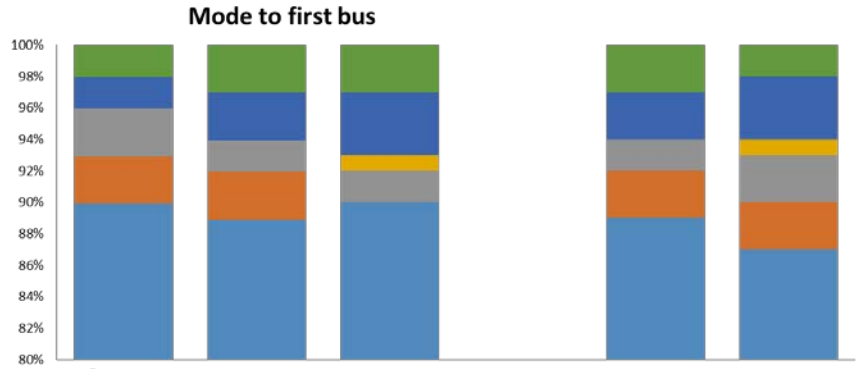
In Figure 24 the percentages are based on the total rider sample so that the sum of all percentages equals 100%. However, home to home trips are excluded[4]. All points of origin with their corresponding destinations are shown, with that exception.

Most riders are going from home to school/college (21.4%, while another 10% are going in the reverse direction from school/college to home, for a total of 31.4% traveling between their home and their study location.

Another 17.2% are traveling from home to work, while 10.6% are making the return trip from work to home (total of 27.8%). Thus a total of 59.2% are making one of these basic types of commuting trips.

[4] It is thus not shown in the chart, but of all riders, 15.7% indicated that home was both the point of origin and destination of their trip. Except for the trivial number who may have been making a round trip simply for recreation, we discount these riders as having misunderstood the nature of the "one-way" trip about which they were being asked.

Figure 26 Mode to the Initial Stop

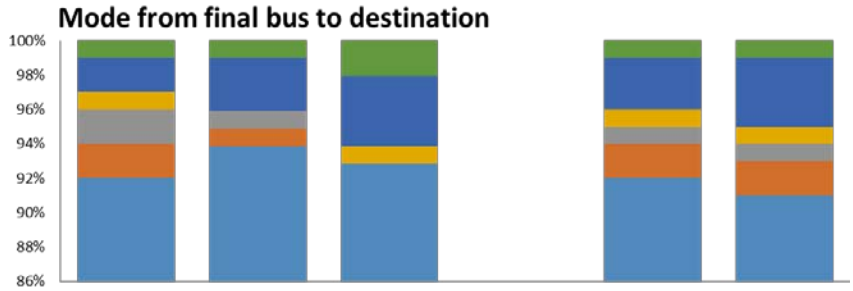


	One to three days	Four to six days	Seven days	- 2015 -	- 2011 -
Other	2%	3%	3%	3%	2%
Bike	2%	3%	4%	3%	4%
Wheelchair/Scooter	0%	0%	1%	0%	1%
Dropped off by someone	3%	2%	2%	2%	3%
Drive	3%	3%	0%	3%	3%
Walked	89%	88%	90%	89%	87%

Mode to the Initial Stop

How do riders get to their stop of origin? Most walk or use a wheelchair (89%), but a few drive (3%), bicycle (3%) or are dropped off (2%). The primary variation in these tendencies is related to the financial differences among them. The seven day riders are least likely to have driven or to have been dropped off (2% total) compared to the four to six day riders (5%) and one to three day riders (6%). The reason has to do with the greater tendency of the latter two groups to have a vehicle available in the household.

Figure 27 Mode from Final Stop to Destination



	One to three days	Four to six days	Seven days	- 2015 -	- 2011 -
Other	1%	1%	2%	1%	1%
Bike	2%	3%	4%	3%	4%
Wheelchair/Scooter	1%	0%	1%	1%	1%
Picked up by someone	2%	1%	0%	1%	1%
Drive	2%	1%	0%	2%	2%
Walk	92%	92%	91%	92%	91%

Mode from Final Stop to Destination

Overwhelmingly, the mode from final stop to final destination is by walking or mobility device (93%). The few who drive (2%) are likely going home and using a park and ride arrangement.

Figure 28 Cities of Trip Origin and Destination

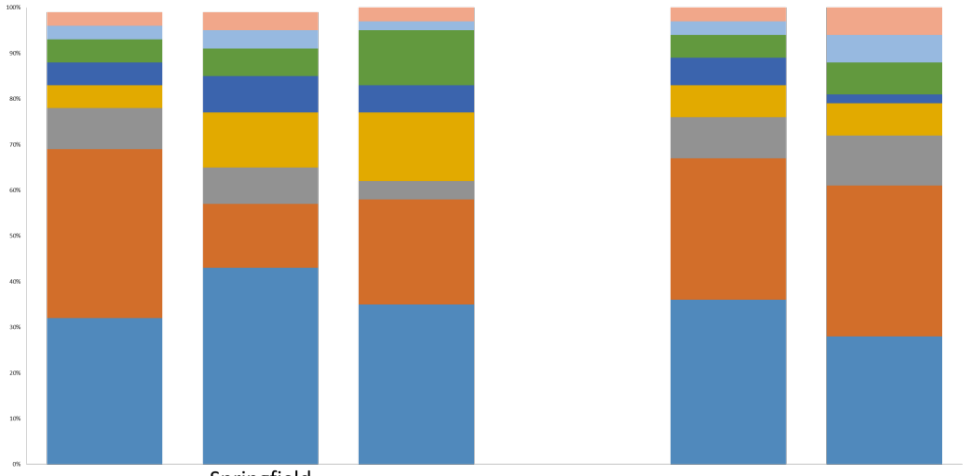
	Eugene to Eugene	Springfield to Eugene	Springfield to Springfield	Eugene to Springfield	Other to Eugene	Eugene to Other	Springfield to Other	Other to Springfield	Other to Other
2015	61.8%	13.4%	11.7%	9.3%	1.7%	1.0%	0.2%	0.5%	0.4%
2011	60.9%	12.3%	12.6%	8.8%	1.8%	0.9%	0.4%	0.5%	0.4%
2007	59.8%	11.8%	14.2%	9.0%	2.2%	1.1%	0.3%	0.8%	0.7%
2004	65.5%	10.2%	10.2%	8.2%	2.5%	1.8%	0.8%	0.4%	0.3%
1999	66.7%	9.9%	9.4%	7.3%	2.1%	2.2%	0.6%	0.6%	1.1%

City Origins and Destinations

The patterns of city to city or area to area travel in 2015 are highly similar to what they were in previous years. Most trips by LTD continue to be within Eugene (61.8%) with travel between Springfield and Eugene accounting for a total of another 22.7% of trips. Travel within Springfield accounts for another 11.7% of trips surveyed. Only 3.8% of trips originate or end in the other small communities.

These patterns have changed very little since the first study in 1999, although between 2004 and 2007 the percent of all trips within Eugene declined by approximately 5% and the change appears to have been permanent.

Figure 29 Location: Trip purpose variations by city of origin



	Eugene (72%)	Springfield (25%)	Other (3%)	- 2015 -	- 2011 -
Medical/Dental Office	3%	4%	3%	3%	7%
Entertainment/Recreation	3%	4%	2%	3%	6%
Other	5%	6%	12%	5%	7%
Middle/High School	5%	8%	6%	6%	2%
Visiting Others	5%	12%	15%	7%	7%
Store or Restaurant	9%	8%	4%	9%	11%
College	37%	14%	23%	31%	33%
Work	32%	43%	35%	36%	28%

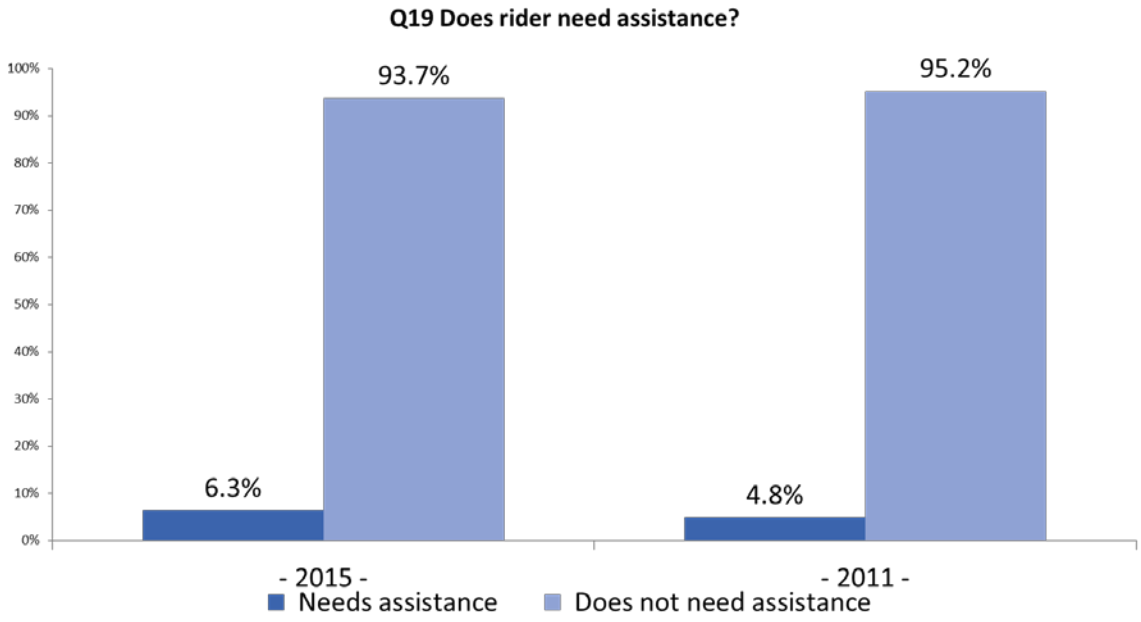
Location: Origins and Trip Purpose

Trip purposes vary substantially by city of origin[5]. Trips originating in Eugene are more likely to be by students heading to school or college (32%) than trips originating elsewhere. On the other hand, trips originating in Springfield are substantially more likely (43%) than trips originating in Eugene (32%) to have work as the destination.

[5] Here again those riders saying that their trips were to get home are omitted because that is not a functional purpose in the same sense that work, school, and other trip purposes are.

Needing Assistance to Use LTD

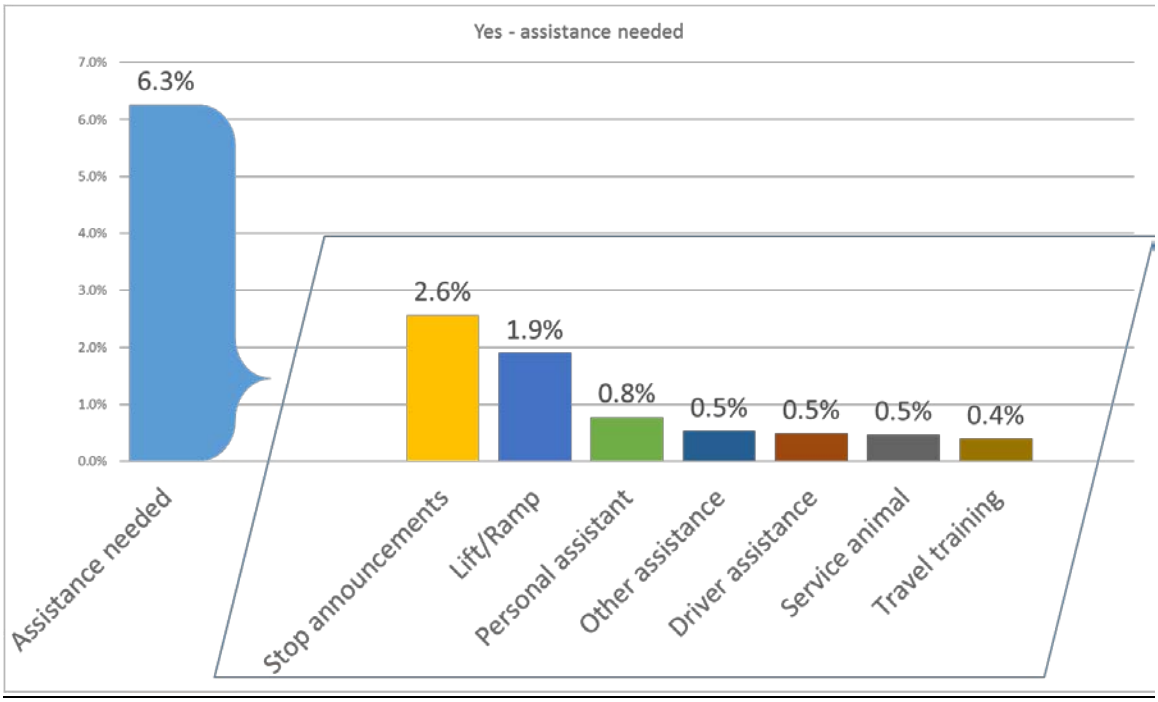
Figure 30 Needing Assistance to Use LTD



Needing Assistance to Use LTD

Of all LTD riders, 6.3% indicated that they needed some type of assistance in using the bus on the day of the survey, up from 4.8% in 2011. Conversely, of course, this means that 93.7% did not need assistance in 2015.

Figure 31 Percent of All LTD Riders Needing Each Type of Assistance



Percent of All LTD Riders Needing Each Type of Assistance

As we have seen, relatively few riders need assistance. The chart above shows the need for various types of assistance from the perspective of the entire LTD ridership[6].

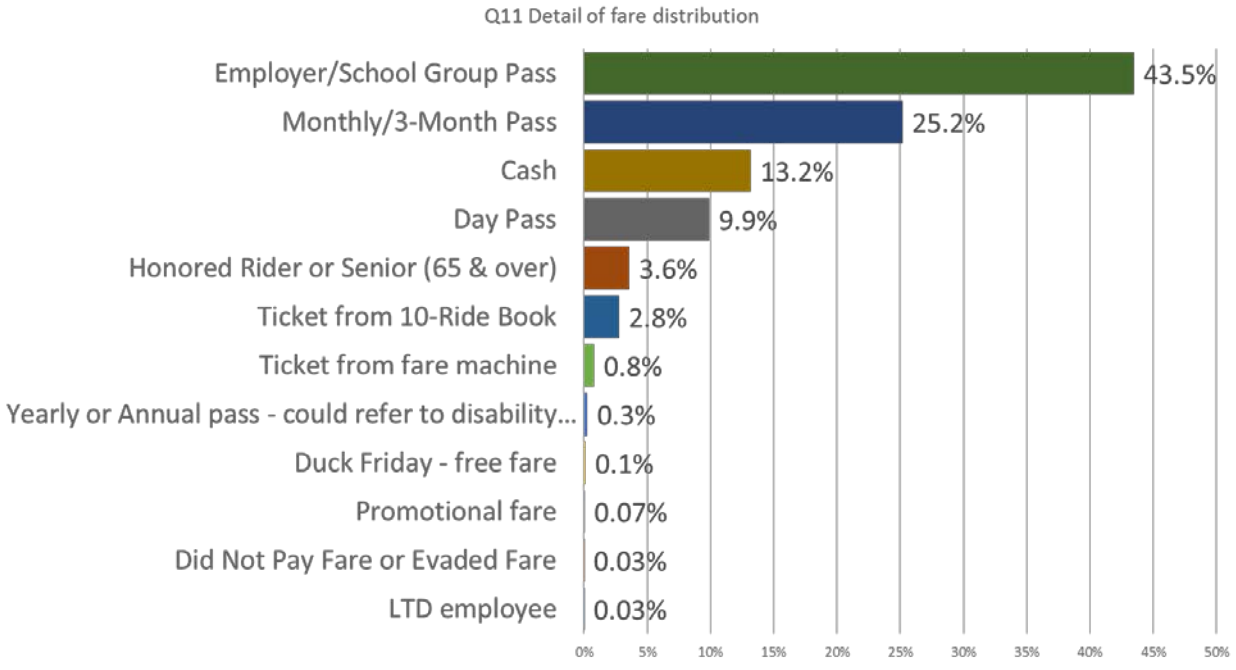
Stop announcements (2.6%) and the lift or ramp (1.9%) are needed by more riders than other forms of assistance.

[6] it should be noted that one rider can have multiple needs. Consequently the sum of the percentages of those needing assistance in the chart above exceeds the 6.3% shown in the previous chart.

