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Mobility on Demand (MOD) Sandbox Demonstration: Dallas Area Rapid Transit (DART) First and Last Mile Solution

Evaluation Report

JUNE 2021

FTA Report No. 0195
Federal Transit Administration

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U.S. Department of Transportation
Federal Transit Administration

COVER PHOTO

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Metric Conversion Table

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liter	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C

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14. ABSTRACT
The Mobility on Demand (MOD) Sandbox Demonstration Program provides a venue through which integrated MOD concepts and strategies, supported through local partnerships, are demonstrated in real-world settings. For the 11 MOD Sandbox Demonstration projects, an independent evaluation was conducted that includes an analysis of project impacts from performance measures provided by the project partners and an assessment of the business models used. This document presents the results from the independent evaluation of the Dallas Area Rapid Transit (DART) First and Last Mile Solution MOD Sandbox Demonstration project. Evaluated were hypotheses that explored project impacts on travel behavior, user experiences, first and last mile to public transit accessibility, service quality for passengers with disabilities, and costs. The project improved first and last mile connectivity to DART transit, increased satisfaction among DART transit users, enhanced service for passengers with disabilities, and increased the geographic scope of DART transit service in the Plano area. In addition, wait and travel times for passengers with and without disabilities reflected similar distributions. The subsidy per rider of GoLink services was lower than the low-ridership fixed-route transit services that it replaced in Plano, but it was not lower than the subsidy for DART fixed-route transit in the overall Dallas region. DART project team members were interviewed to better understand challenges, barriers, successes, and broader lessons learned from the project, representing agency personnel from the offices of Innovation, Service Planning, Scheduling, Paratransit Operations, and Marketing. Lessons learned revealed the importance of having pre-planned, ready-to-go projects with committed partners, flexible contracting terms, metrics for adjusting spatial and temporal service coverage (including terminating service if appropriate), vehicle right-sizing, and understanding customer needs.

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ABSTRACT

The Mobility on Demand (MOD) Sandbox Demonstration Program provides a venue through which integrated MOD concepts and strategies, supported through local partnerships, are demonstrated in real-world settings. For the 11 MOD Sandbox Demonstration projects, an independent evaluation was conducted that includes an analysis of project impacts from performance measures provided by the project partners and an assessment of the business models used. This document presents the results from the independent evaluation of the Dallas Area Rapid Transit (DART) First and Last Mile Solution MOD Sandbox Demonstration project. Evaluated were hypotheses that explored project impacts on travel behavior, user experiences, first and last mile to public transit accessibility, service quality for passengers with disabilities, and costs. The project improved first and last mile connectivity to DART transit, increased satisfaction among DART transit users, enhanced service for passengers with disabilities, and increased the geographic scope of DART transit service in the Plano area. In addition, the wait and travel times for passengers with and without disabilities reflected similar distributions. The subsidy per rider of GoLink services was lower than the low-ridership fixed-route transit services that it replaced in Plano, but it was not lower than the subsidy for DART fixed-route transit in the overall Dallas region. DART project team members were interviewed to better understand challenges, barriers, successes, and broader lessons learned from the project, representing agency personnel from the offices of Innovation, Service Planning, Scheduling, Paratransit Operations, and Marketing. Lessons learned revealed the importance of having pre-planned, ready-to-go projects with committed partners, flexible contracting terms, metrics for adjusting spatial and temporal service coverage (including terminating service if appropriate), vehicle right-sizing, and understanding customer needs.

EXECUTIVE SUMMARY

This report presents the results of the independent evaluation of the Dallas Area Rapid Transit (DART) First and Last Mile Solution project, operated by DART and transportation service provider partner Uber, with support from the Federal Transit Administration (FTA). The objective of the project was to implement first mile and last mile (FMLM) strategies to improve service options and connectivity for customers and to increase efficiency within DART's operations.

The DART First and Last Mile Solution project was one of 11 Mobility on Demand (MOD) Sandbox Demonstrations partially funded by FTA. The independent evaluation was sponsored by the U.S. Department of Transportation (USDOT) Intelligent Transportation Systems Joint Program Office (ITS JPO) and FTA.

DART has expanded its transit services significantly to help accommodate the explosive growth in the Dallas/Fort Worth area, although increasing ridership and service frequency has been a challenge, one that is notably difficult for bus services, and many residents in the area have difficulty completing the first and/or last mile segment of their trips, even in cases where high frequency public transit services are available for significant portions of their trip. Almost 28% of all Dallas area residents and 24% of all jobs in the DART service area are more than a quarter-mile from a bus or rail station.

The project aimed to address these challenges by implementing FMLM strategies to increase connectivity for passengers and improve the overall DART transit network. DART employed a number of different approaches to address these challenges. The MOD Sandbox project leveraged DART's existing GoPass ticketing app to integrate public and third-party mobility providers and included a new version of the GoPass app. The project implemented the GoLink on-demand microtransit shuttle service across three zones in the Plano, Texas area for point-to-point travel within a given zone and FMLM travel to or from a DART transit station. The project also integrated UberPool as an option within the GoPass app for point-to-point or FMLM travel within zones.

GoLink first began in October 2017 within the Legacy West zone. The service was a microtransit system that provided noontime service within the zone for Toyota employees. Field demonstrations for the expanded GoLink pilot that are the subject of this evaluation initially launched in the Plano area in late February 2018. The UberPool option within the GoPass app launched during March 2019 across six zones in DART's service area over the two final months of the evaluation period, including the three Plano zones. This evaluation focused only on the zones within Plano. The evaluation of the demonstration ended in April 2019 and included analysis of two surveys conducted in February 2019 (n = 255) and April 2019 (n = 196), activity data of GoLink shuttle movements with 58,226 trips, and agency data on vehicle activity, costs, and transit system coverage. In August 2019, DART representatives from the offices of Innovation, Service

Planning, Scheduling, Paratransit Operations, and Marketing were interviewed. The report explores the project through the evaluation of 12 hypotheses.

Hypothesis 1: The app increases transit use among the sample as a result of the app improvements, leveraging FMLM MOD providers and lower-cost public transportation.

The results of the evaluation suggest that public transit use may have increased among a portion of the GoLink users surveyed due to the pilot project implementation. The analysis found that almost half (45%) of those surveyed used another DART transportation mode (rail and/or bus) to get to their final destination. These respondents who made FMLM trips were asked to identify how they would have made their trip prior to the existence of GoLink. Although many of these respondents still would have used a DART service for their trip, a notable portion of respondents would have driven in a personal car (25%), taken a taxi, Uber, or Lyft vehicle (20%), or would not have made the trip (11%) prior to the implementation of the GoLink service. This finding suggests that public transit use by these respondents likely increased as a result of the pilot project, supporting Hypothesis 1.

Hypothesis 2: The improvements to the app result in an increase in the mode share of carpool travel to DART transit.

The evaluation sought to determine whether improvements to GoLink resulted in an increase in carpool travel to DART transit services. DART had initially planned to have a more extensive integration of carpooling (called GoPool) with GoLink; however, this ultimately was not successful due to a lack of available drivers as well as other challenges. The survey still explored whether the existing implementation of GoLink influenced carpooling behavior. The results found that just 5% of GoLink users indicated that the service was replacing trips they had previously made through carpooling or vanpooling, and, broadly, they did not provide evidence that to-DART transit increased. Absent greater integration of carpooling into the app, there were no other major reasons why the carpooling mode would have increased as a result of the project app. Hence, overall, Hypothesis 2 was not supported.

Hypothesis 3a: Persons with disabilities find that their ability to access DART transit has improved.

The evaluation explored, through a series of survey questions, whether persons with disabilities experienced improved access to DART transit due to the implementation of GoLink. The analysis shows that all respondents with disabilities considered their access to DART transit stations and the overall DART system as average or above average. Additionally, many respondents with disabilities indicated that their DART system accessibility improved after implementation of the GoLink pilot project. Before GoLink, 57% of passengers

with disabilities rated their access to DART stations as "excellent" or "good" compared to 90% of passengers with disabilities who also rated their access to stations as "excellent" or "good" after upgrades to the GoLink service. These findings support Hypothesis 3a.

Hypothesis 3b: Persons with disabilities experience improved FMLM access as a result of the app.

Activity data were used to evaluate how the GoLink system impacted FMLM access through the app. The standard GoLink shuttle was a wheelchair-accessible vehicle (WAV), but most passengers did not require wheelchair accommodations for their travel. Some passengers using GoLink may have had other disabilities, but these were not visible in the activity data. Trips that required a wheelchair accommodation were recorded and were used as the primary measure of the system's performance with persons with mobility impairments. Travel and wait times for all WAV trips were recorded, including a modified wait time that considered the given estimated time of arrival (ETA) (in minutes) as added on to the initial request time of the trip. The origin and destination of each of these trips was run through the Google Directions API to determine the minutes the trip would take using fixed-route transit. The average travel times of fixed-route transit were compared to those of GoLink. The average in-vehicle travel time of all GoLink WAV trips was consistently faster than the analogous fixed-route travel times during the evaluation period. If the total GoLink travel time was considered to be the vehicle request time to the end of the trip, fixed-route service was found to be faster when there was a fixed-route option available. When the given ETA added to the vehicle request time (moving the start time to request time + ETA minutes), again, GoLink was found to be faster, on average. The comparison was also made specifically for GoLink WAV trips that connect to other transit facilities. The sample size was considerably smaller, and the conclusions were not as consistent or robust. However, a notable finding was that a fixed-route transit service could not service a measurable fraction of trips completed by GoLink (these trips were not included in the time comparisons). For such trips, GoLink was the only option. Across all WAV trips, 13% could not be serviced by fixed-route transit. Across all WAV trips that connected to other public transit facilities, 63% were found to not be achievable by existing fixed-route public transit. These findings collectively suggest that Hypothesis 3b was supported.

Hypothesis 4: Automobile travel among the pilot group declines.

Survey data on automobile travel and mode shift data suggest that there was a reduction in personal automotive travel among the pilot group. Note that this hypothesis was focused on the evaluation of personal automobile travel of users (as opposed to shuttles or municipal vehicles). The most prominent data supporting this came from the survey, which indicated that 22% of respondents

would have driven a personal car in the absence of GoLink, and another 20% would have taken a taxi or Transportation Network Company (TNC) such as Uber or Lyft. The results suggest that about 42% of respondents were taking GoLink instead of using a personal automobile in some form. Because of this sizable shift, the results suggest that GoLink reduced automobile travel. Note this conclusion does not imply that GoLink reduced vehicle miles of travel (VMT). Personal automotive VMT was replaced by GoLink shuttle VMT, which if done at a single passenger occupancy within the shuttles, may be more energy-intensive. Rather, the data suggest that the GoLink service was capable of providing mobility that would have otherwise been traveled by a personal automobile in some form. The results support Hypothesis 4.

Hypothesis 5a: Users of the app consider their transportation and multimodal travel options improved because of the app.

The evaluation examined user experiences and opinions with the app and aspects of GoLink to determine whether respondents considered their transportation options improved due to the app. The survey asked respondents to rate the ease of use, information accuracy, and overall experience of users in terms of trip planning, scheduling, and fare payment. The majority of respondents rated their experiences along these dimensions as "above average." More than three quarters of respondents rated their experience with the app as "excellent" or "good" across these three areas. These findings suggest that those surveyed had positive overall experiences with the GoPass app. Based on responses to trip planning, scheduling, and fare payment questions, the results suggest that transportation and multimodal options were improved because of it, supporting Hypothesis 5a.