T

Fare Media

Figure 32 Fare Media Used by All Riders

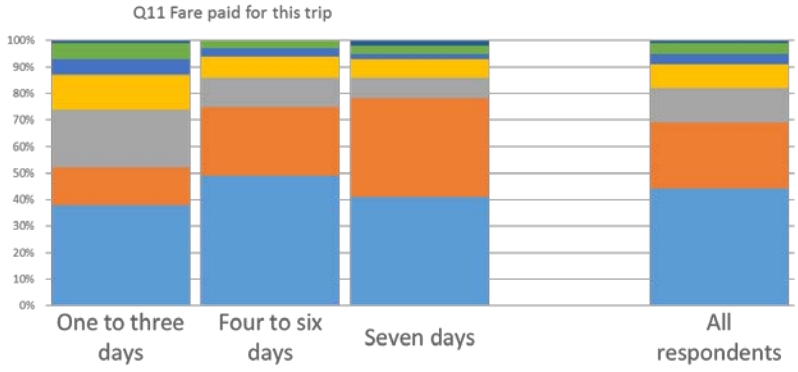


Fare Media Used by All Riders

Of all LTD riders, only 13.2% said they paid the fare in cash. Most riders used a pass of some kind. The largest group used an employer or school group pass (43.5%), while another 25.2% used a monthly or three months pass , and 9.9% used a day pass. Miscellaneous types of fare media round out the total.

The bottom line in this is that almost 87% use a medium other than cash. This provides convenience, speed of boarding, and discounts and subsidies to most riders, as well as saving LTD the challenges involved in handling as much cash as they would otherwise have to.

Figure 33 Fare Media Used, by Frequency of Using LTD

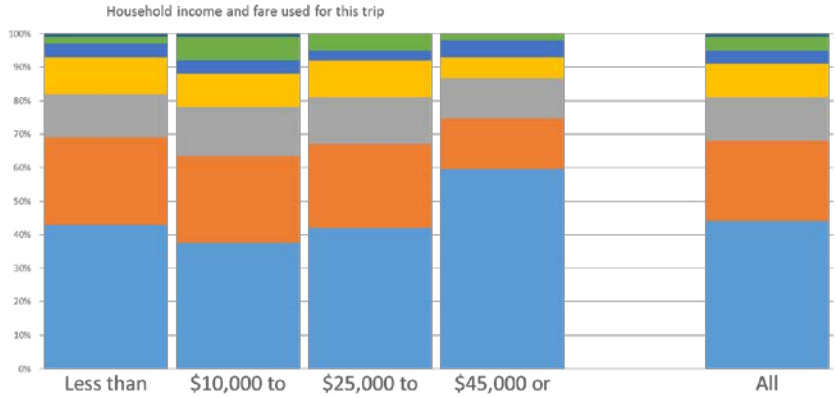


	One to three days	Four to six days	Seven days	All respondents
Other	1%	0%	2%	1%
Free (all categiories, including Honored Rider)	6%	3%	3%	4%
Ticket (Ten ride or from machine)	6%	3%	2%	4%
Day pass	13%	8%	7%	9%
Cash	22%	11%	8%	13%
Monthly/3 month pass	14%	26%	37%	25%
School/Employer	38%	49%	41%	44%

Fare media used, by frequency of using LTD

The fare media used vary somewhat with the frequency of riding. For example, the use of cash, tickets and the day pass is greatest (total of 41%), as one would expect, among the least frequent riders, and least among the most frequent (19%). The use of a school or employer pass is greatest among the four to five day riders (49%), although it is substantial among the seven day (41%) and the one to three day riders (38%) also.

Figure 34 Fare Media and Income



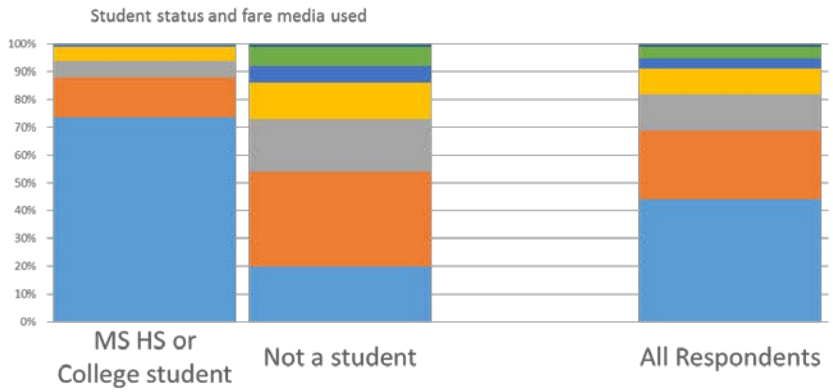
	Less than $10,000	$10,000 to $24,999	$25,000 to $44,999	$45,000 or more	All Respondents
Other	1%	1%	0%	0%	1%
Free (all categiories, including Honored Rider)	2%	7%	5%	2%	4%
Ticket (Ten ride or from machine)	4%	4%	3%	5%	4%
Day pass	11%	10%	11%	6%	10%
Cash	13%	15%	14%	12%	13%
Monthly/3 month pass	26%	26%	25%	15%	24%
School/Employer	43%	38%	42%	59%	44%

Fare Media and Income

Frequently we find that the use of cash fares is greater among those with lower incomes because the purchase price of a pass for an extended period is too great a burden on household cash flow. That is not the case at LTD. The lowest income group has the same rate of cash use (13%) as all riders and the range of variation among income groups is only between 12% and 15%. This suggests that there is considerable fare equity among the ridership.

The use of a school or employer pass is, however, considerably greater among the highest income group (59%). This presumably reflects the fact that more of that income group are employed.

Figure 35 Fare Media and Student / Non-student

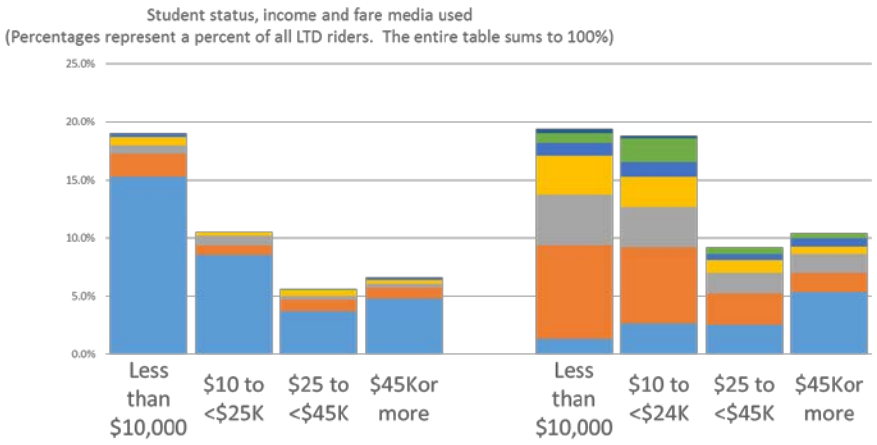


	MS HS or College student	Not a student	All Respondents
Other	0%	1%	1%
Free (all categiories, including Honored Rider)	0%	7%	4%
Ticket (Ten ride or from machine)	1%	6%	4%
Day pass	5%	13%	9%
Cash	6%	19%	13%
Monthly/3 month pass	14%	34%	25%
School/Employer	73%	20%	44%

Fare Media and Student / Non-student Status

For obvious reasons, the use of school/employer passes is far greater among students (73%) than non-students (20%). Another 6% of students pay cash. Some students apparently pay for a day pass (5%) or monthly pass (14%).

Figure 36 Fare Media and Income – As Percent of Total Ridership



Other	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.0%	0.0%
Free (all categiories, including Honored Rider)	0.0%	0.0%	0.1%	0.0%	0.8%	2.1%	0.6%	0.4%
Ticket (Ten ride or from machine)	0.3%	0.0%	0.0%	0.2%	1.1%	1.2%	0.5%	0.7%
Day pass	0.7%	0.3%	0.5%	0.3%	3.4%	2.6%	1.1%	0.7%
Cash	0.7%	0.8%	0.3%	0.4%	4.3%	3.5%	1.8%	1.6%
Monthly/3 month pass	2.0%	0.9%	1.0%	0.9%	8.1%	6.6%	2.7%	1.7%
School/Employer	15.3%	8.5%	3.7%	4.8%	1.3%	2.6%	2.5%	5.3%

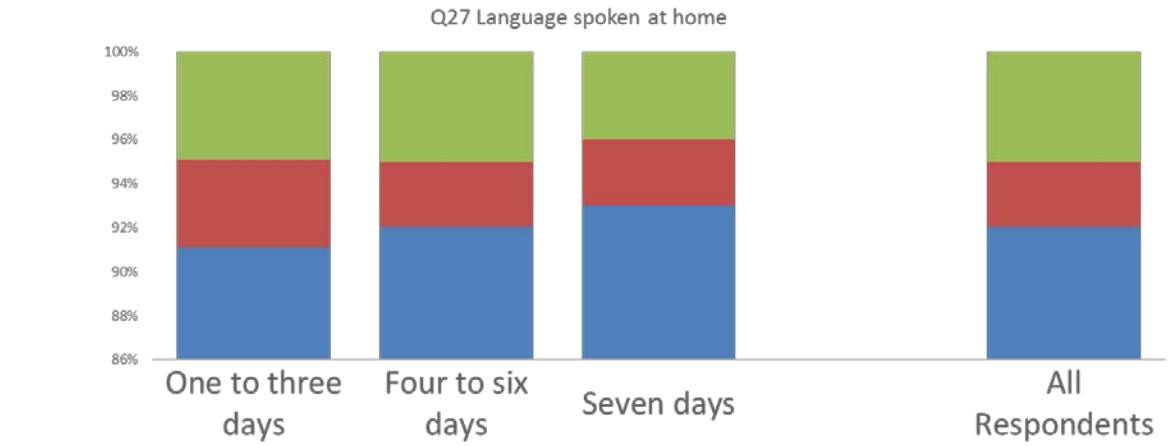
Fare Media and Income – As a Percent of Total Ridership

The percentages in Figure 34 are based on the entire ridership, not on the separate columns of data. When we look at the ridership as a whole in this way, placing the fare payment system in the context of the percent of all riders within each income level using each type of fare payment media, we see that the greatest single proportion of riders (15.3%) have household incomes of less than $10,000 and use a school or employer pass. Another 8.5% have incomes ranging from $10,000 to just under $25,000 and also use a school/employer pass.

Non-students with incomes ranging from less than $10,000 to just under $25,000 are more likely to use a monthly or three month pass, cash, or a day pass than a school/employer pass.

Communication

Figure 37 Language spoken at home

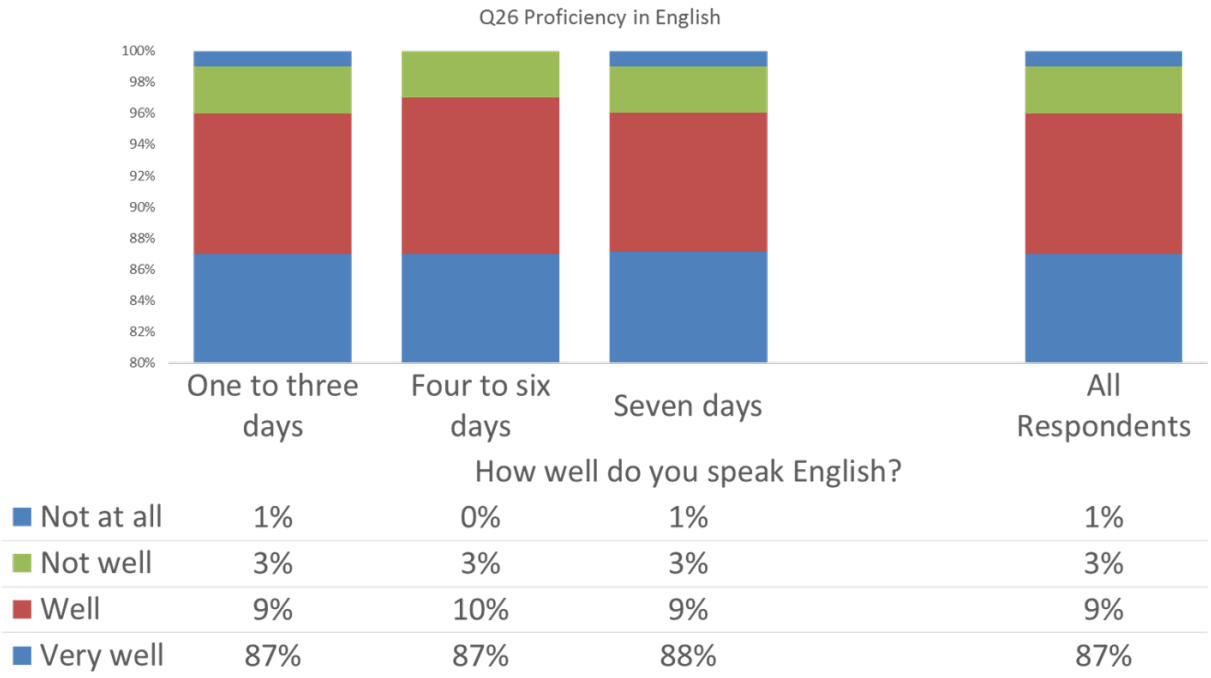


Language spoken at home	One to three days	Four to six days	Seven days	All Respondents
Other	5%	5%	4%	5%
Spanish	4%	3%	3%	3%
English	92%	92%	93%	92%

Language Spoken at Home

The overwhelming majority of LTD riders, 92%, speak English at home. Only 3% speak Spanish, and 5% speak a variety of other languages. This tendency does not vary significantly among the ridership frequency segments.

Figure 38 Proficiency in English



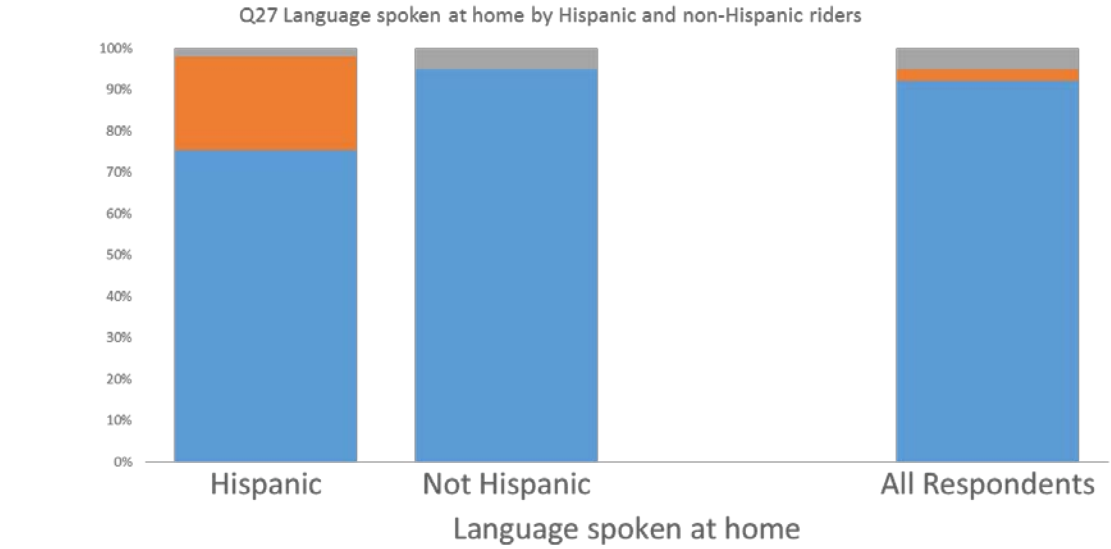
	One to three days	Four to six days	Seven days	All Respondents
Not at all	1%	0%	1%	1%
Not well	3%	3%	3%	3%
Well	9%	10%	9%	9%
Very well	87%	87%	88%	87%

Proficiency in English

Respondents were asked how well they speak English. The overwhelming majority, 87% said that they speak English very well, while another 9% indicated they speak it well. Only a total of 4% indicated that they speak it not well or not at all.

These tendencies do not vary significantly with the frequency of using LTD.