Hypothesis 5b: Users experience lower travel times than they would have without using the app.

The analysis measured whether users experienced lower travel times than they would have without the app-based service by assessing average monthly travel times and user ratings of their in-vehicle travel times. Average in-vehicle travel times with both the GoLink and UberPool options fluctuated modestly over the study year, with average GoLink travel times ranging from 11 to 13 minutes, and average UberPool travel times of about 8 minutes. UberPool data were collected for a span of only two months, so fluctuations in UberPool travel times may not have been fully captured. Survey results suggest that users were generally satisfied with in-vehicle travel times for both GoLink and UberPool options. The results generally support this Hypothesis 5b.

Hypothesis 6: App users experience better FMLM (access and egress) mobility to DART transit in the form of reduced travel times for FMLM trips.

The evaluation assessed whether app users experience improved access and egress mobility to DART transit in the form of reduced travel times through analysis of the survey and activity data. Although average travel times for FMLM trips increased slightly between April 2018 and February 2019, survey results show that the majority of respondents indicated that their FMLM mobility to transit stations improved as a result of GoLink. Thus, the results of this analysis generally support Hypothesis 6.

Hypothesis 7: The geographic scope of locations reachable by DART transit services is increased.

The geographic coverage of locations reachable by DART was measured by mapping the areas considered accessible by DART transit services both before and after GoLink implementation for the service area covered in the MOD Sandbox Demonstration. Before March 2017, 44% of Plano was considered accessible via DART transit. After the implementation of GoLink and as of May 2019, 82% of Plano was covered by DART transit services, reflecting an 85% increase in DART's Plano coverage area. Survey respondents also rated their ability to reach areas within the GoLink zones as favorable. Taken together, these results supported Hypothesis 7.

Hypothesis 8: The costs of fixed-route transit are higher than the MOD services on a per-rider basis.

To assess whether the transportation services offered as part of the MOD Sandbox Demonstration were financially comparable to fixed-route transit on a per-rider basis, researchers analyzed subsidy per rider data provided by DART. This comparison was done at several levels. DART replaced a low ridership fixed-route bus service in the West Legacy region, which required a subsidy of about $33.71 per rider. GoLink shuttles performed with an average subsidy per rider of $16.37. This comparison shows that GoLink had lower operational costs than low-ridership fixed-route transit, which is operational within the same low-density environment. Across the entire DART system, the subsidy per rider for fixed-route transit was $6.80 and for buses system-wide was $8.28. Hence, GoLink's cost performance exceeded that of low ridership routes, but it was not so competitive as to be more efficient than the DART system fixed-route average cost performance. Taking these perspectives into account, the results point to a partially-supported Hypothesis 8.

Hypothesis 9: The average lead time for trips with wheelchair-accessible vehicles (WAVs) that are scheduled for demand-responsive travel declines.

Activity data from the GoLink service permitted the computation of user wait time over the course of the project. The trend in average wait time for WAV trips (i.e., those called for persons with disabilities requiring mobility devices

such as wheelchairs) was evaluated and showed a gradual decline during the evaluation period. Average monthly wait times were between 13 and 23 minutes. The average wait time across all trips was 18. Furthermore, the non-GoLink paratransit service for DART requires that users schedule trips at least an hour prior to the trip. Hence, at almost any value, the wait times provided by GoLink were considered an improvement over the option preceding GoLink. Collectively, the findings supported Hypothesis 9.

Hypothesis 10: Customer satisfaction increases as a result of the project.

The evaluation sought to assess whether customer satisfaction increased as a result of the project. Survey questions asked respondents to rate their experiences with GoLink and UberPool services provided through by the MOD Sandbox project. The findings revealed that the vast majority of respondents rated their overall experiences with GoLink and UberPool as "above average." In addition, respondents gave "above average" ratings to their overall experience with UberPool through GoLink. These findings supported a confirmation of Hypothesis 10.

Hypothesis 11: The perception of the DART brand improves as a result of the project.

The results of the evaluation suggest that the perception of DART's brand may have improved as a result of the project, as most respondents viewed both GoLink shuttle and UberPool services as favorable enough to recommend to peers. In total, 88% of respondents said they would recommend the GoLink service to a family member or friend, and 73% said they would recommend the UberPool option. Generally, these results support Hypothesis 11.

Hypothesis 12: The process of deploying the project will produce lessons learned and recommendations for future research and deployment.

The evaluation team interviewed members of the DART project team to better understand challenges, barriers, best practices, and lessons learned from the implementation of the project. DART identified a number of challenges during pilot implementation, including 1) data sharing difficulties, 2) changing technology providers part way through the project, and 3) GoPass platform integration issues. Lessons learned through project development included 1) identifying potential projects ahead of time, 2) defining clear service goals, 3) enacting a collaborative planning process, 4) having broad contract terms, 5) right-sizing of vehicles, 6) having carefully-crafted marketing, and 7) collecting and sharing relevant data between project stakeholders. Lessons learned from the interviews for future MOD deployments emphasize the importance of having pre-planned, ready-to-go projects with committed partners. Additionally, flexible contracting

terms can allow projects to be more agile and responsive, allowing partners and vendors to more readily pivot in response to customer needs and demand. DART personnel emphasized the importance of adapting a demonstration throughout the pilot period rather than waiting until the end of a contract period to update service features. DART personnel also recommended that public agencies develop metrics for adjusting vehicle size and spatial and temporal service coverage (including terminating service if appropriate). Throughout the course of the MOD demonstration, DART had to actively reduce vehicle size (for greater maneuverability) and reduce the size of service zones to reduce travel and wait times. Finally, the MOD demonstration revealed the importance of understanding customer needs through marketing. Public agencies may need to evolve from measuring individual trips (i.e., connectivity between Point A and Point B) to measuring their "mobility relationship" with their customers. Data may be able to help public transit agencies more dynamically respond to changes in customer and operational needs.

The full report presents detailed findings of the DART evaluation, with lessons learned that may help advance similar initiatives within other public transit systems. Table ES-1 provides a summary of the findings.

Table ES-1

Summary of Findings

Hypothesis	Status	Key Finding
1: The app increases transit use among the sample as a result of the app improvements, leveraging FMLM MOD providers and lower-cost public transportation.	Supported	Analysis of survey data suggests that public transit use may have increased among a portion of the GoLink user base due to GoLink implementation.
2: The improvements to the app result in an increase in the mode share of carpooling travel to DART transit.	Not Supported	The survey data did not contain conclusive evidence that carpooling was impacted by GoLink.
3a: Persons with disabilities find that their ability to access DART transit has improved.	Supported	Analysis of the survey results show that respondents with disabilities indicated their access to DART transit stations and the overall DART system improved after implementation of GoLink.
3b: Persons with disabilities experience improved FMLM access as a result of the app.	Supported	Persons with disabilities experienced improved access both in the form of faster in-vehicle travel times and overall travel times when considering the ETA given. A sizeable share (63%) of WAV trips to DART that were made by GoLink could not have been made by fixed-route public transit.
4: Automobile travel among the pilot group declines.	Supported	Personal automobile and TNC mode substitution as a result of GoLink was found to be 42%. This amounted to a reduction in automobile use among the pilot group that was sizeable given the total distance traveled by the GoLink vehicle.
5a: Users of the app consider their transportation and multimodal travel options improved because of the app.	Supported	Nearly all survey respondents had above average experiences with the GoPass app with respect to trip planning, scheduling, and fare payment.

Table ES-1 (cont.)

Summary of Findings

Hypothesis	Status	Key Finding
5b: Users experience lower travel times than they would have without using the app.	Supported	Although average travel times fluctuated modestly during the study period, survey results suggest that users are generally satisfied with GoLink in-vehicle travel times for both GoLink shuttle and UberPool services.
6: App users experience better FMLM (access and egress) mobility to DART transit in the form of reduced travel times for FMLM trips.	Supported	The majority of survey respondents perceived that their FMLM mobility to/from public transit stations had improved as a result of GoLink.
7: The geographic scope of locations reachable by DART transit services is increased.	Supported	The geographic coverage of locations reachable by DART transit services increased, and survey respondents rated their ability to reach areas within the GoLink zone favorably.
8: The costs of fixed-route public transit are higher than the MOD services on a per-rider basis.	Partially Supported	Subsidy per rider data suggest that the GoLink services are cost-competitive with low ridership fixed-route services that operate in the same region. It was similarly competitive with the paratransit services that operate in the same region and more efficient than the costs of DART paratransit system wide. GoLink was not more cost-efficient than DART fixed-route public transit more broadly.
9: The average lead time for trips with WAVs that are scheduled for demand-responsive travel declines.	Supported	Average lead times (wait times) were an improvement over wait times from existing paratransit services. Average wait times minus given ETAs were also an improvement over the same paratransit wait times previously provided.
10: Customer satisfaction increases as a result of the project.	Supported	Analysis of survey results shows that the majority of respondents rated their experiences overall and with specific aspects of the GoLink service as "above average," suggesting that customer satisfaction increased.
11: The perception of the DART brand improves as a result of the project.	Supported	Analysis of survey results suggests that most respondents viewed both GoLink shuttle and UberPool services as favorable enough to recommend to their peers.
12: The process of deploying the project will produce lessons learned and recommendations for future research and deployment.	Supported	Expert (stakeholder /project partner) interviews identified best practices and lessons learned, including to 1) identify potential projects ahead of time, 2) define clear service goals, 3) enact a collaborative planning process, 4) have broad contract terms, 5) right-size vehicles, 6) have carefully crafted marketing, and 6) collect and share relevant data.

SECTION

1

Introduction

Overview of MOD Sandbox Demonstrations

The Federal Transit Administration (FTA)'s Mobility on Demand (MOD) effort developed around a vision of a multimodal, integrated, automated, accessible, and connected transportation system in which personalized mobility is a key feature. FTA selected 11 MOD Sandbox Demonstration projects that are testing solutions that advance the MOD vision. In partnership with public transportation agencies, the MOD Sandbox is demonstrating the potential for new innovations to support and enhance public transportation services by allowing agencies to explore partnerships, develop new business models, integrate transit and MOD solutions, and investigate new, enabling technical capabilities.

Evaluation of each project's benefits and impacts will guide the future implementation of innovations throughout the U.S. Broadly, MOD Sandbox projects take several approaches, including the development of new or improved trip planners, integration of new mobility services with traditional public transit functions, and implementation of new integrated payment and incentive structures for travel using public transit. Several Sandbox projects focus on improving first mile/last-mile (FMLM) access to public transportation through collaboration with private sector operators, including bikesharing, carsharing, ridesourcing/Transportation Network Companies (TNCs), and other shared mobility operators.

More information about the MOD Sandbox Program can be found at https://www.transit.dot.gov/research-innovation/mobility-demand-mod-sandbox-program. In addition, Table 1-1 provides a summary of all projects in the MOD Sandbox Program.

Table 1-1

Overview of MOD Sandbox Projects

Region	Project	Description
Chicago	Incorporation of Bikesharing Company Divvy	Releases updated version of Chicago Transit Authority's (CTA) existing trip planning app. New version incorporates Divvy, a bikesharing service, and allows users to reserve and pay for bikes within the app.
Dallas	Integration of Shared-Ride Services into GoPass Ticketing Application	Releases updated version of Dallas Area Rapid Transit's (DART) existing trip planning app. Updated version incorporates shared-ride services to provide first/last-mile (FMLM) connections to public transit stations and allows users to pay for services within the app.
Los Angeles and Puget Sound	Two-Region Mobility on Demand	Establishes partnership between Via and LA Metro. Via provides FMLM connections for passengers going to or leaving from transit stations. There is a companion project in Seattle, WA.
Phoenix	Smart Phone Mobility Platform	Releases updated version of Valley Metro's existing trip planning app. New version updates trip planning features and enables payments.
Pinellas County (Florida)	Paratransit Mobility on Demand	Improves paratransit service by combining services from taxi, ridesourcing/TNCs, and traditional paratransit companies.
Portland	Open Trip Planner Share Use Mobility	Releases updated version of TriMet's existing multimodal app. New version provides more sophisticated functionality and features, including options for shared mobility.
San Francisco Bay Area	Bay Area Fair Value Commuting (Palo Alto)	Reduces single occupancy vehicle use within Bay Area through commuter trip reduction software, a multimodal app, workplace parking rebates, and FMLM connections in areas with poor access to public transit.
	Integrated Carpool to Transit (BART System)	Establishes partnership between Scoop and BART. Scoop matches carpoolers and facilitates carpooling trips for passengers going to or leaving from BART stations with guaranteed parking.
Tacoma	Limited Access Connections	Establishes partnerships between local ridesourcing companies/TNCs and Pierce Transit. Ridesourcing companies provide FMLM connections to public transit stations and park-and-ride lots with guaranteed rides home.
Tucson	Adaptive Mobility with Reliability and Efficiency	Built integrated data platform that incorporates ridesourcing/TNC and carpooling services to support FMLM connections and reduce congestion.
Vermont	Statewide Transit Trip Planner	Releases new multimodal app for VTrans that employs fixed and flexible (non-fixed) transportation modes to route trips in cities and rural areas.

An independent evaluation (IE) is required by Federal Public Transportation Law (49 U.S.C. § 5312(e)(4)) for demonstration projects receiving FTA Public Transportation Innovation funding. The IE for the MOD Sandbox Demonstration projects was sponsored by the USDOT Intelligent Transportation Systems Joint Program Office (ITS JPO) and FTA.

This report focuses on the evaluation of the MOD Sandbox Demonstration project with Dallas Area Rapid Transit (DART) implemented in the Dallas/

Fort Worth area. The project, entitled DART First and Last Mile Solution, consisted of collaboration between DART and other transportation partners to deliver improved on-demand transportation options for point-to-point trips and FMLM travel to and from DART transit services in defined service zones. The evaluation of this project involved exploring a number of hypotheses surrounding the project's impact on travel behavior, user experiences, accessibility, and costs. Following a more detailed overview of the project, these hypotheses are explored in the sections that follow.

Evaluation Framework

For each of the 11 MOD Sandbox projects, the IE team developed an evaluation framework in coordination with the project team. The framework is a project-specific logic model that contains the following entries:

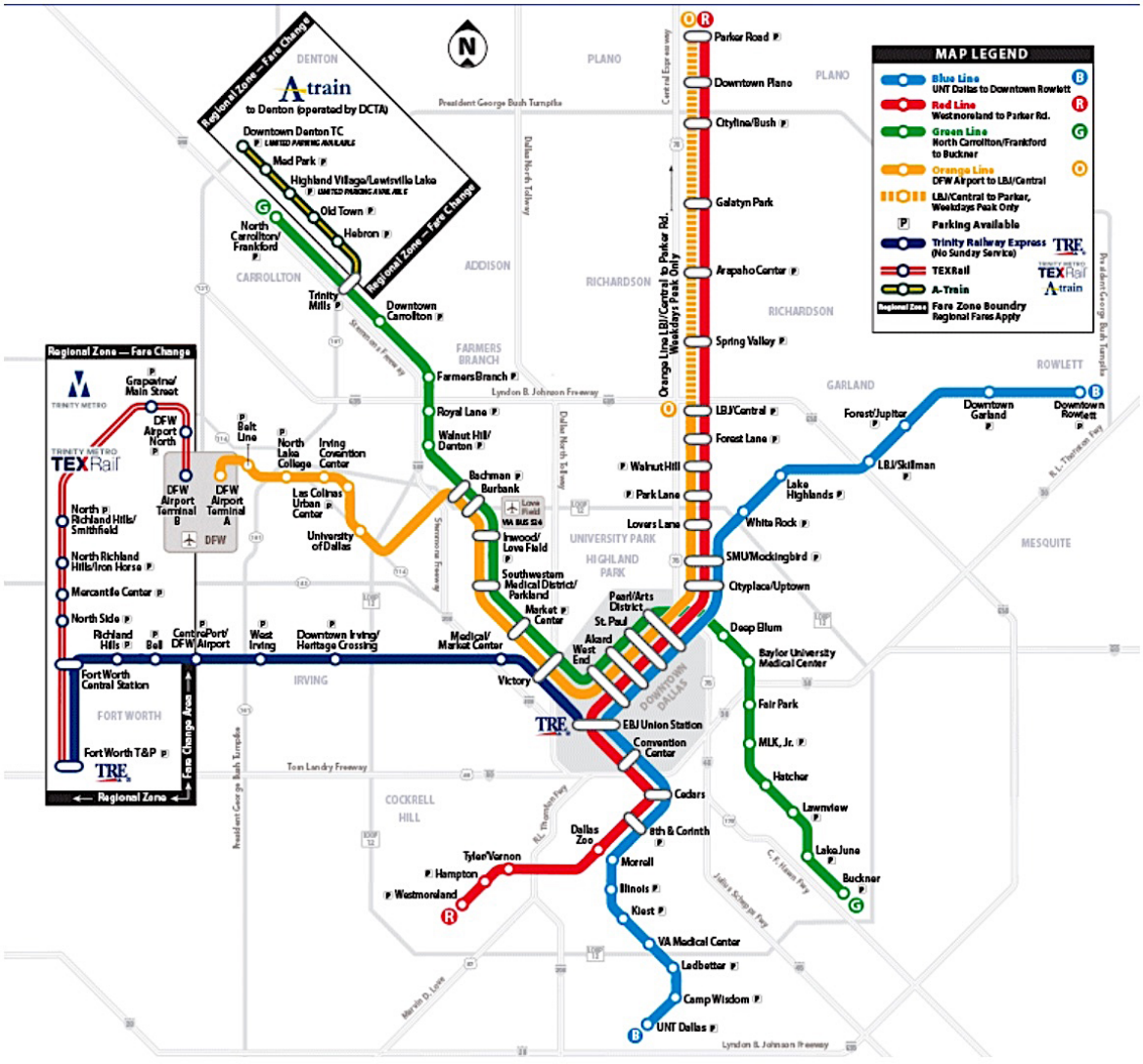
1. **MOD Sandbox Project** – denotes the specific MOD Sandbox project.
2. **Project Goals** – denotes each project goal for the specific MOD Sandbox project and captures what each MOD Sandbox project is trying to achieve.
3. **Evaluation Hypothesis** – denotes each evaluation hypothesis for the specific MOD Sandbox project. The evaluation hypotheses flow from the project-specific goals.
4. **Performance Metric** – denotes the performance metrics used to measure impact in line with the evaluation hypotheses for the specific MOD Sandbox project.
5. **Data Types and Sources** – denotes each data source used for the identified performance metrics.
6. **Method of Evaluation** – denotes the quantitative and qualitative evaluation methods used.

SECTION

2

DART MOD Sandbox Project Summary

DART is a public transit agency in the Dallas/Fort Worth area of Texas that operates bus, light rail, commuter rail, streetcar, paratransit, and vanpool services. DART operates the sixth-busiest light rail service in the U.S., logging more than 95,000 weekday boardings. Figure 2-1 presents a map of the DART light rail system as of August 2019.



Source: DART

Figure 2-1

DART light rail system map 2019

Although DART has expanded its services significantly to help accommodate population and job growth in the area, increasing transit ridership and service frequency, most notably through bus services, has been a challenge. Many residents of the Dallas/Fort Worth area have difficulty completing the FMLM segments of their trips, even while high-frequency rail or bus services are available for major portions of their trips. Nearly 28% of all residents and 24% of all DART service area jobs are more than a quarter-mile from a bus stop or rail station.

For these reasons, DART has explored a number of options over the years to fill the gaps in its fixed-route transit system. For approximately 20 years, DART had been operating a service known as DART On-Call, a demand-responsive service in a group of zones offering walk-up and telephone dispatch services. This service had to be booked between one hour and seven days in advance. The service was intended to replace underperforming fixed-route service in eight locations and was typically anchored at rail stations with a service area of six square miles or less. The service area was designed to operate with one vehicle per zone. However, over the years, On-Call ridership had become stagnant, and one service area was discontinued. DART began exploring ways to reinvent the program to make a more effective door-to-train service. Around the same time, DART also realized that it was competing with TNCs and that the agency had to be more competitive in low-density areas where fixed-route service was not very cost-effective or providing users with the best transit experience. DART anecdotally observed that customers were beginning to use shared mobility to get to and from rail stations (e.g., sometimes replacing a bus connection with shared mobility). DART realized that its role was likely evolving from a public transit provider to a mobility manager. Around 2015, DART began exploring opportunities to collaborate with TNCs, including a special promotion to use TNCs for FMLM connections to DART during St. Patrick's Day and joint marketing campaigns with TNCs on the DART app in an effort to enable greater customer choice.

These considerations led DART to propose a MOD Sandbox Demonstration project designed to leverage microtransit and TNCs to improve service and connectivity for customers while simultaneously providing increased operational and cost efficiencies. Additionally, DART hoped to leverage an updated demand-responsive service to increase public transit ridership among those that historically had not used DART service because of poor fixed-route service quality in lower-density built environments. DART's Sandbox project comprised three components: 1) GoLink dedicated shuttle vehicles providing microtransit demand-responsive service in each zone; 2) an UberPool option for making these trips in respective zones; and 3) integration of both GoLink and TNCs into DART's GoPass smartphone app. With respect to the latter, DART provides a choice of UberPOOL for the same price as GoLink services; however, users