Figure 39 Language Spoken at Home by Hispanic and Non-Hispanic Riders

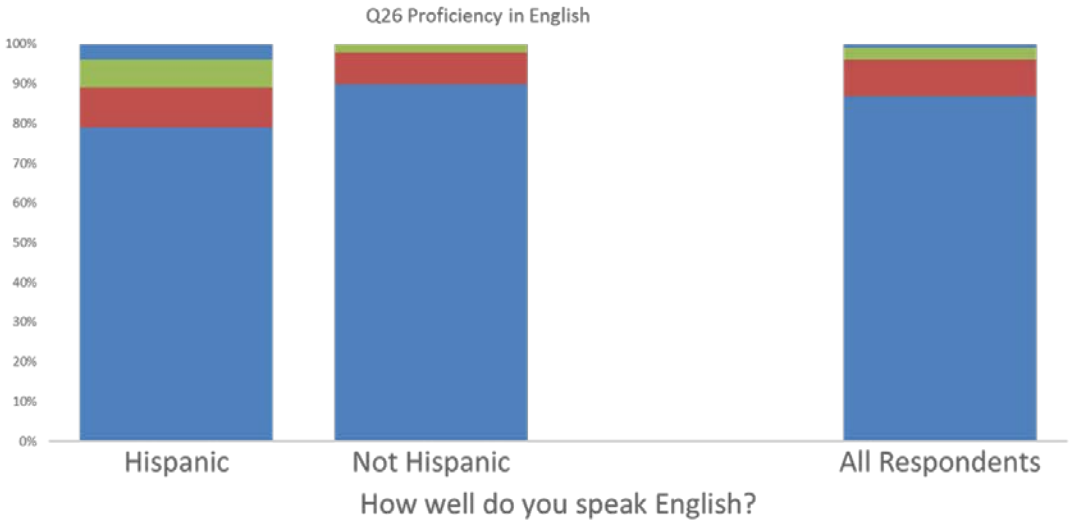


	Hispanic	Not Hispanic	All Respondents
Other	2%	5%	5%
Spanish	23%	0%	3%
English	76%	95%	92%

Language Spoken at Home by Hispanic and non-Hispanic riders

We saw in Figure 14 at approximately 12% of LTD riders identify themselves as Hispanic. Among the Hispanic riders, 76% indicate they speak English at home while 23% speak Spanish, and 2% another Latinate language.

Figure 40 Proficiency in English among Hispanic and non-Hispanic riders

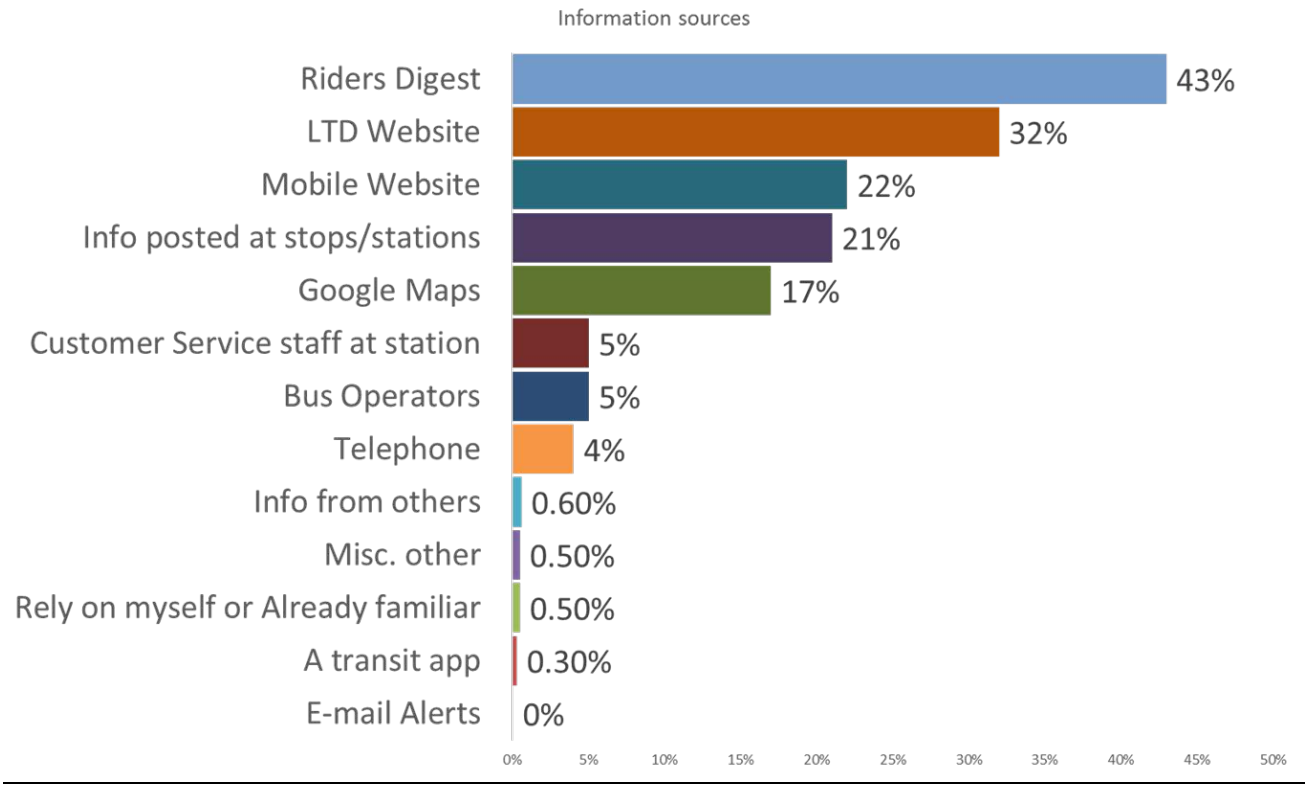


How well do you speak English?	Hispanic	Not Hispanic	All Respondents
Not at all	4%	0%	1%
Not well	7%	2%	3%
Well	10%	8%	9%
Very well	79%	89%	87%

Proficiency in English among Hispanic and non-Hispanic Riders

Although a total of 8% of LTD riders indicated that they speak a language other than English at home, only 4% say they speak English less than well. In other words, although the primary language of a considerable number of riders is other than English, only a small number of riders consider that they have difficulty with English language.

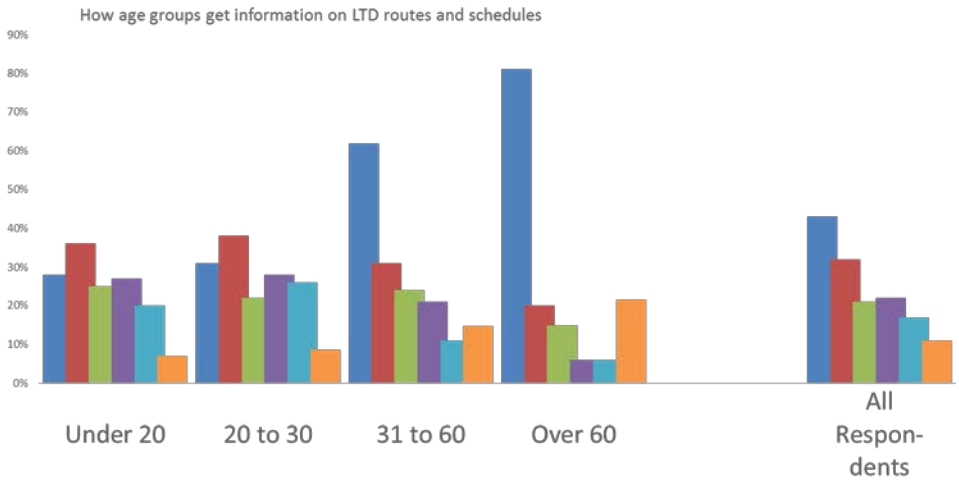
Figure 41 Information Sources for LTD Routes and Schedules



Information Sources for LTD Routes and Schedules

Riders were asked what information sources they use for LTD route and schedule information. More riders use the "Riders Digest" than any other source (43%), but the LTD website, with 32%, is a not too distant second. The mobile website has gained a substantial following, with 22%. Information posted at the bus stops and stations is, of course a traditional source of information, and it continues to attract 21% as a significant source.

Figure 42 Age and Information Sources Used for LTD Information



How do you get route and schedule information for LTD?	Under 20	20 to 30	31 to 60	Over 60	All Respon-dents
Riders Digest	28%	31%	62%	81%	43%
LTD Website	36%	38%	31%	20%	32%
Info posted at stops/stations	25%	22%	24%	15%	21%
Mobile Website	27%	28%	21%	6%	22%
Google Maps	20%	26%	11%	6%	17%
Riders asks info staff or driver	7%	9%	15%	22%	11%

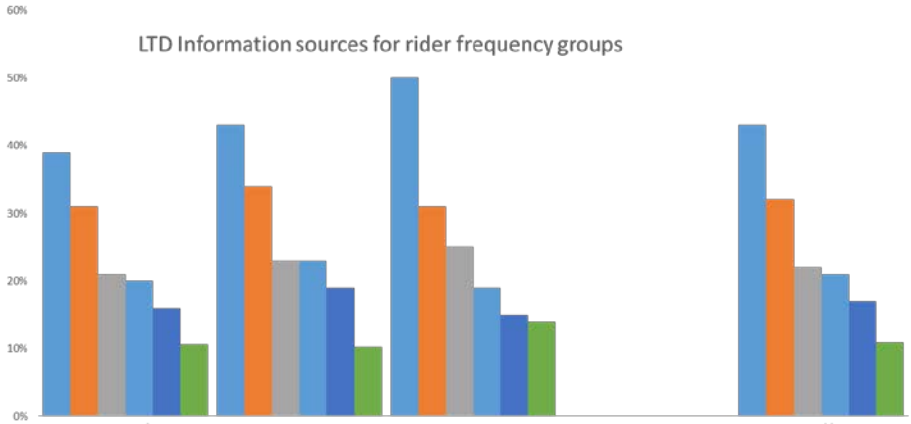
Age and information sources used for LTD information

Information sources vary considerably with age. The most traditional source for riders, the "Riders Digest," is heavily used by those older than 30. Of those between the ages of 30 and 60, 62% indicate that is a source they use, and even more, 81% of those over the age of 60 also use that source.

On the other hand, those under the age of 20 and those between 20 and 30 are more likely than their older fellow riders to rely on the LTD website, the mobile website, or Google maps. They are also more likely to rely on multiple sources approximately equally.

The shift from reliance on printed materials to electronic sources is clearly generational, and therefore inexorable. However, the continuing mix of informational media within each age group suggests that electronics are unlikely to totally displace printed materials in the near future.

Figure 43 Information sources, by frequency of using LTD



	One to three days	Four to six days	Seven days	All Respondents
Riders Digest	39%	43%	50%	43%
LTD Website	31%	34%	31%	32%
Mobile Website	21%	23%	25%	22%
Info posted at stops/stations	20%	23%	19%	21%
Google Maps	16%	19%	15%	17%
Riders asks info staff or driver	11%	10%	14%	11%

Information sources, by frequency of using LTD

The sources of information used vary somewhat with the frequency of using LTD. Also the number of sources used varies. Those who use LTD seven days a week are considerably more likely than others to use the Riders Digest (50%), but they are also likely to use other sources including the LTD website, the mobile website other channels of communications.

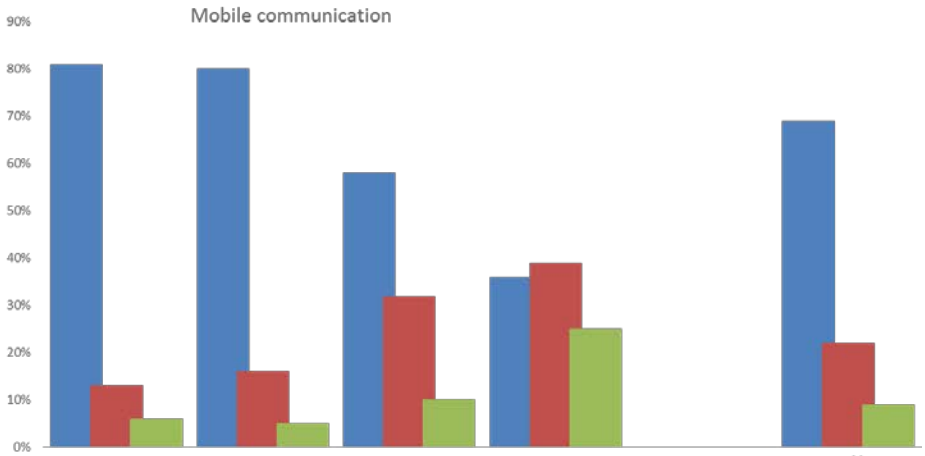
Figure 44 Multiple sources of LTD information

Using multiple sources of information

	Riders Digest	LTD Website	Mobile Website	Google Maps	Info posted at stops/stations	Riders ask info staff or driver
Riders Digest		30%	28%	21%	27%	30%
LTD Website	30%		29%	28%	27%	21%
Mobile Website	22%	22%		21%	19%	16%
Google Maps	11%	15%	14%		13%	11%
Info posted at stops/stations	21%	21%	19%	19%		22%
Riders ask info staff or driver	16%	11%	10%	11%	15%	

Use of multiple sources, particularly the Riders Digest and the website suggests that the two sources are not entirely alternatives but rather supplementary to each other. Thus, for example, among all respondents, 43% indicated they use the Riders Digest, and 32% indicate they use the LTD website. Figure 42 displays the percentages within each category who use other sources as well. For example, 30% of those who rely on the Riders Digest also use the website.

Figure 45 Cell phones/ Smartphones among LTD riders, by age



	Under 20	20 to 30	31 to 60	Over 60	All Respon-dents
Smartphone with Internet access	81%	80%	58%	36%	69%
Conventional cell phone	13%	16%	32%	39%	22%
No mobile phone	6%	5%	10%	25%	9%

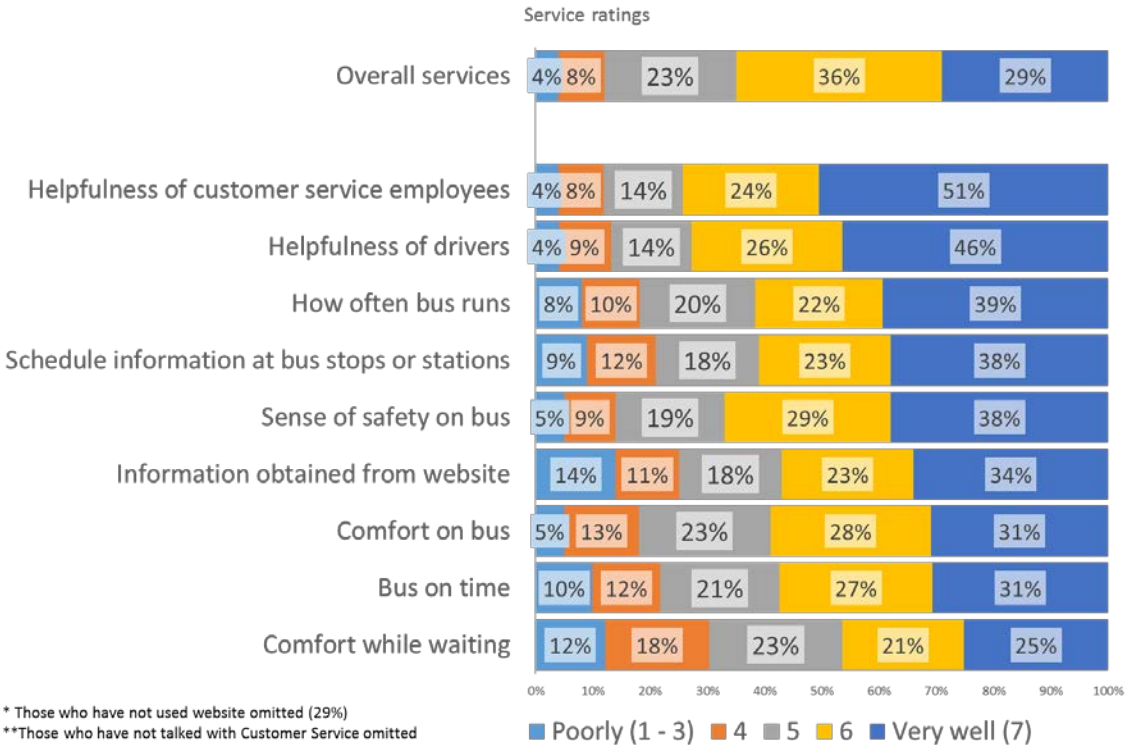
Cell phones/ Smartphones among LTD riders, by age

A vast majority of riders have a mobile phone (91%). Most (69%) have a Smartphone with Internet access. This tendency is still very much related to age. While only 36% of the riders 60 and older have a Smartphone, 81% and 80% (respectively) of those under 20 or from 20 to 30 have one. Nationally, according to the PEW Research Center, 64% of all adults own a Smartphone[7]. Thus, the LTD ridership is rather typical in this respect.

[7] See http://www.pewinternet.org/fact-sheets/mobile-technology-fact-sheet/

Service Ratings

Figure 46 Service Ratings (Excluding those who did not use a service)



Service Ratings, 2015

Respondents were asked to rate various aspects of LTD based on how well it meets their needs. The questionnaire used a scale of 1 to 7 on which a score of 1 means "poorly" and a score of 7 means "very well." The chart above displays ratings for ten specific aspects and the rating of LTD service overall.