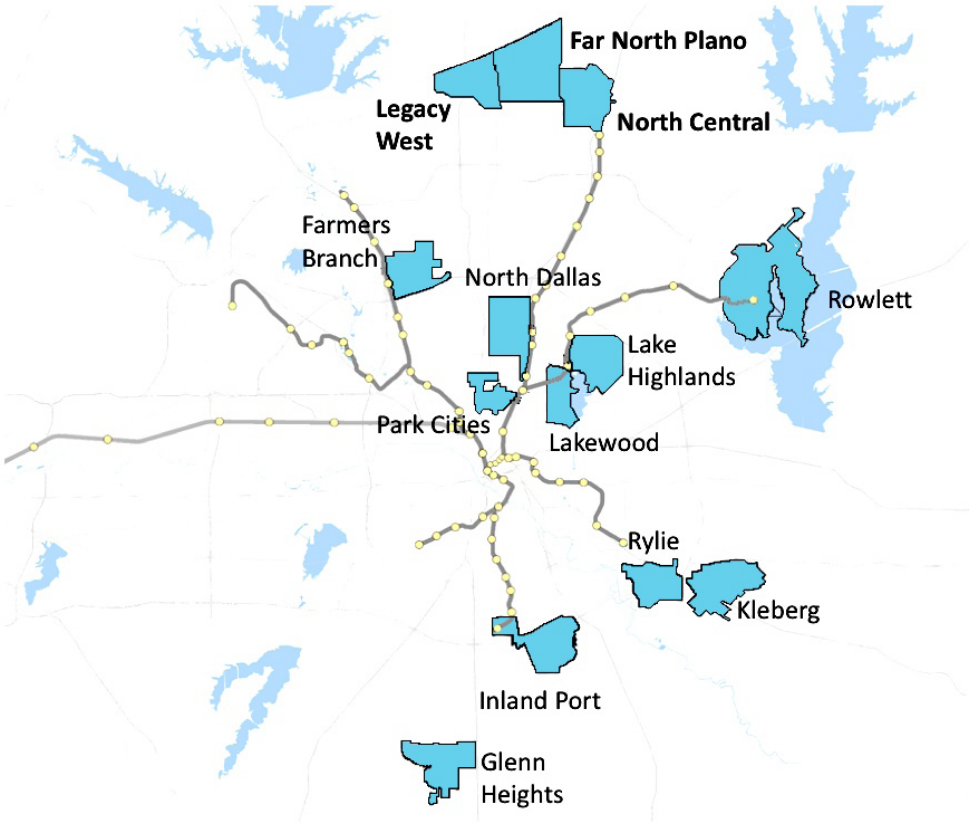
have to download, register, and pay through the Uber app. TNC use is free for users traveling to and from a rail station for up to two trips per a day. For users traveling within a zone not connecting to a rail station, users have to pay $3 per a trip (half the price of a day pass), and Uber deducts this from the ride cost and DART pays the difference.

At the beginning of the MOD Sandbox demonstration project, On-Call was operational at seven locations. As part of the demonstration, DART transitioned On-Call into GoLink by expanding the existing zones beyond six square miles, eliminating restrictions that required one vehicle per zone, and changing some of the program rules. As part of the revised program rules, the advanced call requirement was eliminated, a requirement to travel to/from an anchor point was also eliminated (allowing point-to-point travel within a demand-responsive zone), and six new service areas were added (three in Plano and three in south Dallas). DART acknowledges, however, that removing a service area size limitation may not be the best approach operationally. In one zone, the service area is 23 square miles, which may be too large, as the zone has longer travel and wait times. In general, however, DART attributes the revised program rules contributing to increasing ridership and, in some cases, dramatic increases in ridership for some zones.

Technology updates included integrating a new version of DART's existing GoPass app that included access to DART transit trip planning, scheduling, and fare payment along with access to an UberPool option for integrated FMLM travel. Service updates included converting 13 on-call transit zones to GoLink zones—areas that accommodated FMLM access to and from other DART transit services (bus and light rail) and within-zone circulation via a GoLink shuttle or subsidized UberPool option. The GoLink service could be booked through the GoPass app or could be made via phone reservation at least 30 minutes in advance. The 13 GoLink pilot zones across the Dallas/Fort Worth are shown in Figure 3-2. Of note is that the MOD Sandbox Demonstration included only 3 of the 13 zones located in Plano (Legacy West, Far North Plano, North Central Plano), which are noted in bold in Figure 2-2.

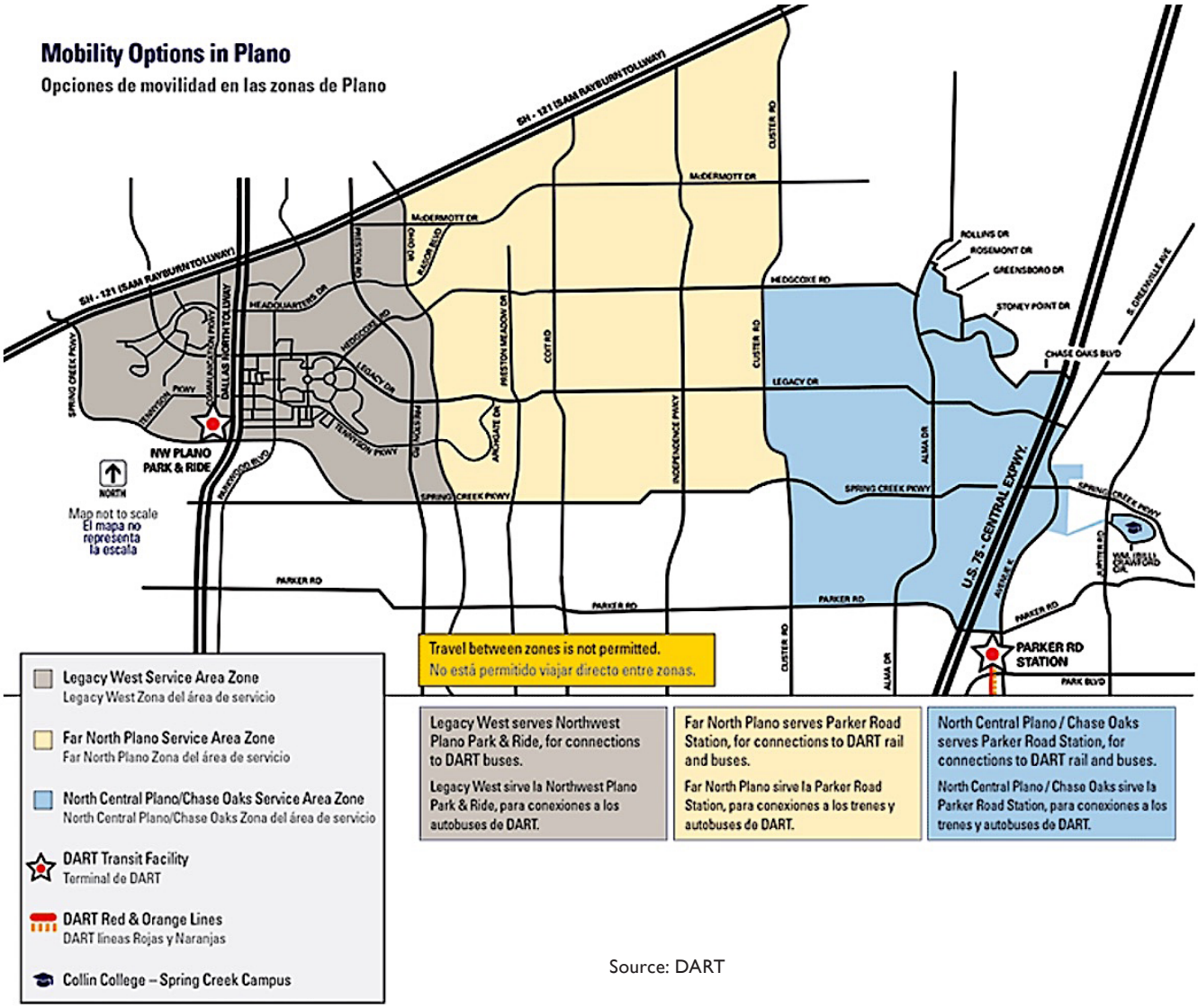
Figure 2-2

DART GoLink zones as of March 2019



The scope of the MOD Sandbox Demonstration and this evaluation covers the three Plano zones (Legacy West, North Central Plano, Far North Plano). As one of the larger GoLink areas, the Plano service area was of particular interest to DART and was the focus of this evaluation. The Plano GoLink area consisted of three distinct service zones, including Legacy West, North Central Plano, and Far North Plano. Both the GoLink shuttle and UberPool option were available for each of the three Plano zones. GoLink shuttle trips could be taken to or from another DART public transit service (bus or light rail) in the Plano area for no additional cost, or riders could pay $1.50 to travel to or from any destination within a single zone. Alternatively, riders had the option to book an UberPool ride for $1 to travel to or from a designated DART public transit station or $3 for non-FMLM UberPool travel within a single zone. The North Central Plano and Far North Plano zones served the Parker Road Station for connections to DART light rail and bus service, and the Legacy West zone served the Northwest Plano park-and-ride for connections to DART buses. The three Plano DART GoLink service zones are displayed in more detail in Figure 2-3.

Total funding for the MOD Sandbox Demonstration was $1,505,000, including $1,204,000 from FTA and $301,000 in local matching funds.



Source: DART

Figure 2-3

DART Plano GoLink zones as of October 2019

Project Timeline

The main milestones for the DART pilot project are as follows:

- **January 25, 2017** – DART MOD Sandbox Demonstration project start (cooperative agreement execution with FTA)
- **October 2017** – Lunchtime pilot of GoLink started for user-acceptance testing

- **March 2018** – All-day GoLink service launches in Plano Legacy West and North Central Plano zones (5:00 am–8:00 pm Monday through Friday)
- **August 2018** – GoLink service launches in Far North Plano zone
- **March 2019** – UberPool option launches in Plano zones
- **April 2019** – End of demonstration period

DART collected data relevant to this MOD Sandbox Demonstration between February 2018 and April 2019, which was also the evaluation period.

SECTION

3

Evaluation Approach, Planning, and Execution

Evaluation Results

The IE team guided the evaluation of the MOD Sandbox project by employing an evaluation plan developed at the outset of the project. The evaluation plan was built primarily off a logic model constructed by the IE team and had five basic components:

1) **Project Goals** – The stated goals of the project were defined from the proposal, project summary, and discussion with project team members.
2) **Evaluation Hypothesis** – Each project goal had a corresponding hypothesis, a statement that could be answered with "Yes" or "No" that was related to measuring the achievement of the associated project goal.
3) **Performance Metric** – Described the measurement that was proposed to be used to evaluate the hypothesis.
4) **Data Sources** – Data sources that followed the performance metric and described the data type and source necessary to compute or evaluate the performance metric.
5) **Method of Evaluation** – Defined how the hypothesis would be evaluated; with the logic model, this was very general, declaring whether the evaluation would be completed via survey analysis, activity data analysis, time series analysis, lessons learned, or other method.

The logic model was a table, with one row containing five cells, each populated with the components described above. The content of the logic model was also populated in advance of project implementation, where knowledge of the project trajectory and exact data collected were uncertain. The components of the logic model constructed for the evaluation of the DART project are presented in Table 3-1.