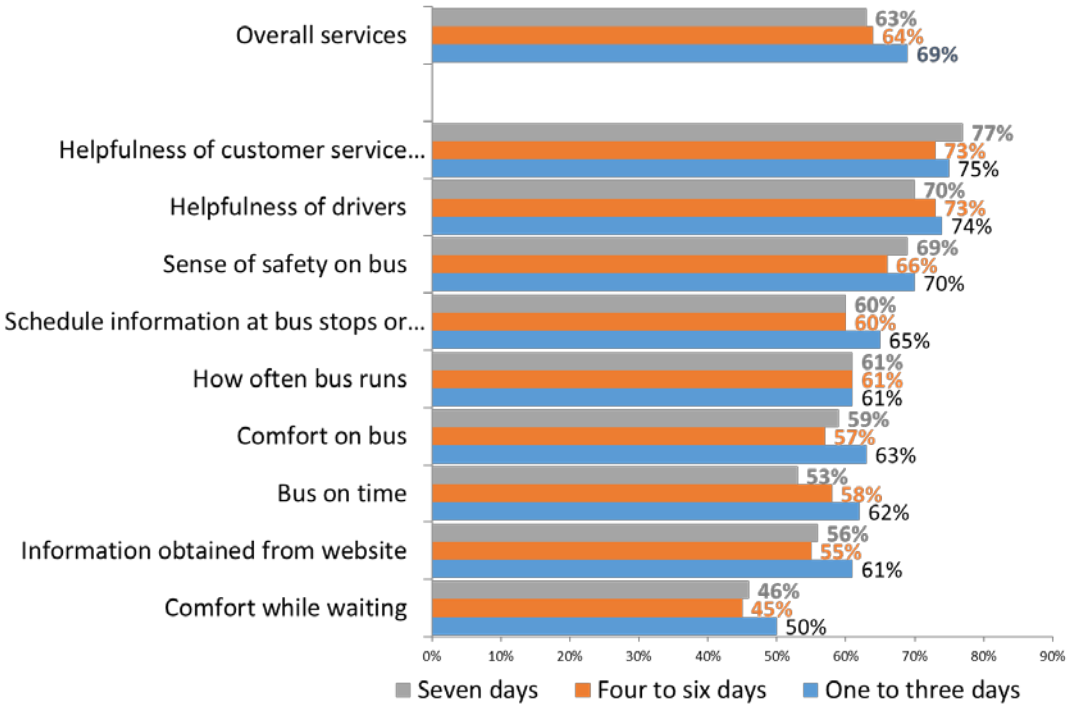
First, note that 29% give overall service the top rating of 7 and another 36% rate it a 6, the equivalent of "well." Thus a total of 65% give a very positive rating. Also, notice that negative ratings are low, with a maximum of 14% rating any given aspects of service as poor or near poor (ratings from 1 to 3). That low rating by 14% is for information from the LTD website. Another 11% gave the website a neutral rating of four. The only other service element with a similarly low rating is comfort while waiting for the bus, which was scored negatively (1-3) by 12% and as neutral (4) by another 18%.

Helpfulness of customer service employees and drivers are the most positively rated aspects of service. This is not unusual among bus systems. It is an indication of how important the personal interaction with operating staff is to the customer. Third on the list, when ranked in this manner by top percentage (rather than, for example, by the mean score), is frequency of

services, expressed as, "How often the bus runs." At the bottom of the list are comfort while waiting at the stop and the buses running on time.

Figure 47 Comparing the ratings of the rider frequency segments

(Top two positive scores only)



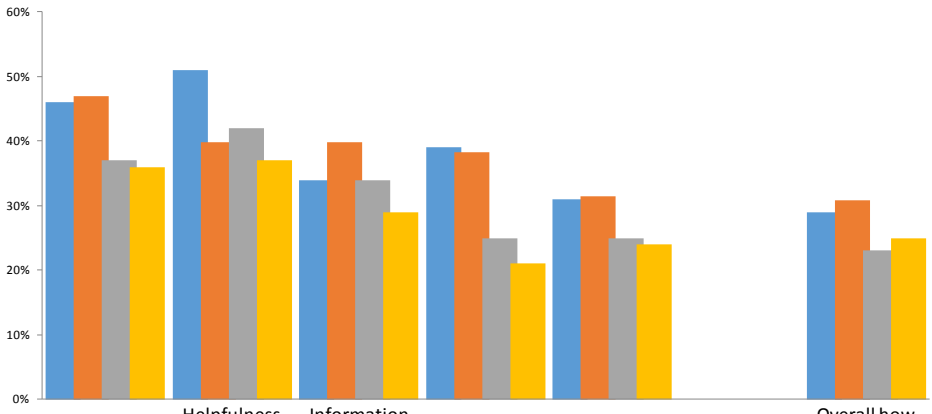
Service ratings by rider frequency segment

Figure 46 shows the percent of riders, by frequency segment, who gave each aspect a rating of 6 or 7. The top scores are similar for the three segments in both their rank order and their total positive scores. The three are helpfulness of customer service personnel, helpfulness of the drivers, and the sense of safety on the buses. In other words, perceptions of the best rated services are similar regardless of the frequency of using LTD. However, there are differences.

For most aspects of service, the least frequent riders provide more positive ratings than the other segments. This is probably explained simply by exposure. That it, presumably, since it is inevitable that over time there will be some service problems, the fact that they ride less frequently makes it less likely they will suffer those inconveniences. In addition, more of them are using LTD for purposes other than getting to work or school. These are, presumably, purposes that allow for somewhat greater flexibility of time which means that such things as on time performance are not as critical to them.

Figure 48 Service Ratings since 2004

Comparison of 2015, 2011, 2007 and 2004 ratings of questions in common
(Note: Only the top score is reported for each year. Wording of top score was changed in 2011 from "Excellent" to "Very well" and the rating scale was changed from 7 points to 5.



	Helpfulness of LTD drivers	Helpfulness of customer service employees	Information obtained from LTD website	How often your bus runs	How often your bus is on schedule	Overall how do you rate LTD services?
"Very well" 2015 (7 pt scale)	46%	51%	34%	39%	31%	29%
"Very well" 2011 (5 pt scale)	47%	40%	40%	38%	32%	31%
"Excellent" 2007 (7 pt scale)	37%	42%	34%	25%	25%	23%
"Excellent" 2004 (7 pt scale)	36%	37%	29%	21%	24%	25%

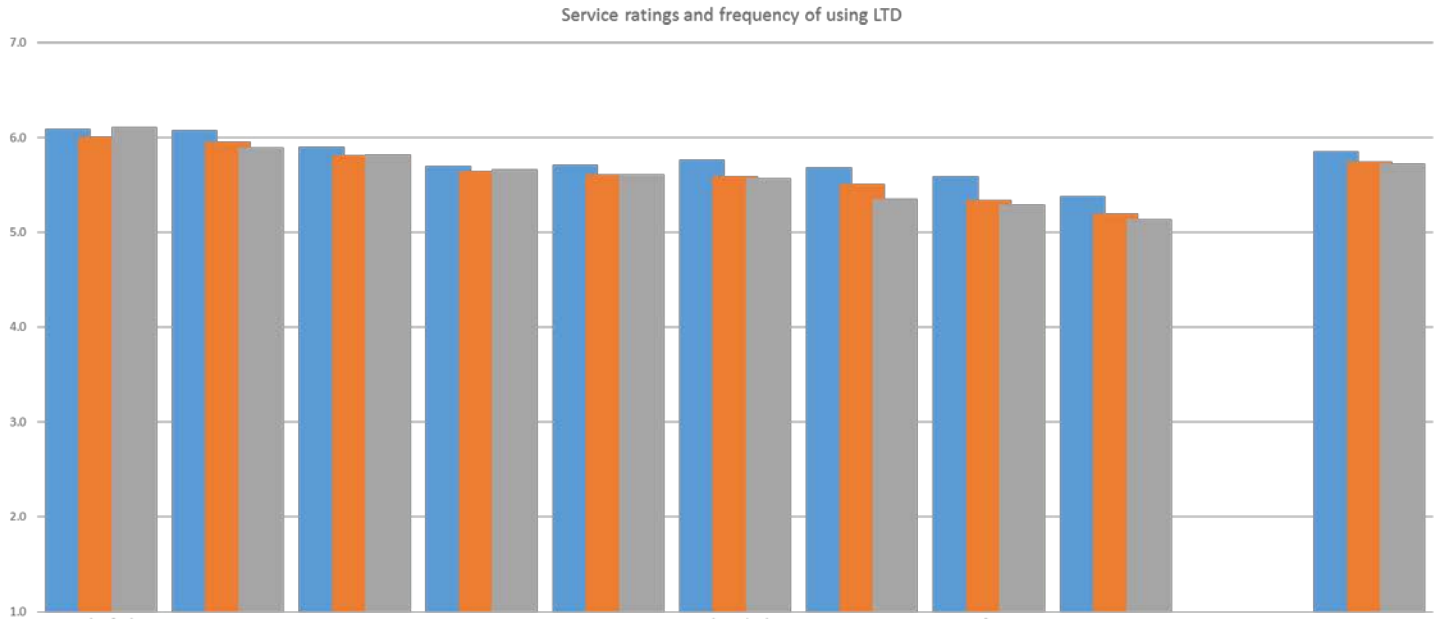
Service Ratings since 2004

Changes have occurred in measurement of overall customer satisfaction over time that cause difficulty interpreting the result in terms of "change." In 2011 the scale was changed to a 1-5 basis from the 1-7 scales that had preceded 2011. Also, between 2007 and 2011, the positive anchor term was changed from "Excellent" (a very high bar) to "Very well" (a lower bar). This meant that we had to make some assumptions about equivalences in order to compare results from one year to another as shown in the chart.

While we would like to believe that the most positive rating for overall service really rose from 23% in 2007 to 31% in 2011, that change is highly unlikely. That the change is due to measurement change from a seven point to a five point scale and from the term "excellent" to the term "very well" is more likely. Similarly, the slight decline in the top scores to 29% when returning to a 7 point scale in 2015 is likely also the result of a difference in method.

With minor exceptions (most notably helpfulness of customer service employees in comparison to drivers) the rank order of positive ratings is not identical, but is very similar year to year. This suggests that these ratings are stable and difficult to change.

Figure 49 Mean ratings of service, by frequency of using LTD

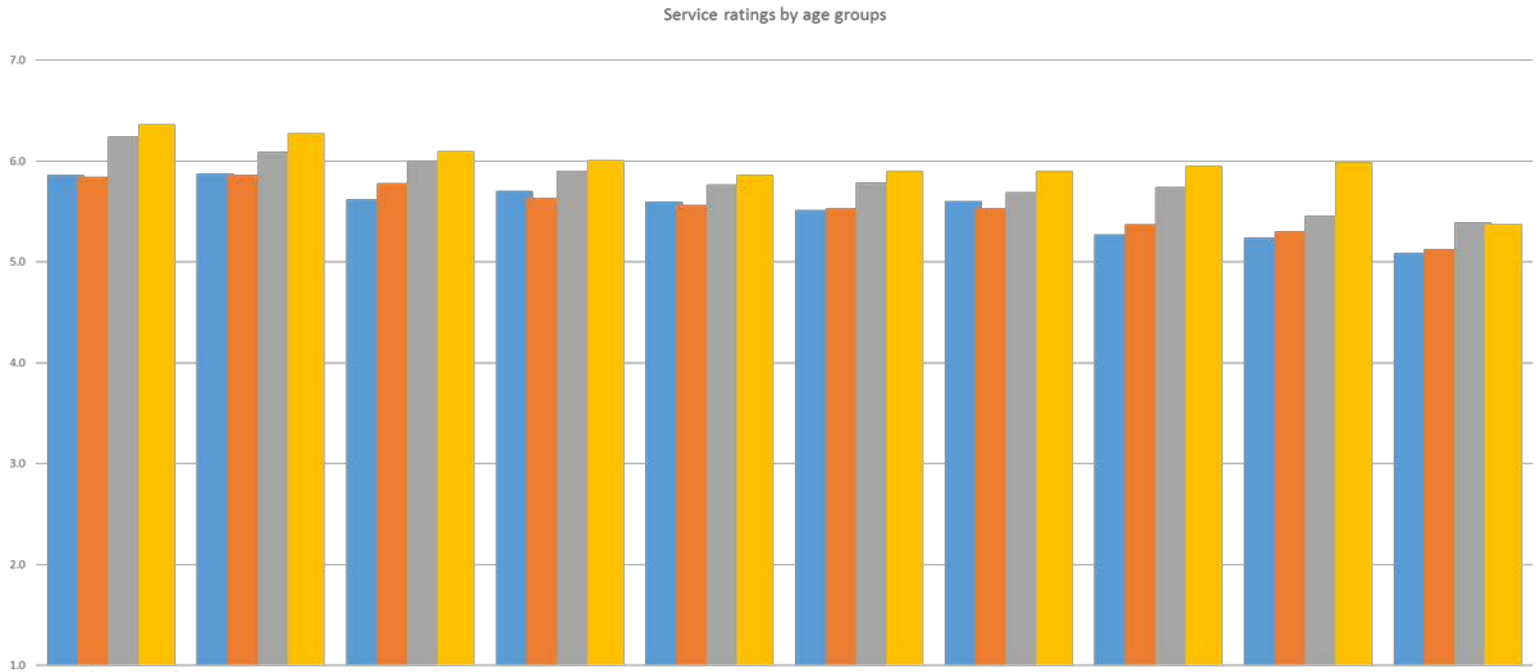


	Helpfulness of customer service employees	Helpfulness of drivers	Sense of safety on bus	How often bus runs	Comfort on bus	Schedule information at bus stops or stations	Bus on time	Information obtained from website	Comfort while waiting	Overall services
One to three days	6.1	6.1	5.9	5.7	5.7	5.8	5.7	5.6	5.4	5.9
Four to six days	6.0	6.0	5.8	5.7	5.6	5.6	5.5	5.3	5.2	5.8
Seven days	6.1	5.9	5.8	5.7	5.6	5.6	5.4	5.3	5.1	5.7

Mean ratings of service, by frequency of using LTD

The comparison of 2015 mean scores on the dimension of frequency of using LTD shown in Figure 47 above reveals essentially the same thing that Figure 45 indicated – the ratings are very similar in both rank order and degree of positive scoring regardless of frequency of using LTD. The least frequent riders tend to have slightly more favorable scores on several aspects of service.

Figure 50 Mean ratings of service, by age



	Helpfulness of customer service employees	Helpfulness of drivers	Sense of safety on bus	Overall services	How often bus runs	Comfort on bus	Schedule information at bus stops or stations	Bus on time	Information obtained from website	Comfort while waiting
Under 20	5.9	5.9	5.6	5.7	5.6	5.5	5.6	5.3	5.2	5.1
20 to 30	5.8	5.9	5.8	5.6	5.6	5.5	5.5	5.4	5.3	5.1
31 to 60	6.2	6.1	6.0	5.9	5.8	5.8	5.7	5.7	5.5	5.4
Over 60	6.4	6.3	6.1	6.0	5.9	5.9	5.9	6.0	6.0	5.4

Mean ratings of service, by age

On all aspects of service, riders older than thirty are somewhat more likely to provide a favorable rating.

How the specific elements of service relate to overall service ratings

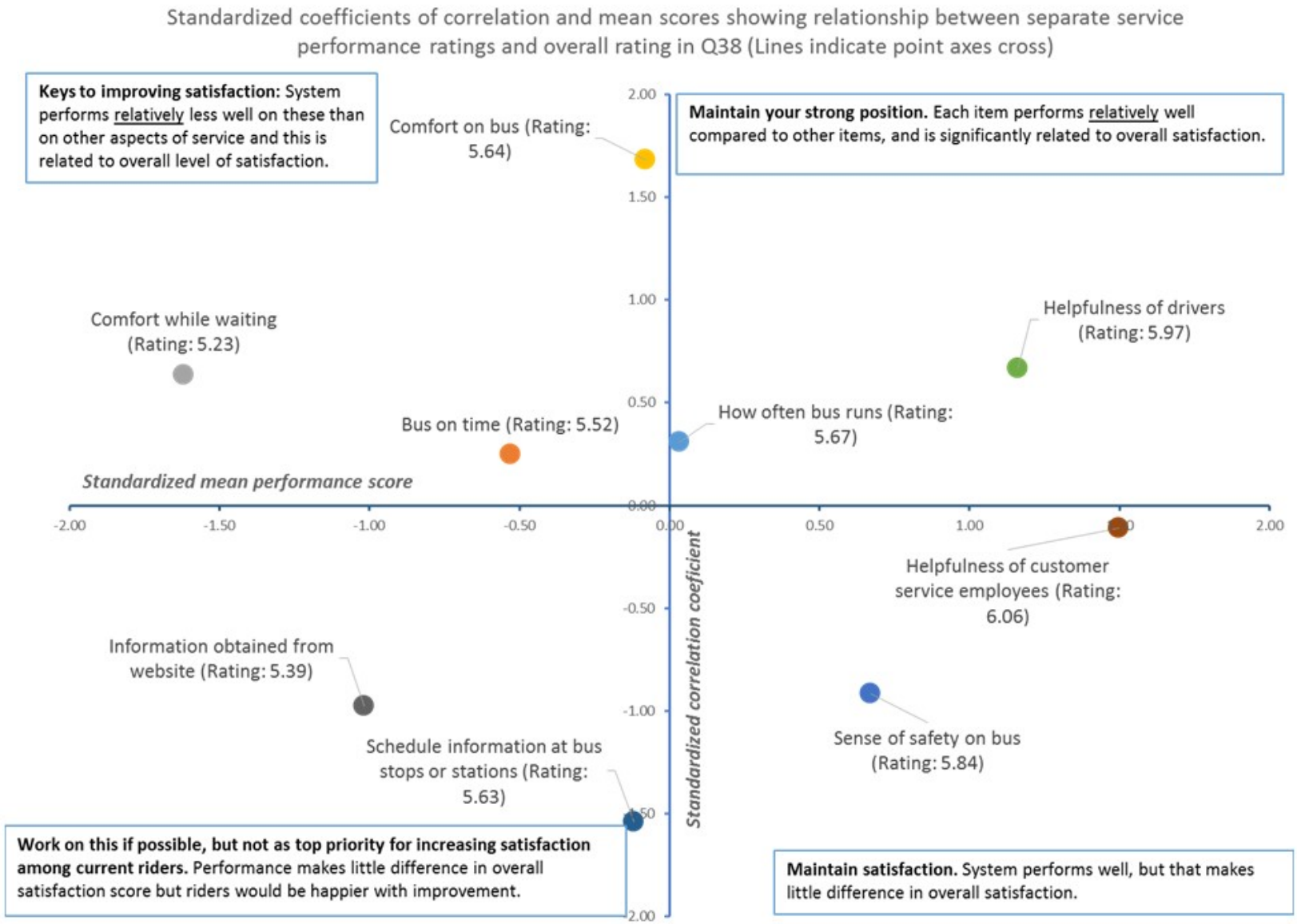
In Figure 51 (on the following page) we examine the correlations between the overall rating of LTD service and the separate elements that make up the service. When there is a high correlation between a specific aspect of service and the overall rating, the implication is that the service element is probably influencing the overall satisfaction score. Using this logic, it appears that certain elements (upper right of chart) are helping to boost the already relatively favorable overall satisfaction score, while others (upper left) tend to detract from it. It is the latter group that requires attention in order to help move overall satisfaction scores.

Elements in the lower left of the chart receive poor performance scores, but apparently have relatively little influence on the overall satisfaction score. Similarly, elements in the lower right quadrants have high performance scores, but they have little relationship to the overall satisfaction score, and thus can be assumed to have little influence on it.

To put it another way, the system's *perceived* strengths are at the right and above the line. The *perceived* weaknesses that need attention are at the left and above the line.

Another thing to keep in mind in considering this chart is that all aspects of service tend to be favorably rated in this survey, though some more favorably than others. What we are after here is what aspects of LTD service can be improved even if they are already favorably rated, and how will that affect the rating of service overall? To obtain this statistic means that the scores must be *standardized relative to other scores,* meaning that in this chart they are presented as *relatively higher* or *relatively lower* than other scores, not that they are high or low in an absolute sense.

Figure 51 How the specific elements of service relate to overall service ratings



Upper right quadrant. Frequency of service and the helpfulness of the drivers are right of the vertical line meaning that riders tend to rate them relatively well. That they are above the horizontal line means that compared to other elements of services, they are relatively closely related to the rating of service overall. These are system strengths and should be nurtured and maintained.

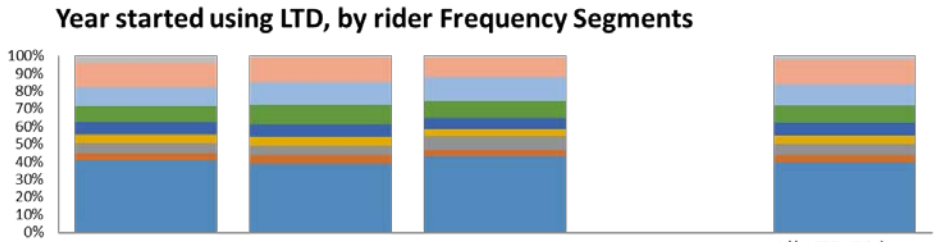
Lower right quadrant. Also to the right of the line because they are relatively well rated, are helpfulness of customer service employees and the sense of personal safety with other passengers on the bus. However, they are below the horizontal line which means they are relatively weakly associated with the overall rating score. Obviously it is advantageous to maintain any good rating such as these. It is implied that any improvement in the already high rating would have little effect on the overall rating. On the other hand, while currently these are not closely associated with the overall rating of service, losing a sense, of safety with other passengers or have consistently unhelpful customer service personnel would surely damage ratings. In this quadrant there is little to gain, but potentially much to lose.

Lower left quadrant. The two items in this quadrant, information from the LTD website, and schedule information at the bus stops and stations are not well rated. Neither are they very closely associated with the overall service score. This simply means that many existing riders who rate the overall system performance well, rate these elements poorly. Better performance would help satisfy them, but it would make little if any difference in the overall rating of LTD service. On the other hand, these elements might be very important in to new riders not familiar with the system.

Upper left quadrant. This is the quadrant in which improvement would bring the greatest reward in terms of increasing the overall LTD rating. These are core elements of the rider experience. They include on time performance, perhaps the most difficult element to improve upon without dedicated bus lanes (and thus generally one of the elements in the upper left quadrant of this chart for any system), comfort while riding on the bus, and comfort while waiting for the bus. None of these represents an "easy win." All have both capital and operational costs. But any improvement will result in an increase in favorable overall customer perceptions.

Rider Attraction and Retention

Figure 52 When Riders Began Using LTD



	1-3 days	4-6 days	7 days	All LTD Riders 2015
First time riding	4%	1%	1%	2%
Less than one year	14%	14%	11%	14%
1 year	11%	12%	13%	12%
2 years	9%	11%	10%	10%
3 years	7%	7%	6%	7%
4 years	5%	5%	4%	5%
5 years	6%	5%	8%	6%
6 years	4%	5%	3%	4%
7+ years	41%	38%	43%	40%

When Riders Began Using LTD

With such a large body of college student riders, one would expect that a very high proportion of riders would have begun using LTD only recently. That is, in fact, the case. Of all riders, 16% had begun riding only in 2015, and another 12% in 2014. Thus, more than one fourth of the ridership (28%) in 2015 was new to LTD in the previous two years. This somewhat lower than the 32% recent riders found in 2011.

It is also notable that a large minority of riders (40%) said they have been riding for seven years or longer - i.e., since 2008 or earlier. The seven-day riders are slightly more likely to be long-time riders. For example, 54% of that segment say they have been riding LTD for five or more years compared to 48% of the four to six day riders and 51% of the one to three day riders. However, the tendency is not at all pronounced.

How do EmX Riders Compare to Riders Overall

The chart which begins on the next page and continues for three pages provides a profile of EmX Riders compared to those on other LTD routes and the ridership overall ("All respondents"). In virtually all ways measured by this survey, EmX riders are almost identical to other LTD riders.

In several ways, EmX riders vary somewhat from riders on other routes:

- EmX riders were slightly more likely (6%) to drive to the bus stop compared to the regular route riders (1%) and thus less likely to walk to the stop (86% compared to 90%).
- EmX riders were slightly more likely to be commuting to work than other riders (39% vs 33%) and slightly less likely to be commuting to school (34% vs 39%) on the trip surveyed.
- EmX riders were slightly more likely to make their trip using only one bus (67%) compared to users of regular routes (57%).
- EmX riders were considerably more likely to pay the fare with an employer or school group pass (50%) than regular route riders (36%) and less likely to use cash (9% compared to 15%).
- EmX riders were slightly less likely to identify themselves as Hispanic (10% compared to 14%).
- EmX riders were slightly more likely to be employed outside the home (40% compared to 34%).

All other characteristics are quite similar.

Figure 53 Profile of how EMX and other LTD Riders use LTD

Profile of EMX Riders		Regular routes (1-98)	EMX routes (101, 102)	All Respondents
Frequency of weekly use of LTD	1-3 days	28%	26%	27%
	4-6 days	49%	48%	49%
	7 days	23%	26%	24%
Year started using LTD buses	7+ years	40%	40%	40%
	6 years	5%	3%	4%
	5 years	6%	6%	6%
	4 years	4%	6%	5%
	3 years	6%	8%	7%
	2 years	10%	11%	10%
	1 year	12%	12%	12%
	Less than one year	14%	12%	14%
	First time riding	2%	2%	2%
Access Mode	Walked	90%	86%	89%
	Drive alone	1%	6%	2%
	Drove with another rider and parked	0%	1%	0%
	Dropped off by someone	3%	2%	2%
	Dropped off by a taxi or paid rideshare	0%	0%	0%
	Wheelchair/Scooter	1%	0%	0%
	Biked and put bike on bus/EMX	3%	3%	3%
	Biked and left bike at/near bus stop/station	1%	0%	1%
	Other	2%	2%	2%
Main purpose of bus trip today	Work	33%	39%	35%
	College	31%	32%	31%
	Middle/HS	8%	2%	6%
	Store or restaurant	9%	7%	9%
	Medical/Dental	3%	2%	3%
	Social service aptmt	2%	1%	2%
	Visiting others	6%	10%	7%
	Entertainment/recreation	4%	3%	4%
	Other	5%	3%	4%
Number of buses used for this trip	One bus	57%	67%	60%
	Two buses	35%	29%	34%
	Three or more buses	8%	4%	7%
Fare Media used to pay for this trip	Cash	15%	9%	13%
	Day Pass	9%	9%	9%
	Ticket from 10-Ride Book	3%	3%	3%
	Ticket from fare machine	0%	2%	1%
	Monthly/3-Month Pass	25%	20%	24%
	Employer/School Group Pass	36%	50%	40%
	Other	11%	7%	10%

Figure 54 Demographic profile of EMX and other LTD riders

Demographic profile of EMX and other LTD riders		Regular routes (1-98)	EMX routes (101, 102)	All Respondents
Gender	Male	49%	47%	48%
	Female	50%	52%	50%
	Transgender	2%	1%	1%
Age in Census Bureau groupings	16 thru 24	46%	46%	46%
	25 thru 34	21%	24%	22%
	35 thru 44	11%	9%	11%
	45 thru 54	9%	7%	9%
	55 thru 64	8%	10%	8%
	65 thru 74	4%	3%	4%
	75 or older	1%	0%	1%
Hispanic or Latino	Yes	14%	10%	13%
	No	86%	90%	87%
Ethnicity	African American	3%	3%	3%
	Asian	7%	10%	8%
	White	66%	70%	67%
	Native American	2%	2%	2%
	Alaska Native	0%	1%	0%
	Pacific Islander	0%	1%	0%
	Multi-racial	5%	1%	4%
	Other	2%	2%	2%
	Hispanic only	6%	4%	5%
	Hispanic with race also cited	7%	6%	7%
Minority Member of an ethinic or racial minority group Derived from Q24	Of a minority racial group	17%	16%	17%
	Caucasian/White	83%	84%	83%
Language spoken at home	English	92%	92%	92%
	Spanish	4%	3%	3%
	Other	5%	5%	5%
How well do you speak English?	Very well	86%	90%	87%
	Well	10%	7%	9%
	Not well	3%	3%	3%
	Not at all	1%	1%	1%
Employment	Work outside home	34%	40%	35%
	Middle or HS or Other student	9%	5%	8%
	College student	25%	27%	26%
	Unemployed	6%	6%	6%
	Homemaker	1%	1%	1%
	Retired	5%	4%	5%
	Employed at home	2%	0%	1%
	Student and employed	12%	12%	12%
	Disabled	5%	5%	5%

Figure 55 Communications – EMX and other LTD riders

Communication and information seeking by EMX and other LTD riders		Regular routes (1-98)	EMX routes (101, 102)	All Respondents
Mobile phone owned	Conventional cell phone	22%	22%	22%
	No mobile phone	9%	7%	9%
	Smartphone with internet access	68%	70%	69%
Where riders get route and schedule information	Riders Digest	45%	37%	43%
	LTD Website	32%	30%	32%
	Mobile Website	23%	20%	22%
	Info posted at stops/stations	20%	24%	21%
	Google Maps	16%	18%	17%
	Customer Service staff at station	6%	5%	5%
	Bus Operators	5%	4%	5%
	Telephone	4%	4%	4%

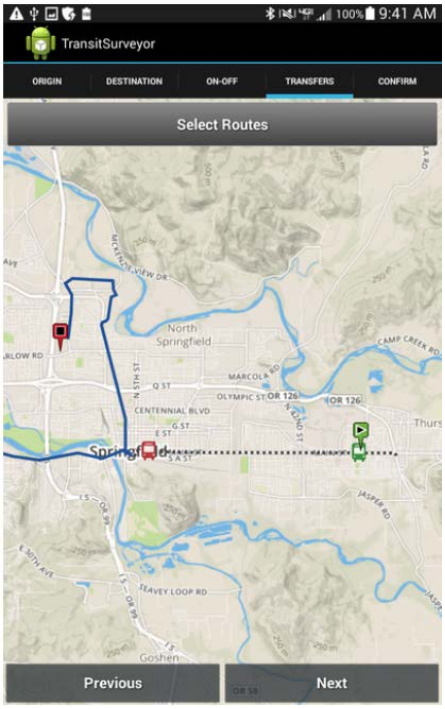
Pilot Tablet Survey

Methodology and Purpose

Concurrent with the system-wide on-board survey, a pilot survey using tablet computers was conducted on a smaller sample of bus trips. Approximately 60 hours of surveyor time was utilized to conduct 266 oral interviews utilizing specially programmed tablet computers to capture origin and destination information as well as answers to other questions. The tablet questionnaire was somewhat shorter than the paper survey. It included:

- All origin-destination related questions (1-10 in the paper survey)
- Fare payment and usage characteristics (11-13 in the paper survey)
- Questions relating to transit dependence (14-16 in paper survey)
- Key demographic questions (employment/student status, age, income, race and language, – 17, 18, 22, 23, 24, 25, 26, 27 in paper survey)
- One "overall" satisfaction rating (38 in paper survey)
- Questions about information sources, mobile phone usage and assistance required (19-21 in paper survey)

Collection of origin-destination data was aided by the use of maps and dropdown menus which utilized GTFS data to display routes and bus stop locations. The android apps - ODK Collect and ODK Transit - were developed by Jeffrey Meyers who had previously worked with TriMet to develop similar programs for their use. The programs were used on LG brand 4G Android tablets. The digital apps have been provided along with this report.



The Pilot Tablet Survey was conducted to answer several questions about the relative effectiveness of this data collection method compared to traditional paper surveys.

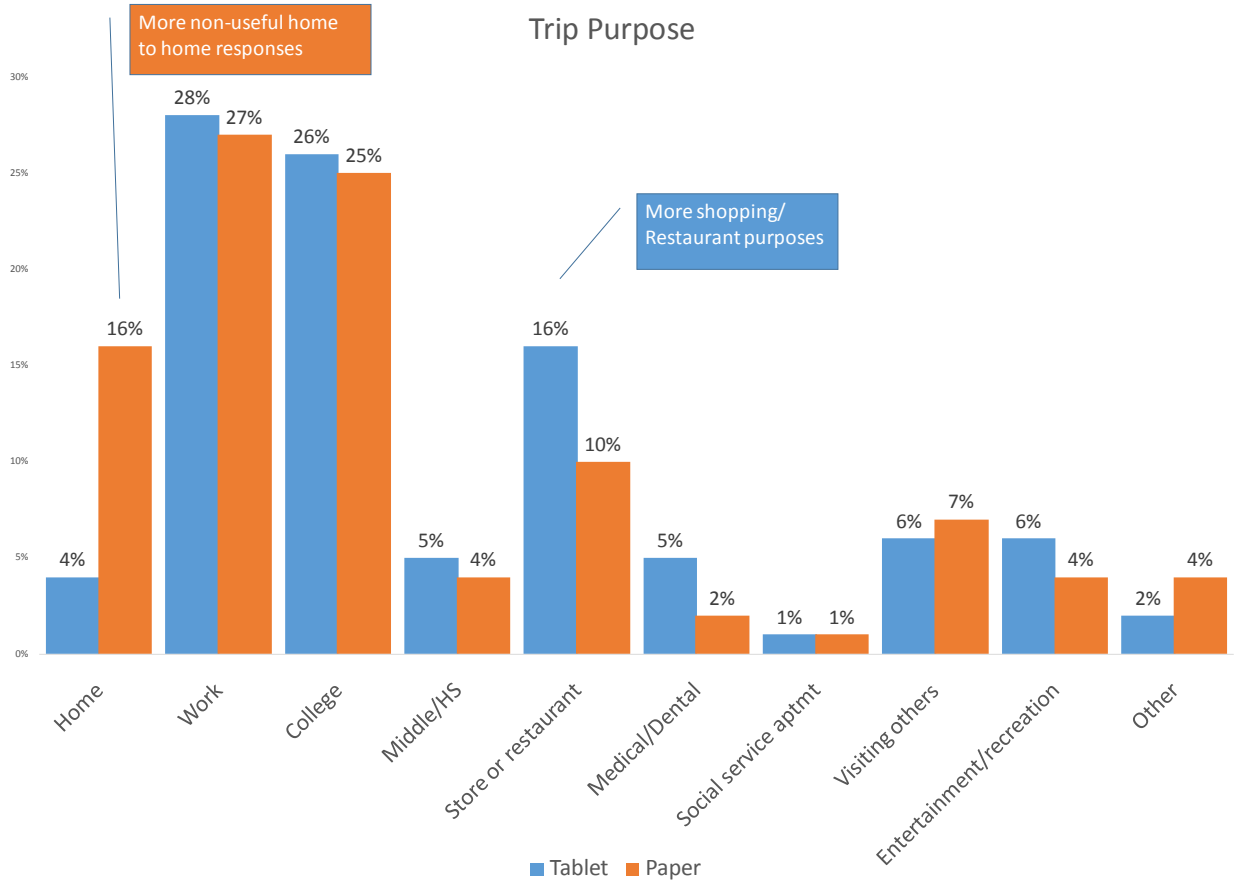
1. Effectiveness in collecting complete, geocodable origin-destination information.
2. Potential bias introduced by conducting interviews orally and/or by having surveyors select passengers rather than surveying every passenger.
3. Skill level required by surveyors to use tablet programming.
4. Cost per geocodable interview relative to paper surveys.