Table 3-1

Evaluation Hypotheses, Performance Metrics, and Data Sources for DART GoLink Sandbox Project

Number	Project Goals	Evaluation Hypothesis	Performance Metric	Data Elements	Data Sources
1	Increase transit ridership on DART within the pilot region of implementation.	The app increases transit use among the sample as a result of the app improvements, leveraging FMLM MOD providers and lower-cost public transportation.	Ridership change as a result of the app on selected routes that are affected by the app	Survey Data	Pilot participants
2	By improving information about alternative modes accessing DART, increase carpool travel to DART.	The improvements to the app result in an increase in carpools.	Mode share of carpools accessing DART transit stations, change as a result of the app	Survey Data	Pilot participants
3a	Improve FMLM access to DART transit for people with disabilities.	Persons with disabilities find that their ability to access DART transit has improved.	Perception of general FMLM access, mobility, wait times, and travel times	Survey Data	Pilot participants
3b	Improve FMLM access to DART transit for people with disabilities.	Persons with disabilities experience improved FMLM access as a result of the app.	Measured travel time for access and egress travel to DART transit	Survey Data (persons with disabilities) Activity Data	Pilot participants DART
4	Reduce overall automobile travel based on pilot participant data.	Automobile travel among the population declines; the app causes automobile travel to decline.	Distance of travel by automobiles	Survey Data Activity Data	Pilot participants DART
5a	Improve transportation / multimodal travel options within the pilot region.	Users of the app consider their transportation and multimodal travel options improved because of the app.	Users' reported perception of options available to them as a result of the app	Survey Data	Pilot participants
5b	Improve transportation / multimodal travel options within the pilot region.	Users experience lower travel times than they would have without using the app.	Reported perception of change in travel time Measured travel time of app users	Survey Data Activity Data	Pilot participants DART
6	Improve FMLM service to DART transit (for all persons).	App users experience better FMLM (access and egress) mobility to DART transit in the form of reduced travel times for FMLM trips.	Measured and perceived travel time for access and egress travel to DART public transit stations	Survey Data Activity Data	Pilot participants DART

Table 3-1 (cont.)

Evaluation Hypotheses, Performance Metrics, and Data Sources for DART GoLink Sandbox Project

Number	Project Goals	Evaluation Hypothesis	Performance Metric	Data Elements	Data Sources
7	Expand service within certain low-density areas not currently served by fixed-route transit due to fiscal constraints, expand public transportation coverage to suburban areas, improve access to jobs	The geographic scope of locations reachable by DART transit services is increased.	A measure of area considered accessible via DART with and without the app	DART Transit Mapping	DART
8	Replace ineffective, costly fixed-route public transit in low-density areas with MOD services (cost effectiveness of shuttle/ feeder buses vs. MOD service providers for FMLM service).	The costs of fixed-route transit are higher than the MOD services on a per-rider basis.	Cost per rider of DART bus routes Cost per rider of MOD service providers within the app	Operational cost data	DART
9	Transition next-day demand-responsive scheduling to same-day scheduling for WAVs.	The average lead time for trips with WAVs that are scheduled for demand-responsive travel declines.	Average schedule lead time from paratransit and MOD services for WAVs	Activity Data	DART
10	Improve customer satisfaction.	Customer satisfaction increases as a result of the project.	Reported customer satisfaction of DART riders	Survey Data	Pilot participants
11	Improve the brand impact of DART.	The perception of the DART brand improves as a result of the project.	Reported brand perception of DART	Survey Data	Pilot participants
12	Produce lessons learned through stakeholder interviews.	The process of deploying the project will produce lessons learned and recommendations for future research and deployment.	N/A	Stakeholder Interview Data	DART, project partners and participants

The quantitative and qualitative evaluation methods used in the DART evaluation included the following:

- Survey analysis
- Activity data analysis
- Summary of expert (stakeholder /project partner) interviews

The content of the logic model was translated into a data collection plan, which was incorporated into a broader evaluation plan. The evaluation plan contained further details on the proposed data structures and analytical approaches to address each hypothesis. The evaluation plan was reviewed by project stakeholders and finalized at the inception of the project. The project team then executed the project, working with the evaluation team to collect and transfer data at key junctures.

Data Collected

A variety of datasets was used to conduct the evaluation. These datasets were collected in collaboration with DART and were in the form of surveys, activity data, and expert interview data. Descriptions of the available datasets are as follows:

- **Survey Data** – Two separate on-board surveys of GoLink users were launched during the evaluation. The first was in February 2019 and targeted GoLink shuttle users (n = 255). The second was in April 2019 (n = 196) and asked additional questions about users' experience with the UberPool option of the GoPass pilot project. The surveys were designed to ask questions about travel behavior and experiences with the GoPass app and GoLink services.
- **Activity Data** – Activity data of GoLink users were provided that described the trips of individual passengers. These data were used to derive other attributes of the trip to execute the analysis of several hypotheses. The dataset spanned trips taken between February 2018 through February 2019 and in total contained 58,225 trips that had the following attributes:
  - Trip request time
  - Pickup time and location
  - Drop-off time and location
  - Wait time
  - Travel time
  - Rider and driver IDs
  - Booking method
  - Whether the passenger uses a wheelchair

- **Agency Data** – Monthly data on subsidies provided to GoLink per rider by zone and by mode were provided by DART for analysis. DART also provided average travel times for GoLink trips for a month outside of the trip-by-trip activity dataset as well as average travel times for UberPool for two months at the end of the evaluation period.
- **Expert Interview Data** – Expert interviews were conducted with nine members of the DART project team who had deep knowledge of the project. The IE team conducted the interviews in August 2019 with DART personnel in multiple departments and covered lessons learned, challenges and barriers, and key institutional findings.

These datasets were applied to evaluate the hypotheses defined within the evaluation plan. In the next section, these hypotheses are explored and the questions they posit are addressed using the data available. Standard data limitations exist for surveys in that impacts and responses are self-reported and generally on an ordinal scale. Activity data included GoLink shuttles, but UberPool activity data were not available at the same trip-by-trip resolution.

Hypothesis 1: The app increases transit use among the sample as a result of the app improvements, leveraging FMLM MOD providers and lower-cost public transportation.

Performance Metric	Key Finding
Ridership change as a result of the app on selected routes that are affected by the app	Analysis of survey data suggests that public transit use may have increased among a portion of the GoLink user base due to GoLink implementation.

To evaluate whether the DART GoLink app increased public transit use among those surveyed, questions asked if users linked to another DART service and also queried what transportation modes were used for these trips prior to GoLink implementation. It was found that almost half (45%) of those surveyed used at least one other DART transportation mode (light rail and/or bus) to get to their destination, as shown in Table 4. This showed that a substantial portion of DART GoLink trips are serving as first-mile connections to public transit connections. We note that the survey instrument did not ask about whether respondents used GoLink as a last-mile connection from another mode to complete their trip. Analysis of activity data suggests that at least 75% of trips connected to some type of public transit facility, although these connections do not necessarily imply connection to a DART transit mode. As a result, this question likely reflects a lower-bound estimate of the true portion of GoLink users taking first- and last-mile trips.

Table 3-2

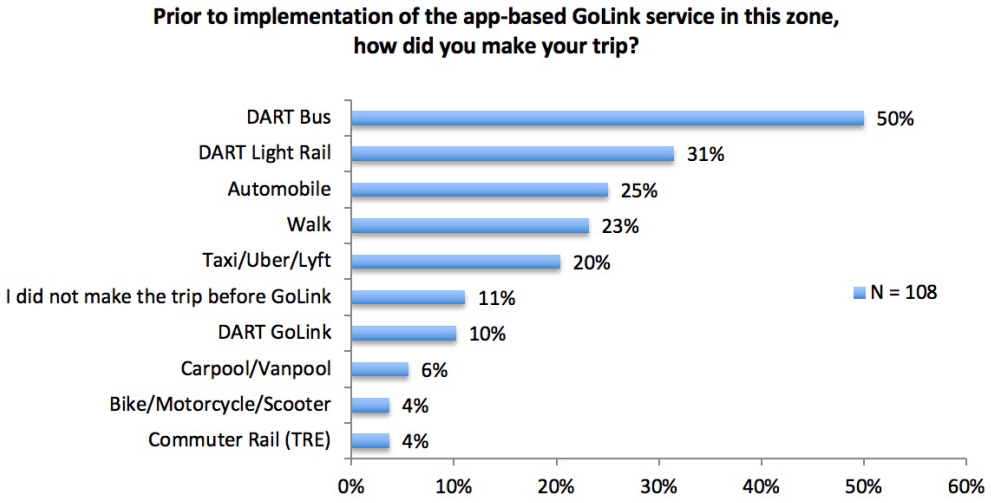
After completing this trip on GoLink, are you going to use another DART transportation mode to get to your destination? (N=254)

Answer	Percentage
Yes	45%
No	55%

Respondents that used GoLink to get to public transit (i.e., answered "yes" in Table 3-2) were asked how they were going to make their trip had the GoLink service not been available. The distribution of these responses is shown in Figure 3-1. Respondents could select multiple responses to this question, so the percentages displayed in Figure 3-1 add up to a value greater than 100%. The results showed that DART buses were the most commonly used mode by respondent to get to another DART public transit mode prior to the GoLink implementation (50%), followed by light rail (31%). As these respondents still would have used DART transit services without GoLink, the presence of GoLink did not increase their use of public transit. However, a notable portion of respondents reported that they would have driven in a car (25%), taken a taxi, Uber, or Lyft (20%), or would not have made the trip (11%) prior to the implementation of the GoLink service. Finally, 10% of respondents stated that they would have used GoLink itself (the GoLink option was available through a previous app called "TapRide"). These responses suggest that public transit use may have increased among the GoLink user base as a result of its implementation. More specifically, it is clear that the presence of GoLink enabled access to transit in ways that displaced the personal automobile either via personal car, taxi, or TNC. Furthermore, a smaller share of respondents would not have made the trip at all in the absence of GoLink, suggesting that their presence on other DART modes was enabled by the operation of GoLink.

Figure 3-1

Mode substitution as a result of GoLink among those who connected to another DART mode (data labels rounded)



Many respondents who did not use GoLink as a first-mile connection to public transit during their sample trip (i.e., answered "no" in Table 3-2) also used DART buses or light rail prior to GoLink. Although these respondents were still using a DART service (GoLink), they did not necessarily reflect users who increased their public transit use. Hence, quantifying the magnitude of change to public transit ridership as a result of GoLink is more difficult with the data available. However, by shifting a notable proportion of the sample to DART services who otherwise would have completed the trip with an automotive mode (automobile, taxi/Uber/Lyft, etc.), the evidence suggests that the presence of GoLink increased public transit use among the sample, and the resulting conclusion is that Hypothesis 1 is supported.

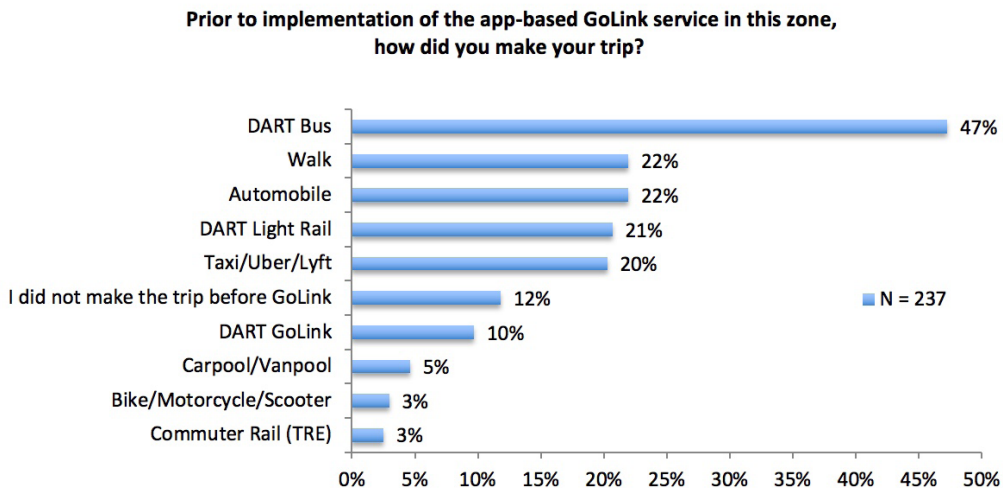
Hypothesis 2: The improvements to the app result in an increase in the mode share of carpool travel to DART transit.