Summary of Results

The tablet surveyors completed 266 interviews on a cross-section of routes and day parts. This analysis compares the demographic and other findings of the tablet survey with those of the systemwide paper survey in an effort to address the four issues raised above.

In comparing the two surveys, it is important to keep in mind that since the tablet survey was only a pilot and had a much smaller sample, the margin of error from random sources (not including potential selection bias or other sources of bias) is +/-5.9%, while for the much larger sample of self-administered paper surveys it is less than +/-1%.

Figure 56 Functional Origin-Destination – Tablet vs Paper



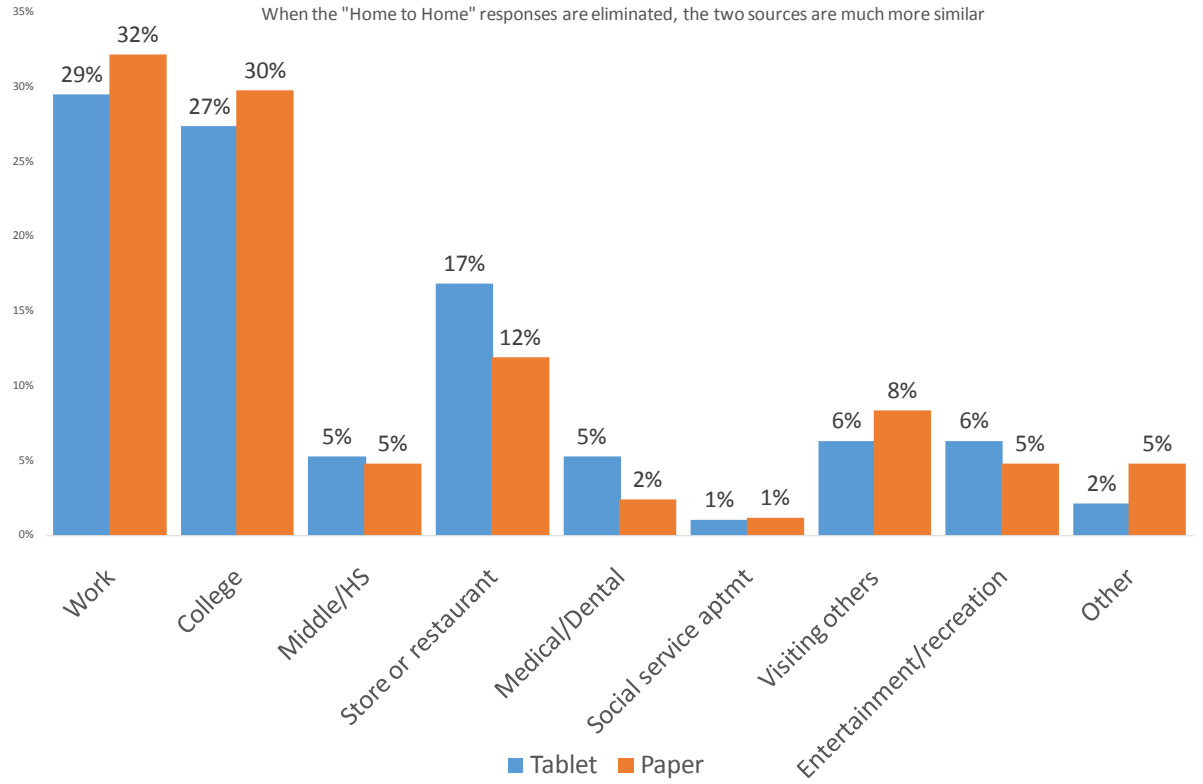
Origin-Destination

Among the interviews conducted by tablet, 91% had complete origin-destination information, in that all four points of interest were identified. While the comparable percent for the 2015 paper survey is not yet known, in 2011 it was approximately 70%.

The trip purpose chart above is based on the functional origin and destination – the type of place that the rider was traveling to or from. Tablet survey respondents were much less likely to provide the non-useful response of home to home, and were more likely to identify shopping or restaurant trips.

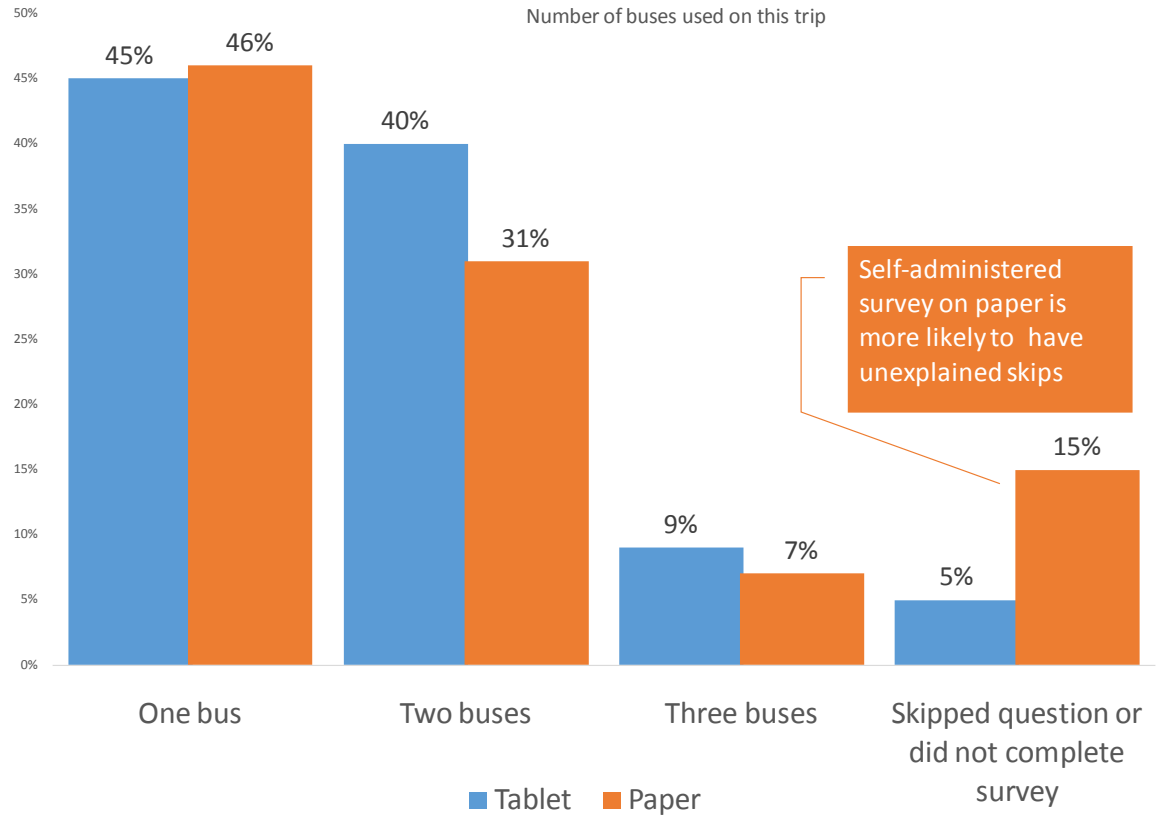
We might hypothesize that those going shopping are less "busy" than commuters and students and more willing to take the time to talk with the surveyor.

Figure 57 Trip Purpose without Home to Home



When we remove the home to home responses, we see that the distribution of trip purposes is quite similar between the two surveys and all but one are within the margin of sample error. The exception is that a higher percent of tablet respondents were going shopping or to a restaurant. At a response of 17%, sample error for that item is +/-4.5%, meaning that, assuming no other source of bias, the difference is statistically meaningful.

Figure 58 Number of Buses Used to Complete Trip

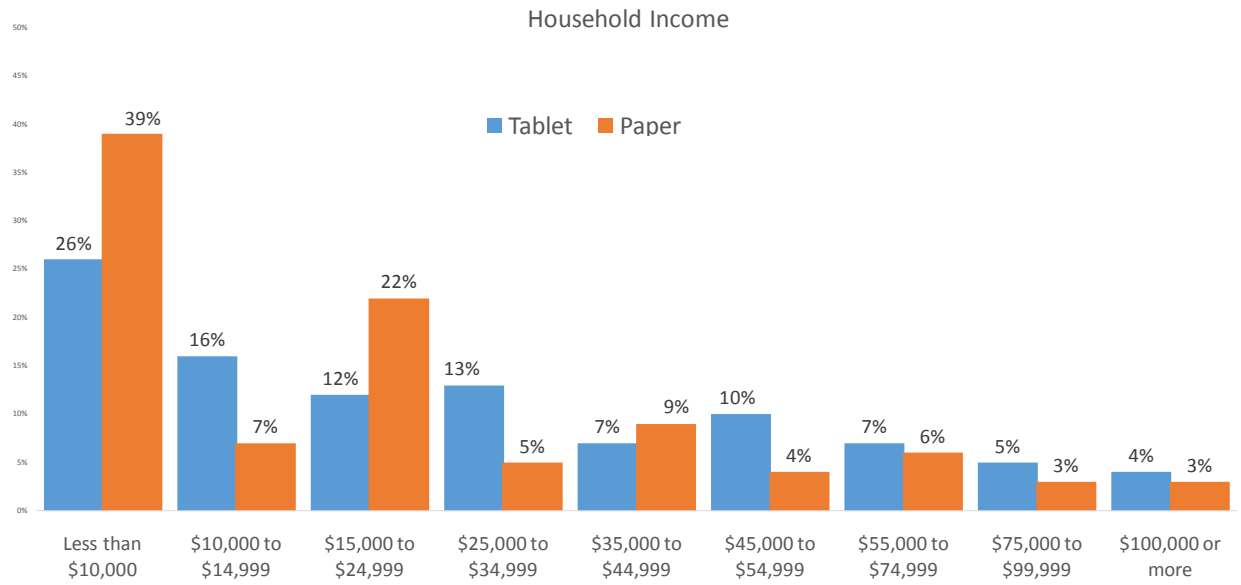


Number of Buses Used and Skipped Questions

As the chart above shows, about 15% of paper survey respondents failed to identify the number of buses they were using to complete their one way trip. Only 5% of tablet responses were missing this data point.

Clearly, the tablet provides an advantage in collecting accurate origin-destination information. A higher percent of respondents provide all four points of interest, there are fewer non-useful responses (such as home to home) and there are fewer skipped questions.

Figure 59 Income



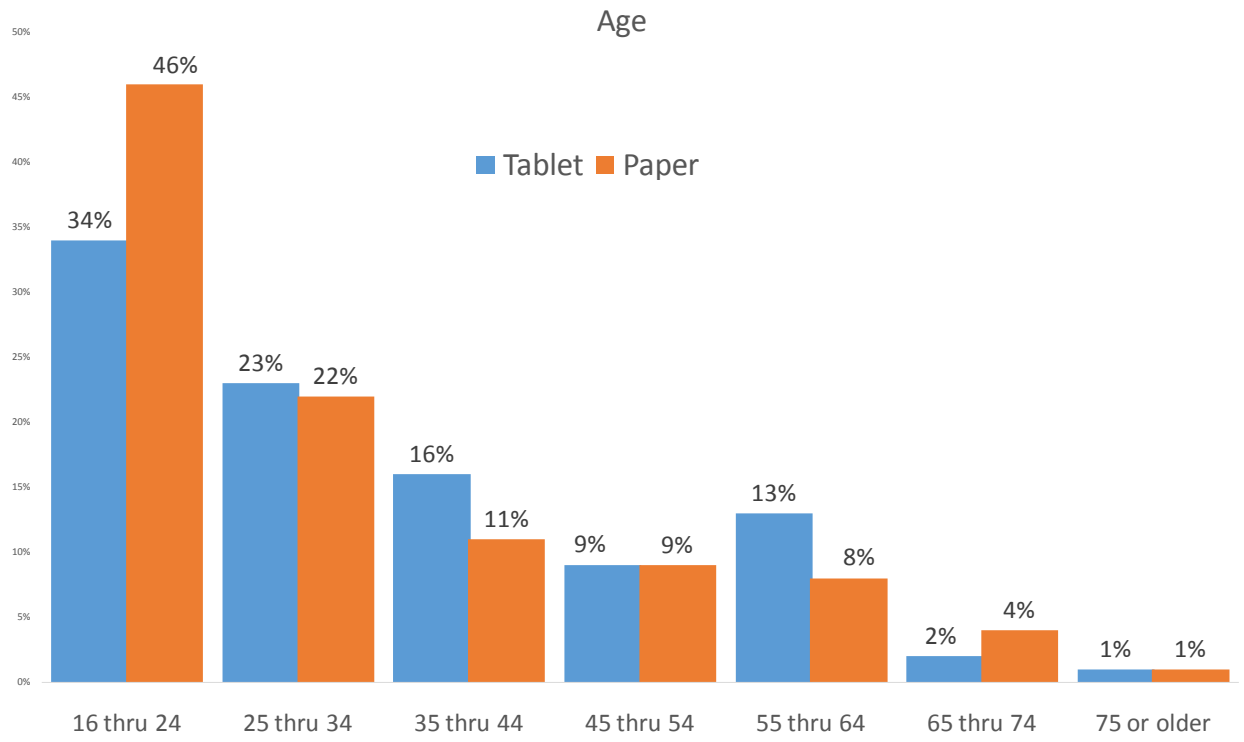
Household Income

The set of respondents surveyed using tablets was significantly less likely to fall into the lowest income bracket than the paper survey sample (26% compared to 39%). More broadly, among the tablet respondents, 54% had incomes under $25,000. Among the paper survey sample 68% fell into this range.

It is not entirely clear why this difference would exist. The obvious explanation is a difference in sampling methods. The paper survey is self-administered and all riders are asked to complete the survey. The sheer sample size and the non-selectivity of respondents means that the paper survey can be assumed to be more representative. The tablet survey requires selection of respondent according to a randomization rule. However, such rules are nevertheless potentially ignored, and the likely direction of bias would probably be away from lower income persons. If that is the case, then more extensive training and a higher skill level would probably suffice to correct the bias.

But it is also likely that there is bias introduced by systematically different levels of respondent cooperation when approached selectively by a tablet-wielding interviewer. People may wonder why they were singled out for interview. Trust in an interview methodology is more characteristic of higher levels of education and income. Those familiar with tablets and other electronic information systems may be more willing to cooperate and even interested in cooperating. If variance in these cooperation rates is the source of the bias, then it is not immediately certain how to resolve it. A simultaneous self-administered paper survey and tablet survey on the same vehicle might help in two ways. First, it would signal to the riders that all were being asked for information and a few were being asked for greater detail. Second, it would provide a vehicle by vehicle basis for weighting the tablet results.