Performance Metric	Key Finding
Mode share of carpools accessing DART transit stations change as a result of the app	Survey data did not contain conclusive evidence that carpooling was impacted by GoLink.

DART had initially planned to have a more extensive integration of carpooling (called GoPool) with GoLink; however, this ultimately was not successful due to a lack of available drivers as well as other challenges. The survey still evaluated whether improvements to GoLink resulted in some increase in carpool travel to DART public transit services. Although GoPool was not implemented as initially intended, it was still possible to evaluate whether other components of the project could have influenced carpooling. This was executed through responses to survey questions on FMLM travel and mode substitution prior to GoLink. As shown in Table 3-2, almost half (45%) of the surveyed respondents used GoLink to get to DART transit. Comparatively, it is shown that prior to the implementation of GoLink, just 5% of the overall sample made their trips by carpooling or vanpooling, as displayed in Figure 3-2.

Figure 3-2

Mode substitution as a result of GoLink (data labels rounded)



The question indicated that the mode substitution away from carpooling as a result of GoLink was relatively small. Furthermore, based on the function of GoLink, there were limited plausible use cases that would have yielded an increase the use of carpooling. For these reasons, the assessment of Hypothesis 2 is not supported.

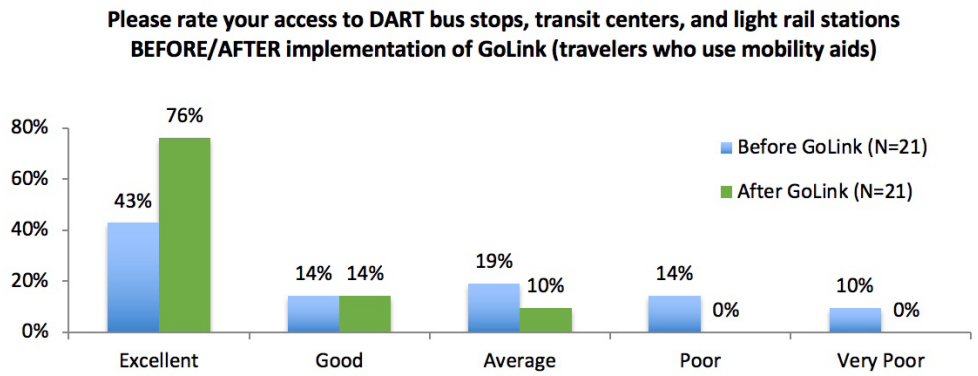
Hypothesis 3a: Persons with disabilities find that their ability to access DART transit has improved.

Performance Metric	Key Finding
Perception of general FMLM access, mobility, wait times, and travel times	Analysis of survey results show that respondents with disabilities indicated their access to DART public transit stations and the overall DART system improved after the implementation of GoLink.

To test whether persons with mobility impairments experienced improved access to DART transit due to the implementation of GoLink services, the first survey asked respondents to rate their access to DART's transit stations (bus stops, public transit centers, light rail stations) and to DART's overall bus and rail system both before and after the implementation of GoLink. Among the February 2019 survey respondents, 23 were considered to be travelers who use mobility aids by identifying that they use a wheelchair, cane, or walker. The before and after survey results are shown in Figures 3-3 and Figure 3-4.

Figure 3-3

Access to DART bus stops, transit centers, and light rail stations by travelers who use mobility aids (data labels rounded)

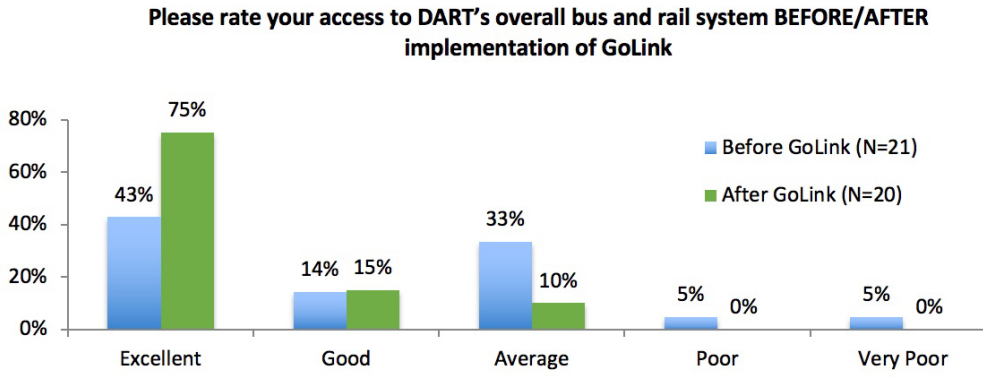


In Figure 3-3, we find that travelers who use mobility aids access to DART public transit stations improved, on average, after the implementation of GoLink. Before GoLink, 57% of these riders rated their access to DART stations as 'excellent' or 'good,' as compared to 90% of these riders who rate their access to stations as above average after the implementation of GoLink. Using the Wilcoxon Signed Rank test at the 5% level of significance with the data displayed in Figure 3-3, we find a highly statistically significant difference ($p = 0.000075$) between the access ratings before and after GoLink implementation.

Similarly, travelers who use mobility aids rate their experience accessing DART's overall bus and rail system as improved after the implementation of GoLink (Figure 3-4). Fifty-seven percent of these riders rated their access to DART's overall transit system as better than average before GoLink, while 90% rate their access to the overall system as better than average after GoLink's implementation.

Figure 3-4

Access to DART's overall bus and rail system by travelers who use mobility aids (data labels rounded)



The findings presented in Figures 3-3 and 3-4 suggest that Hypothesis 3a is supported. Survey respondents who used mobility aids indicated their access to DART transit stations and the overall DART system had improved after the implementation of GoLink. Hypothesis 3b further examines the topic of DART accessibility for persons with disabilities through activity data and measured travel times to provide additional insights.

Hypothesis 3b: Persons with disabilities experience improved FMLM access as a result of the app.

Performance Metric	Key Finding
Measured travel time for access and egress travel to DART transit	Persons with disabilities experienced improved access in the form of faster in-vehicle travel times and overall travel times when considering the ETA given. A sizeable share (63%) of WAV trips to DART made by GoLink could not have been made by fixed-route transit.

To evaluate whether persons with mobility impairments experienced improved FMLM access as a result of GoLink, the longitudinal changes in average GoLink travel times among riders who used a wheelchair within a WAV for the trips were measured. Activity data indicated whether a trip was booked by an individual with a wheelchair; this was the only attribute in the activity data indicating that the passenger was a person with a disability. Of note is that it is unclear whether the activity data provided includes a complete picture of trips taken using mobility devices, as users may have had to specifically identify their use of a mobility device when booking a ride. Some trips taken by travelers using mobility aids may not have been captured in the case that some did not select this option on the app and therefore may not have been counted as a trip using a mobility aid on the backend data. Therefore, the data likely represent a lower bound on persons with disabilities served by the GoLink system. During the months for which travel time data were available, March 2018 had the lowest number of rides taken by passengers with disabilities (n=7) and August 2018/ February 2019 experienced the highest (n=76). Across the timeseries, 574 trips were identified as WAV trips.

All trips in the data set were also run through Google API Directions to extract the point-to-point driving distances and an estimated total travel time for use of fixed-route transit. The fixed-route travel time estimated includes some walk and wait times that would be calculated based on the requested pick-up time from the data. This input is not always available, but it is in the case of these data and, as such, provides a close estimate of what the traveler would have to do with the fixed-route transit. Comparison of fixed-route transit travel times with GoLink travel times yielded several insights pertaining to this hypothesis.

GoLink trips had a requested pick-up time, a given ETA, and an in-vehicle ride time. "Wait time" can be calculated in two ways—the difference between the requested pick-up time and vehicle arrival and the difference between the time derived from the requested pick-up time and the given ETA, which provides the user some context on when to look for the vehicle but may less reflect when the user desired to travel.

Figure 3-5 shows a plot of three trends of average travel time differences by month. In each case, the difference is computed as *Fixed-route transit travel time –*

GoLink travel time. A positive difference in this trend implies that GoLink is faster. The trends plotted in Figure 3-5 include:

- *Fixed-route transit travel time – GoLink travel time*
- *Fixed-route transit travel time – (GoLink travel time + wait time – ETA given)*
- *Fixed-route transit travel time – (GoLink travel time + wait time)*

The first is a comparison fixed-route transit travel time against GoLink's in-vehicle time. The second is a comparison of fixed-route transit travel time against GoLink's in-vehicle time plus the wait time from the requested pickup but adjusted for the ETA communicated to the user. For example, if a user has requested pick up time as 5:00 PM, is communicated an ETA of 4 minutes, and the vehicle arrives at 5:05 PM, the ETA adjusted wait time is 1 minute. The third trend considers the entire GoLink in-vehicle travel time plus the minutes from the requested pick up as the full wait time.

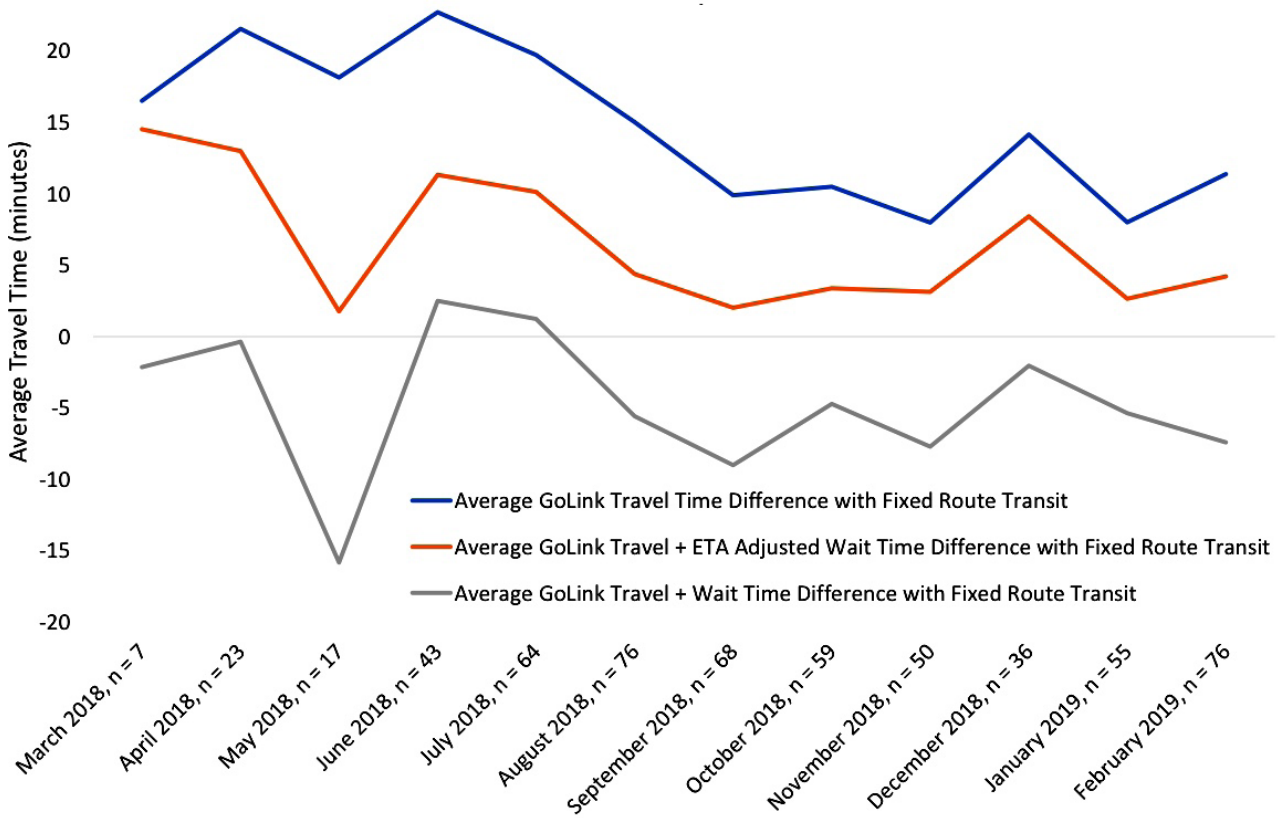


Figure 3-5

Difference between DART GoLink travel time and fixed transit route by month (WAV trips)

The plots show that the GoLink in-vehicle travel time for WAV trips was consistently superior to the travel time for fixed-route public transit. The same finding is shown when the wait time is added to the in-vehicle travel time and adjusted by the provided ETA to the user. The combined GoLink travel and wait

time is shown to be, on average, generally inferior to total fixed-route travel time. The results of Figure 3-5 show the difference in time for all WAV trips.

Figure 3-6 shows the same trends for only those WAV trips that connect to DART or park-and-ride destinations. The trends are not as positive as found in Figure 3-5, but a majority of observations show GoLink as faster than fixed-route public transit.

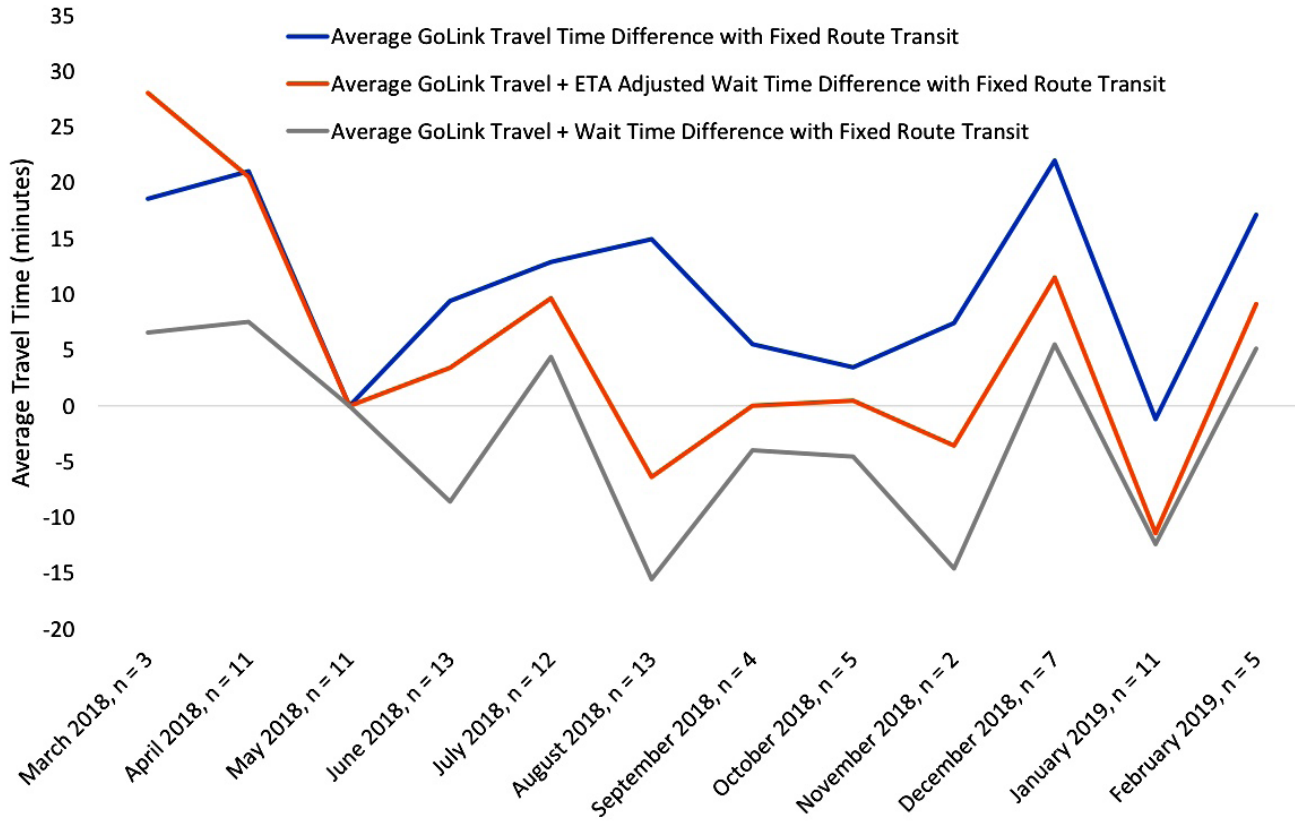


Figure 3-6

Difference between DART GoLink travel time and fixed-transit route by month (WAV trips)

However, unique to WAV trips in the GoLink activity data set is the relatively small share of trips that connect to DART transit as compared to the broader GoLink activity dataset. Only 17% of the WAV trips were found to connect to public transit compared to 76% of the trips in the entire dataset. The majority of WAV trips were intra-Plano trips, suggesting a different use case. This result informs a broader story with respect to GoLink performance relative to fixed-route transit and explains the greater volatility of trend that is observed in Figure 3-6. For example, in May 2018, there were no WAV trips that connected to DART, so the difference across the three time series is zero.

The trends of both figures show only the average differences for those trips where fixed-route transit was computable or feasible. However, for a number of WAV GoLink trips, travel by fixed-route transit was, in fact, not feasible; the Google Trip Planner returned zero results for such trips. Several of these trips were inspected manually, and it was confirmed that the reason for the zero-result return was due to transit services being unavailable. By proportion, 13% of WAV trips completed by GoLink could not be completed by fixed-route transit, and 63% of WAV trips connecting to DART transit could not be completed by fixed-route public transit. For the broader population, 28% of GoLink trips could not be completed by fixed-route public transit and 35% of all trips connecting to DART transit could not be completed by fixed-route public transit.

Therefore, although by some more conservative measures, GoLink did not always perform better than fixed-route transit in terms of total travel and wait time, it provided a transit mode of access for a sizable portion of trips for which fixed-route transit was not available. Collectively, these findings suggest that access was improved by the pilot, supporting Hypothesis 3b.

Hypothesis 4: Automobile travel among the pilot group declines.

Performance Metric	Key Finding
Distance of travel by automobiles	Personal automobile and TNC mode substitution as a result of GoLink was found to be 42%. This amounted to a reduction in automobile use among the pilot group that was sizeable given the total distance traveled by the GoLink vehicle.

To provide insight into whether automobile (personal automobile and TNC/taxi) travel among GoLink respondents declined, how respondents made their sample trip prior to GoLink service implementation was examined. As shown in Figure 3-3, 22% of respondents reported in the absence of GoLink that they would have driven a personal automobile for at least a portion of their trip, and 20% prior to GoLink implementation would have taken a taxi, Uber, or Lyft. This suggests that at least some GoLink users were substituting GoLink and other modes for trips that were formerly made with a private vehicle. Taken together, the survey responses suggest that about 42% of trips taken by GoLink would have been taken with an automobile.

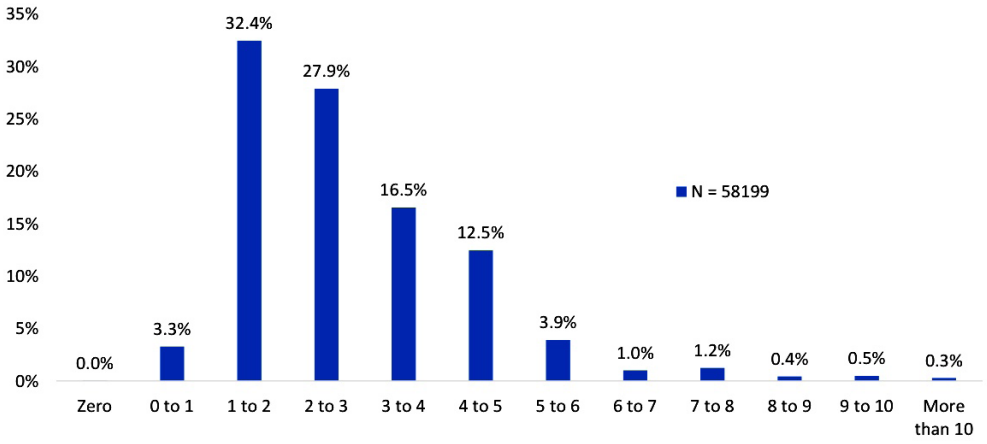
The exact amount of this reduced automotive travel is unknown and requires some estimation. Using GoLink activity data, trip distances from origin to destination were estimated using the Google Maps API. This permitted a distance of miles traveled per trip by the GoLink vehicle to be estimated on the road network. The trip distance estimated was a direct trip. In other words, it does not account for the routing that the GoLink vehicle may have done to pick additional individuals during the trip. However, such distances are still useful for estimating the distance of driving that would have been traveled by automobile or

TNC had the user taken one of those modes instead of GoLink trip. Figure 3-7 shows the distribution of origin to destination distances traveled by the GoLink system for all trips from April 2018 to February 2019. In total, there were 58,199 trips and a total distance of about 163,000 miles traveled during this time period. Data labels are listed in tenths to show more detailed differences across the bins. Note that these are only estimated miles driven by GoLink shuttles based on the shortest route from the origin and destination; it does not include the miles to the final destination of the user, which may have been considerably more distant via DART light rail. That is, the final destination of users within the activity data was not known nor was it known for survey respondents. In addition, the specific automobile trips that were substituted by GoLink are also not known. If it is assumed that 42% of the trips that are automotive substitutions are randomly distributed, then the total distance displaced just by GoLink trips would be about 68,500 miles, which is equivalent to about 42% of the 163,000 total mileage traveled by the shuttles.

This analysis by itself does not imply that GoLink reduced overall vehicle miles of travel (VMT) of all vehicles (including that produced by the shuttles). The personal automotive VMT is replaced by GoLink shuttle VMT, which if done at a single passenger occupancy within the shuttles may, in fact, be more energy intensive. Rather, this finding suggests that the GoLink service was sufficiently capable of providing mobility that would have otherwise been delivered by a personal automobile in some form.

Figure 3-7

Distribution of GoLink trip distance (data labels rounded)



Of note is that the mileage displaced by GoLink could be larger than the estimated 42% of all GoLink miles depending on how many automotive travelers shifted to GoLink for their entire trips vs. only a portion of their trip. That is, direct substitution of personal automobile travel with the GoLink shuttle is a lower bound on the estimated VMT reduction by the system. In the absence of GoLink, users may have traveled by automobile all the way to their destination. By connecting them to the public transit network more efficiently, some users may have forgone the entire trip to their destination. Activity data reveals

only the origin and destination of the GoLink trip and not the final destination of the user. This broader impact, although likely non-zero in magnitude, is not quantifiable with the available data. Nonetheless, given the substantive automotive mode substitution reported by respondents and the distance traveled by GoLink vehicles, Hypothesis 4 is supported overall.