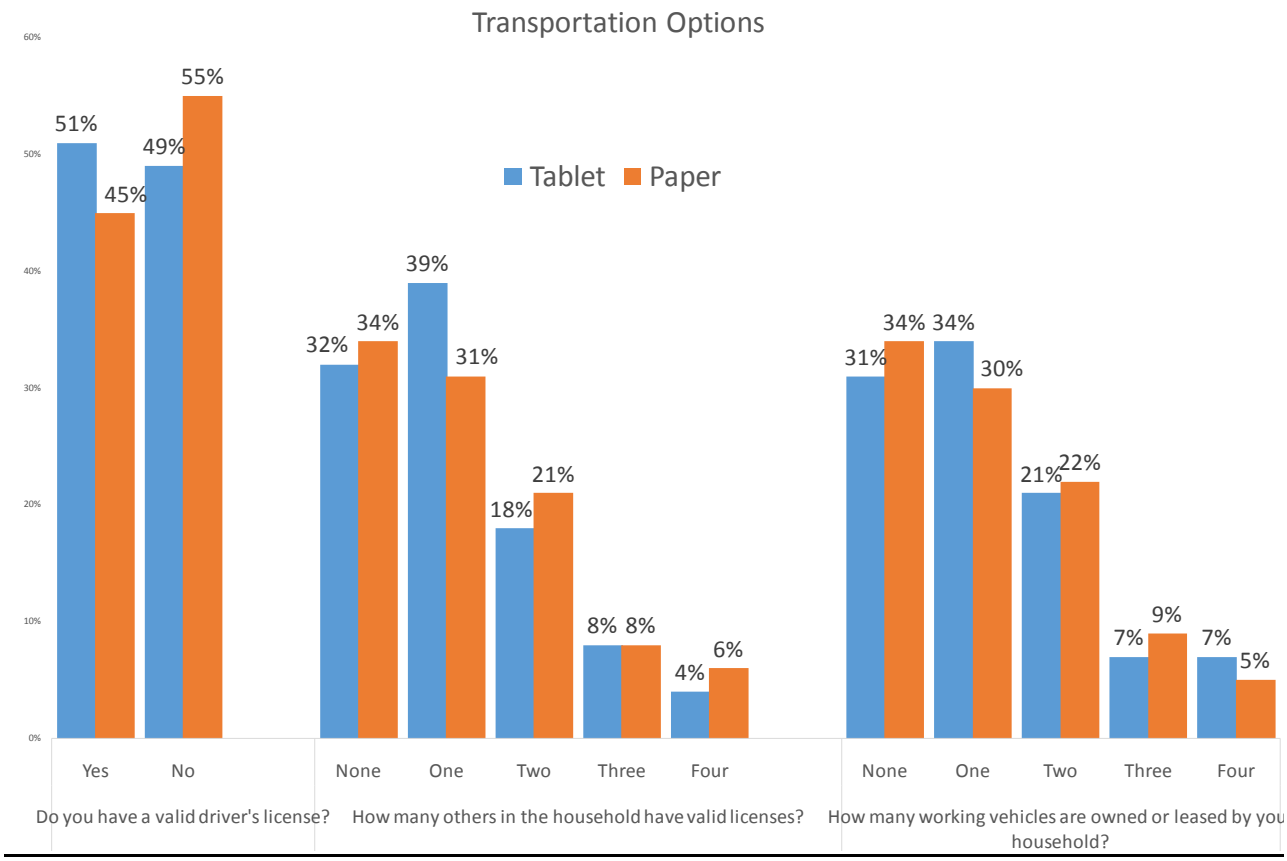
Figure 60 Age



Age

Those interviewed by tablet were less likely to be in the age range of 16 to 24, and slightly more likely to be in the age groups between 25 and 64. Again we have to ask why this systematic difference would exist. If familiarity with tablet interviewing were the cause of respondent cooperation bias, we would expect that any bias would be toward a higher percentage of youth in the tablet rather than in the paper survey.

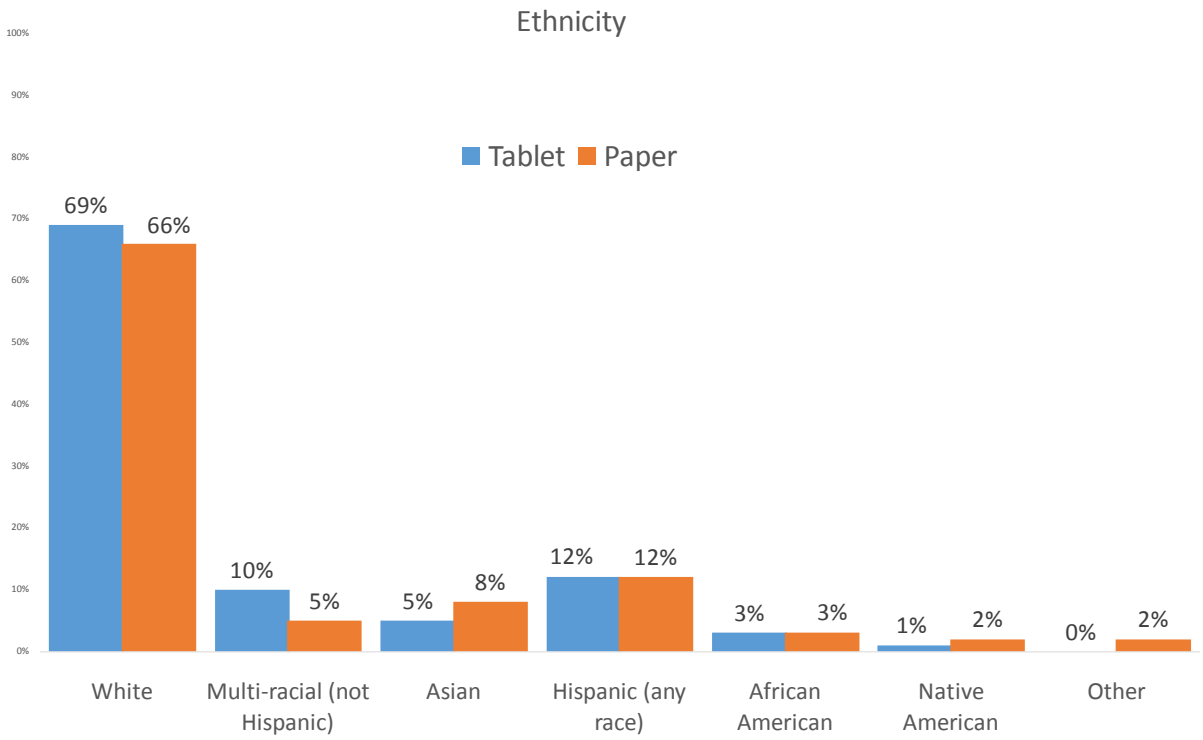
Figure 61 Transportation Options



Transportation Options

Tablet respondents were somewhat more likely to have a driver's license but quite similar to paper respondents in terms of the availability of a vehicle.

Figure 62 Ethnicity

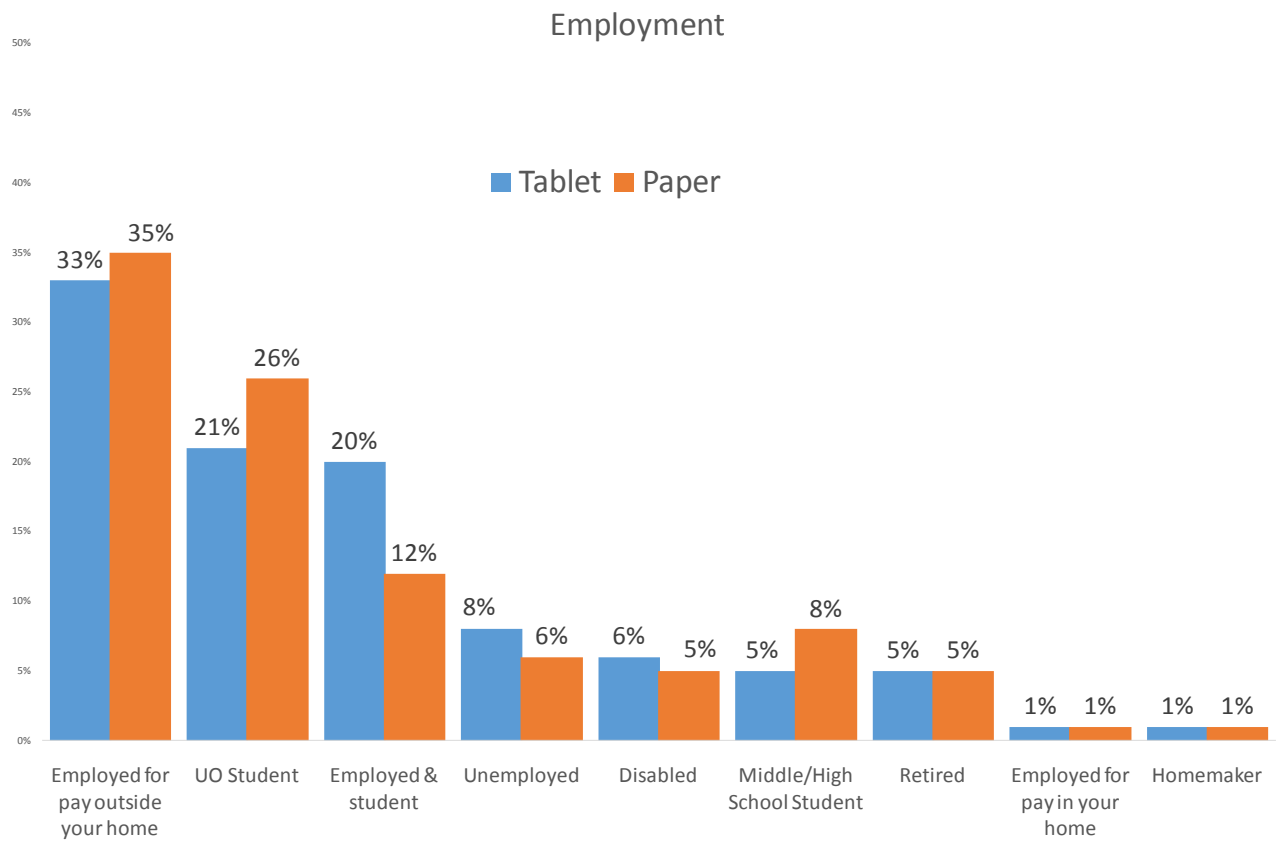


Ethnicity and Language

Those interviewed by tablet were very similar to the paper survey sample in terms of ethnicity.

They were, however, more likely to say they spoke English very well (95%) than the paper survey respondents (87%). However, they were equally likely to say they spoke English at home (93% for tablet and 92% for paper). About 1.2% of the paper surveys were completed in Spanish while the tablet survey was conducted only in English.

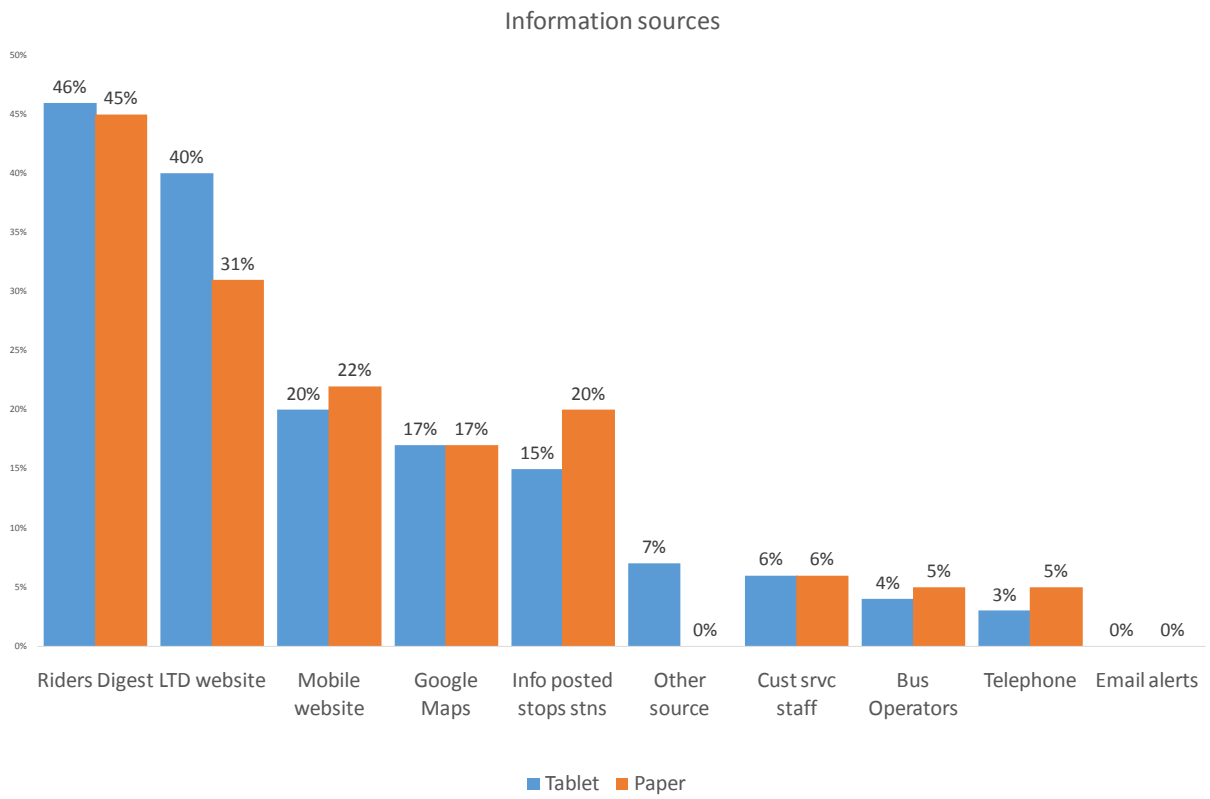
Figure 63 Employment Status



Employment and Student Status

The two surveys were quite similar in terms of the distribution of employment status. In the tablet survey 45% of respondents were students, while in the paper survey 43% were. The tablet survey included more respondents who were both employed and students – perhaps by doing a better job of capturing multiple responses to this "check all that apply" question.

Figure 64 Information Sources



Information Sources

Respondents between the two surveys were similar in their use of various information sources with one notable exception. The tablet respondents were significantly more likely to cite the website as a source of information, perhaps indicating a greater level of comfort dealing with computers (like the tablets being used to conduct the survey).

While the two sets of respondents do not vary drastically, there are distinct differences in the demographic makeup of the samples which would indicate some level of bias introduced by the oral interview format. The tablet survey respondents are less likely to be low income, young and to speak English less than very well.

1. Effectiveness in collecting complete, geocodable origin-destination information.

Clearly, the tablet provides an advantage in collecting accurate origin-destination information. A higher percent of respondents provide all four points of interest (91%), there are fewer non-useful responses (such as home to home) and there are fewer skipped questions.

In his debrief of the effort, Paul Zvonkovic notes:

"Although a relatively small amount of data was collected in comparison to the paper survey, it appears that most of the travel pattern information collected is exactly what would be needed for the type of travel demand forecasting (TDF) that has been used by LTD in the past. If enough samples are collected, this is just the kind of information needed for both TDF and the evaluation of travel patterns for service planning purposes."

While the geo-coding of the paper surveys is not yet complete, it is likely that 60-70% will include all four points in sufficient detail for geo-coding.

2. Potential Bias due to Oral Interview Format or Respondent Selection.

As mentioned in the prior memo, "Implications of Traditional vs Tablet On-board Survey," there are three potential sources of bias when conducting interviews orally as is required by the tablet approach.

- **Sampling of riders on bus:** The use of oral interviews means that riders entering a bus must be "sampled." Unlike a self-administered paper survey, not every rider can be surveyed. This raises considerable risk of survey staff bias in selecting respondents. A randomization rule included in the survey software can help with this by specifying which boarding rider to interview, but cannot resolve it entirely especially in crowded situations in which it is difficult to determine the order of boarding.

- **Variable response of riders:** Some riders who may complete an "anonymous" paper survey may be reluctant to provide oral answers to a surveyor, particularly in a setting where others can hear. In his debrief, Zvonkovic notes:

  "… some respondents are not too keen on having even the cross streets near their home said out loud for everyone on the bus to hear."

  Other riders may simply be less comfortable interacting with a surveyor or with the tablet resulting in reduced response among specific segments. In the field of survey research there is a substantial body of research that demonstrates that significant bias can be introduced simply due to interaction with an interviewer, regardless of skill level of the interviewer.

- **Disproportional sampling of stops:** Bus stops vary widely in the numbers of persons boarding. In a self-administered survey, this is not a problem because all riders are asked to

participate and therefore the volume of responses will tend to directly reflect the volume of passengers boarding. In an oral/tablet interview, however, only a few of the people boarding at a given stop will be interviewed regardless of how many board, and some closely spaced stops may be missed altogether. This will skew the data, over-representing passengers at less used stops and under-representing passengers at heavily used stops. We understand that TriMet addressed this issue by conducting a complete boarding/alighting count in advance of the survey and used that data for weighting. However, Dr. Clark notes that, while weighting is a logical way to address the issue, the weighting factor for each respondent at the heavily used stops would be so large as to risk serious distortion if by chance the few people interviewed were dissimilar in some way from most people at the stop.

The discussion earlier in this review comparing demographic and usage characteristics between the two samples allows us to consider whether or not significant bias has been introduced.

While the characteristics of respondents from the paper and tablet surveys do not vary drastically there are distinct differences in the demographic makeup of the samples which would indicate some level of bias introduced by the oral interview format. It is of concern that the tablet survey respondents are less likely to be low income, young, or to speak English very well.

Charactertic	Tablet	Paper
Age under 25	34%	46%
Income less than $10K	26%	39%
Income less than $25K	54%	68%
Speak English very well	95%	87%

This bias is likely due to a combination of factors: possible interviewer bias in selecting respondents in spite of randomization software; differing levels of willingness to be interviewed – i.e. response rates -- among these groups; the tendency of respondents to give different answers when "someone is listening" and the factor of the social interaction between interviewer and respondent which has been shown in many studies to affect responses. Of course, the tablet pilot was mono-lingual, excluding non-English speaking participants entirely. This would need to be rectified in any large scale implementation.

Note that the greater accuracy and completeness of the data, specifically the OD data, does not offset the danger of bias for modeling. If a system were to rely on only tablets and if the bias proved to be a general phenomenon and were not handled by a combination of training, bilingualism and paper supplement with weighting, then the modeling process would over the long term build the bias into the planning process with uncertain consequences for service planning. The differences are subtle enough and may not be sufficiently related to origins and destinations for that to be a problem, but we don't know that.

3. Skill Level Required by Surveyors to Utilize Tablet Programming.

Conducting interviews using the tablets, particularly the mapping software, required a significantly higher skill level and more training for the interviewers. One interviewer quit after

a single shift. Those that were most successful had significant experience using touch screen computers in general and specifically on-line maps.

During much of the pilot, surveyors were still learning to use the software. In his debrief, Zvonkovic notes:

"…map is a nice tool & works fine, but takes practice to find locations & zoom correctly. That's practice while riding on a moving / jostling vehicles. As one surveyor commented, 'you hit a bump and the map will often orient itself to the Aleutian Islands (Alaska)'."

The longer learning curve and high level of required expertise argue for using a smaller, more highly trained team of interviewers over a longer period of time. Training large numbers of surveyors to use tablets to conduct the survey in a week would be ineffective.

4. Cost per Interview Relative to Paper Surveys.

One of the greatest differences between the two data collection methods is cost per completed interview. The analysis below first considers only marginal costs – those that vary with the number of interviews completed.

Marginal Cost per Tablet Interview:

- 266 interviews were conducted using 77.25 surveyor hours at a rate of $25/hour. This equals 3.44 interviews per surveyor hour or about 17.5 minutes per interview. With experience, it is likely that surveyors could complete 4-5 interviews per hour.
- Total Marginal Cost of $7.76/interview equals surveyor time of $7.26 plus an estimate of $.50 per interviewer for tablet rental and data costs. These costs were much higher during the pilot due to the brief duration of the survey. The $.50 assumes monthly tablet rental and data costs spread over a full month.
- 91% of tablet interviews were fully geocodable. The marginal cost per geocodable interview is $8.53.

Cost Comparison		
Marginal Costs	Tablet	Paper
Completed Interviews	266	6722
% Fully Geocodable	91%	65%
# Geocodeable cases	242	4,369
Surveyor Hours	77.25	534.25
Surveyor Cost	$1,931	$10,215
Minutes/ Interview	17.5	4.7
Surveyor Cost/Interview	$7.26	$1.52
Printing/shipping of paper	NA	
Other Marginal Costs	$ 0.50	$1.70
Data cleaning for paper survey	NA	$0.19
Total Cost/Interview	$7.76	$3.41
Marginal Cost per geocodable interview	**$8.53**	**$5.25**
Fixed costs		
Programming/Layout design	$4,900	$200
Assuming N=6,722 for both surveys		
Fixed cost per completed survey	$0.729	$0.03
Total cost per completion if N=6,722	$8.489	$3.44
Cost to complete 6,722 initial surveys	$57,063	$23,122
Resulting geocodable N=	6,117	4,369
Full Cost per geocodable interview	**$ 9.33**	**$ 5.29**

Marginal Cost per Paper Survey Completion:

- 6722 completed questionnaires were collected using 534.25 hours at a rate of $19.12/hour. This equals 12.6 interviews per surveyor hour or about 4.7 minutes per completion.
- Total Marginal Cost of $3.22 per interview includes $1.52 of surveyor cost, $1.34 for data entry, $.36 for printing, supplies and shipping. In addition, hours used to clean/code O/D data before sending for data entry amounted to an additional $.19 per questionnaire.
- Assuming 65% are geocodable (70% in 2011), cost per geocodable interview is $5.25.

Fixed Costs

The comparison of marginal costs does not take into account the up-front programming costs which are necessary for the tablet. For the pilot, the programming costs, which were leveraged off of TriMet's prior work, were approximately $4900. This is a fixed cost which would remain constant regardless of the size of the sample. The 'Fixed Cost" section of the cost comparison above allocates this cost as if the tablet and paper surveys had similar sample sizes. This results in a cost per geocodable interview for the tablet survey of $9.33 and for the paper survey of $5.29.

In summary, the cost for collecting origin/destination data, even when you allow for a lower level of completion with the paper surveys, is about 75% higher for the tablet methodology. The geocodable rate for the paper survey would have to fall below 40% in order for the tablet and paper method to be comparable in terms of cost per geocodable interview.

Future Survey Method

In future passenger surveys, LTD would like to capitalize on the potential of tablet based interviewing to capture more accurate origin-destination data for modeling, while also collecting information from a large and reliably representative sample of riders. And, of course, they would like to do this at a reasonable cost.

It appears that this can be most effectively achieved using a hybrid survey method that combines the strengths of the two approaches. For example, LTD might:

- Continue to conduct a periodic system wide survey to provide route level demographic, usage characteristic and satisfaction data. This survey would not attempt to collect complete O/D data (e.g. four points) but would include trip purpose and city to city level O/D. A survey with this level of detail would be less expensive due to lower data entry costs and no need for data cleaning.
- Utilize a small number of highly trained bilingual staff (either temporary staff or part time employees) to conduct tablet based O/D interviews over an extended time period. For example, two surveyors working full time for about 2 months could likely conduct close to 3000 interviews. In addition to the O/D information, these interviews would include only minimal demographic questions - age, income and ethnicity. The surveyors would become

more proficient with the tablets through use. This would reduce the interview time, reduce cost and potentially increase the willingness of riders to participate in a “quick” interview.

- Data from the periodic paper survey would be used to verify that the O/D data is representative of the overall ridership and to weight it based on age, income and ethnicity if needed.
- It may also be desirable to address the issue of disproportionate sampling of stops by weighting the O/D data from the tablet survey to reflect the level of boarding at each stop. This could be accomplished using an independent boarding/alighting count (either collected during the periodic on-board survey or by automatic passenger counters.)

Appendix A: Questionnaires

English and Spanish versions of the questionnaire used during the onboard survey – enclosed.

Appendix B: Full Data Sets

Full data sets for both paper and tablet samples provided in digital form – Excel files

Appendix C: Survey Sample/Schedule

Provided in digital form – Excel file

Appendix D: Tablet Survey Debrief

Paul Zvonkovic, who supervised the tablet survey, has provided a detailed debrief of issues to consider for future tablet-based survey efforts - provided separately.

ENCUESTA PARA CLIENTES DE LTD - OCTUBRE DE 2015

Si contestó esta encuesta en las últimas dos semanas, marque esta casilla y si conteste solo las preguntas 1-17. ☐

Háblenos sobre el viaje de ida que está haciendo ahora. *Un ejemplo de viaje de ida es ir de su casa al trabajo, aunque use más de un autobús. La vuelta del trabajo a su casa sería un viaje de ida diferente.*

1. ¿Dónde COMENZÓ este viaje de ida?
(Marque la mejor respuesta)

1 ☐ Casa
2 ☐ Trabajo/visita de trabajo
3 ☐ Universidad
4 ☐ Escuela secundaria/ preparatoria
5 ☐ Tienda o restaurante
6 ☐ Consultorio médico/ odontológico
7 ☐ Cita de servicios sociales
8 ☐ Visita a alguien
9 ☐ Entretenimiento/Recreación
10 ☐ Otro lugar:_____

2. Mi punto de partida fue en:

Dirección: *(p. ej., 123 W. 1st Ave)*

_____

_____

O esquina:
(p. ej., E. 18th Ave & Pearl)

_____

_____

Ciudad: ☐ Eugene
☐ Springfield
☐ Otra:

_____

3. ¿Cómo llegó a la primera parada de autobús?

1 ☐ Caminé
2 ☐ Conduje
3 ☐ Conduje con otro pasajero y estacioné
4 ☐ Alguien me dejó en el lugar
5 ☐ Me dejó un taxi o un vehículo compartido que pagué
6 ☐ Silla de ruedas/Silla con motor
7 ☐ En bicicleta y puse la bicicleta en el autobús/EMX
8 ☐ En bicicleta y dejé la bicicleta en la parada/ estación de autobuses o cerca de la parada/estación
9 ☐ Otro medio: _____

_____

4. ¿Dónde subió al primer autobús?

Nombre de la estación:
_____ O

Ubicación de la parada:

_____
Calle

_____
Intersección más cercana

Ciudad: ☐ Eugene
☐ Springfield
☐ Otra:

_____

5. Mi primer autobús fue en la Ruta número: _____

6. ¿Usará más de un autobús para realizar este viaje de ida?

☐ No, este es el único autobús que usaré

Usaré una 2.ª ruta de autobús:
#_____

Usaré una 3.ª ruta de autobús:
#_____

7. ¿Dónde bajará del último autobús?

Nombre de la estación:
_____ O

Ubicación de la parada:

_____
Calle

_____
Intersección más cercana

Ciudad: ☐ Eugene
☐ Springfield
☐ Otra:

_____

8. ¿Cómo llegará su destino cuando baje del último autobús?

1 ☐ A pie
2 ☐ Conduciré
3 ☐ Conduciré con otro pasajero
4 ☐ Me pasarán a buscar
5 ☐ Tomaré un taxi o un vehículo compartido que pagaré
6 ☐ Silla de ruedas/Silla con motor
7 ☐ Usaré la bicicleta que traje conmigo en el autobús/EMX
8 ☐ Usaré una bicicleta diferente
9 ☐ Otro medio: _____

_____

9. ¿Dónde FINALIZARÁ este viaje de ida?
(Marque la mejor respuesta)

1 ☐ Casa
2 ☐ Trabajo/visita de trabajo
3 ☐ Universidad
4 ☐ Escuela secundaria/ preparatoria
5 ☐ Tienda o restaurante
6 ☐ Consultorio médico/ odontológico
7 ☐ Cita de servicios sociales
8 ☐ Visita a alguien
9 ☐ Entretenimiento/Recreación
10 ☐ Otro lugar _____

10. Mi punto de llegada está en:

Dirección: *(p. ej., 123 W. 1st Ave)*

_____

_____

O esquina:
(p. ej., E. 18th Ave & Pearl)

_____

_____

Ciudad: ☐ Eugene
☐ Springfield
☐ Otra:

_____

Dé vuelta a la encuesta y conteste las preguntas de atrás ➡

ENCUESTA PARA CLIENTES DE LTD
OCTUBRE DE 2015

11. ¿Cómo pagó la tarifa de este viaje de ida? *(Marque UNA sola opción)*

1 ☐ Dinero en efectivo
2 ☐ Pase diario
3 ☐ Boleto de talonario de 10 viajes
4 ☐ Boleto de máquina expendedora
5 ☐ Pase mensual/por 3 meses
6 ☐ Pase grupal de empleador/escuela
7 ☐ Otra opción *(especifique)*: _____

12. ¿Cuántos viajes individuales de ida en LTD hará usted hoy?
(Encierre un número en un círculo)

1 2 3 4 5 6 o más

13. Incluyendo hoy, ¿cuántos días ha viajado en LTD en la última semana? *(Encierre un número en un círculo)*

1 2 3 4 5 6 7

14. ¿Tiene licencia de conducir válida? 1 ☐ Sí 2 ☐ No

15. ¿Cuántos <u>otros</u> miembros de su familia tienen licencia válida?

0 – Ninguno 1 2 3 4 o más

16. ¿Cuántos autos que funcionan posee o arrienda su familia?

0 – Ninguno 1 2 3 4 o más

17. Por favor marque, todas las opciones que apliquen para usted. ¿Cuál es su situación laboral?

1 ☐ Trabajo <u>fuera de mi casa</u> y recibo pago
2 ☐ Trabajo <u>en mi casa</u> su casa y recibo pago
3 ☐ Estudiante de UO
4 ☐ Estudiante de LCC
5 ☐ Escuela secundaria/preparatoria
6 ☐ Estudiante de otro nivel
7 ☐ A cargo de las tareas del hogar
8 ☐ Jubilado
9 ☐ Desempleado
10 ☐ Discapacitado

18. ¿Cuántos años tiene? _____

Si ha llenado el resto de esta encuesta en las dos últimas semanas, deténgase aquí y devuelva el cuestionario al encuestador. *¡Gracias!*

19. ¿Qué tipo de ayuda, si es el caso, necesitó para usar el autobús hoy? *(Marque todas las opciones que apliquen)*

1 ☐ Ninguna ayuda
2 ☐ Ascensor/rampa
3 ☐ Anuncios de parada
4 ☐ Ayuda del conductor
5 ☐ Instrucciones para viajar
6 ☐ Asistente personal
7 ☐ Animal de servicio
8 ☐ Otra: _____

20. ¿Cómo obtiene información de rutas y horarios de LTD?
(Marque todas las opciones que apliquen)

1 ☐ Riders Digest
2 ☐ Teléfono
3 ☐ Sitio web para dispositivos móviles
4 ☐ Sitio web de LTD
5 ☐ Conductor del autobús
6 ☐ Google Maps
7 ☐ Personal de servicio al cliente en la estación
8 ☐ Alertas por correo electrónico
9 ☐ Información publicada en las paradas/estaciones
10 ☐ Otra:_____

21. ¿Lleva un teléfono celular?

1 ☐ Teléfono celular común
2 ☐ Sin teléfono celular
3 ☐ Smartphone con acceso a internet

22. ¿Cuál es el ingreso anual total de su hogar?

1 ☐ Menos de $10,000
2 ☐ De $10,000 a $14,999
3 ☐ De $15,000 a $24,999
4 ☐ De $25,000 a $34,999
5 ☐ De $35,000 a $44,999
6 ☐ De $45,000 a $54,999
7 ☐ De $55,000 a $74,999
8 ☐ De $75,000 a $99,999
9 ☐ De $100,000 o más

23. ¿Cuántas personas viven en su casa?

1 2 3 4 5 6 7 8 o más

24. ¿Es usted de origen hispano o latino? 1 ☐ Sí 2 ☐ No

25. ¿De qué raza u origen étnico se considera usted?
(Marque todas las opciones que lo describan)

1 ☐ Afroamericano/negro
2 ☐ Asiático
3 ☐ Caucásico/blanco
4 ☐ Indio nativo de Estados Unidos
5 ☐ Nativo de Alaska
6 ☐ Otra: _____

26. ¿Qué tan bien habla inglés?

1 ☐ Muy bien 2 ☐ Bien 3 ☐ No muy bien 4 ☐ Nada bien

27. ¿Qué idioma habla con más frecuencia en su casa?

1 ☐ Inglés 2 ☐ Español 3 ☐ Otro: _____

28. ¿Se identifica usted como...?

1 ☐ Hombre 2 ☐ Mujer 3 ☐ Transgénero

En los últimos 30 días, ¿en qué medida LTD cubrió sus necesidades de transporte en cada una de las siguientes áreas?	**Muy bien**						**Mal**
29. Frecuencia con la que pasa el autobús	7	6	5	4	3	2	1
30. Frecuencia con la que el autobús llega a tiempo	7	6	5	4	3	2	1
31. Comodidad mientras espera al bus	7	6	5	4	3	2	1
32. Comodidad mientras viaja en autobús	7	6	5	4	3	2	1
33. Sensación de seguridad al viajar con otros pasajeros	7	6	5	4	3	2	1
34. Ayuda de los conductores de LTD	7	6	5	4	3	2	1
35. Información sobre horarios en las paradas o estaciones	7	6	5	4	3	2	1
36. Ayuda de los empleados de servicio a clientes ☐ No he hablado con ellos	7	6	5	4	3	2	1
37. Información obtenida del sitio web de LTD ☐ No he hablado con ellos	7	6	5	4	3	2	1
38. EN GENERAL, ¿cómo clasifica el servicio de LTD?	7	6	5	4	3	2	1

39. ¿En qué año comenzó a usar los autobuses LTD?

2008 o antes 2009 2010 2011
2012 2013 2014 2015
☐ Es la primera vez que uso LTD

Comentarios:

_____

_____

_____

_____

***¡Gracias!* Por favor devuelva el cuestionario al encuestador.**