Hypothesis 5a: Users of the app consider their transportation and multimodal travel options improved because of the app.

Performance Metric	Key Finding
Users reported perception of options available to them as a result of the app	Nearly all survey respondents had above-average experiences with the GoPass app with respect to trip planning, scheduling, and fare payment.

To determine whether users experienced improved transportation options due to the GoPass app, survey questions asked respondents to rate the ease of use, information accuracy, and overall experience using the app across various metrics. The responses to these questions are shown in Figures 3-8, 3-9, and 3-10. Figure 3-8 shows the user responses to the app's ease of use with respect to trip planning, scheduling service, and fare payment. The results show generally favorable ratings, in that about 60% of respondents gave an "excellent" rating across all attributes.

Figure 3-8

Ratings for ease of use with GoPass in trip planning, scheduling service, and fare payment (data labels rounded)

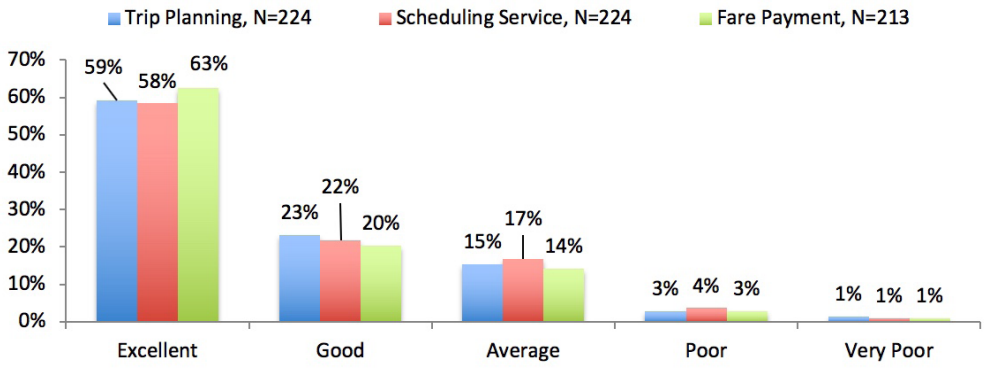
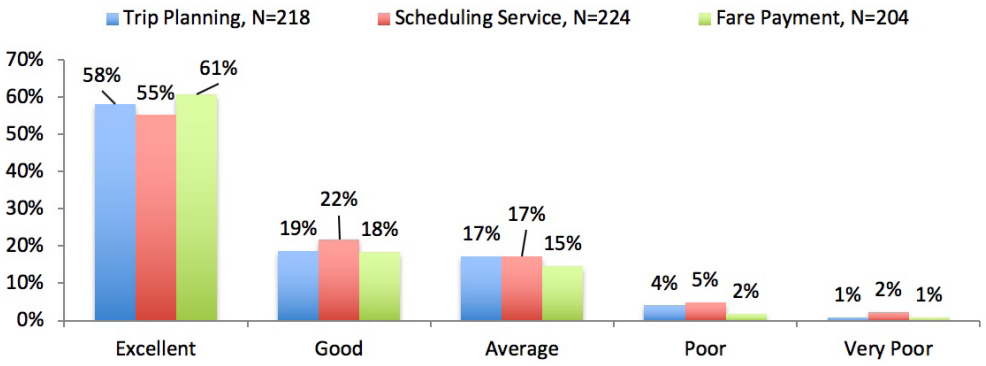


Figure 3-9 shows the distribution of responses to the same question related to information accuracy. Respondents generally gave the GoPass app high markets for information accuracy of trip planning, scheduling service, and fare payment. About 75% of respondents considered all three attributes to have "good" or "excellent" information accuracy.

Figure 3-9

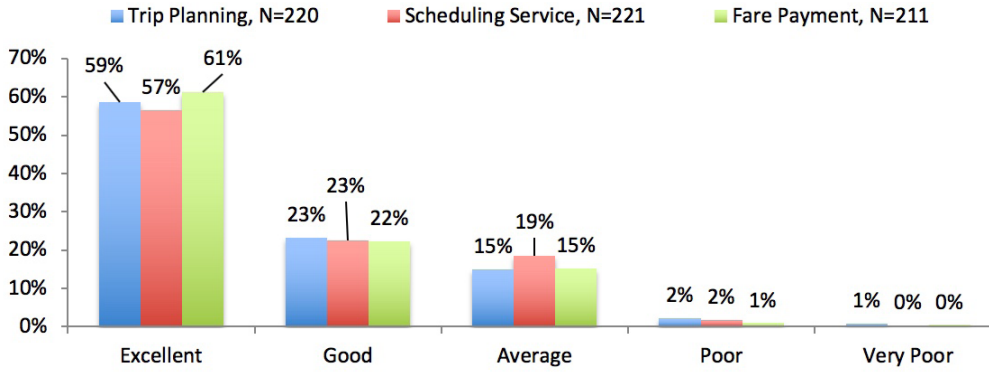
Ratings for information accuracy with GoPass in trip planning, scheduling service, and fare payment



Finally, respondents were asked to rate their overall experience with GoPass for trip planning, scheduling service, and fare payment. Figure 3-10 shows the distribution of responses and reveals that most users had at least a "good" or "excellent" impression of the app.

Figure 3-10

Ratings for overall experience with GoPass in trip planning, scheduling service, and fare payment (data labels rounded)



Most respondents had above average experiences with the GoPass app with respect to trip planning, scheduling, and fare payment, and more than three quarters rated their experience with the app as "excellent" or "good" across these three areas. Between 15% and 19% of respondents rated their experience with the app across these areas as "average," and only 3% or less rated their experience as "poor" or "very poor." In general, these findings collectively suggest that those surveyed had positive overall experiences with the functioning of the GoPass app, pointing to the conclusion that they considered transportation and multimodal options improved because of it. The generally positive ratings given to the app suggest a confirmation of Hypothesis 5a.

Hypothesis 5b: Users experience lower travel times than they would have without using the app.

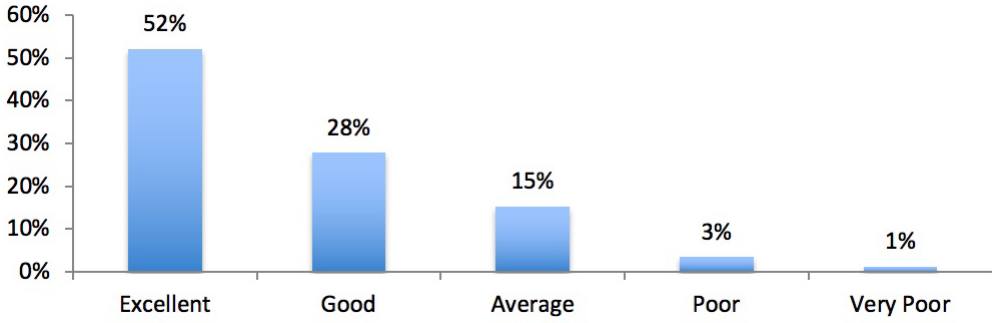
Performance Metric	Key Finding
Reported perception of change in travel time; measured travel time of app users	Although average travel times fluctuated modestly during the study period, survey results suggest that users were generally satisfied with in-vehicle travel times for both the GoLink shuttle and UberPool options.

To evaluate whether respondents experience lower travel times than they would have without the app, responses to survey questions and activity data were analyzed regarding in-vehicle travel times, as were survey and activity data of travel times since UberPool became available as an option in the GoPass app.

To assess perceptions of travel time, respondents were asked to rate their approximate in-vehicle travel time on a scale of 1 to 5, with 1 being poor and 5 being excellent. The first survey (in February) asked respondents to rate their in-vehicle travel time with the GoLink microtransit shuttle. The results are shown in Figure 3-11, with 80% of respondents rating their in-vehicle travel time with GoLink as above average ("excellent" or "good"). Only 15% rated their travel time as average, and under 5% rated their travel time as below average. These results suggest that the majority of respondents perceived their in-vehicle travel time with GoLink as favorable.

Figure 3-11

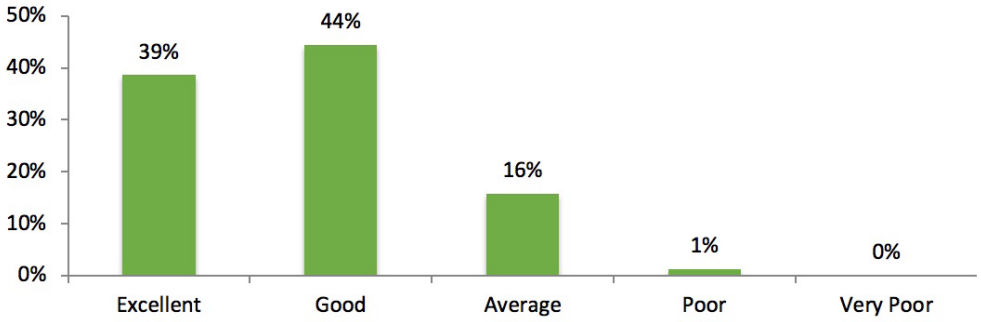
Ratings for approximate in-vehicle travel time with GoLink shuttle (N = 230) (data labels rounded)



The second survey (in April) asked a similar question and queried respondents to rate their in-vehicle travel time with GoLink since UberPool became available as part of the service. As shown in Figure 3-12, the responses were similar to the findings from the first survey, in that 83% of respondents rated their in-vehicle travel time with GoLink as above average. However, a greater portion of respondents rated this travel time as "good" (44%) and a lower proportion rated the travel times as "excellent" (39%) relative to the first survey. As noted in Figure 3-11, a greater portion of respondents rated their travel time with GoLink (before the introduction of UberPool) as "excellent" (52%) and smaller proportion rated it as "good" (28%). The reasons for this shift among the top two categories is unclear; however, both ratings are positive, as a majority of respondents perceived their in-vehicle travel times for both GoLink shuttle and UberPool options as above average.

Figure 3-12

Ratings for approximate in-vehicle travel time with GoLink since UberPool available (N = 171) (data labels rounded)



Average GoLink travel times by zone also were examined for February 2018 to March 2019. Measured travel times fluctuated during this period but remained somewhat consistent during the course of the study period by the zone in which the trip started. The trend in average GoLink shuttle travel times by zone during the study period are displayed in Figure 3-13. In the Legacy West zone, GoLink travel times were 6 minutes, on average, during February 2018 but increased during the study period up to about 11 minutes from October 2018 to February 2019 before falling to 9 minutes in March 2019. In the North Central Plano zone, travel times were 13 minutes, on average, in March 2018 but decreased slightly to 12 minutes, on average, during March 2019. In the Far North Plano zone, travel times were 17 minutes, on average, during August 2018 and rose slightly to 18 minutes, on average, for March 2019. The overall average GoLink travel time across all three zones in Plano was 13 minutes as of March 2019. These results show that average travel times stayed relatively consistent in each zone during the course of the study year. Of note is that average travel times may differ across zones due to their geographic size; for example, Far North Plano is the largest zone and had the highest average travel times.

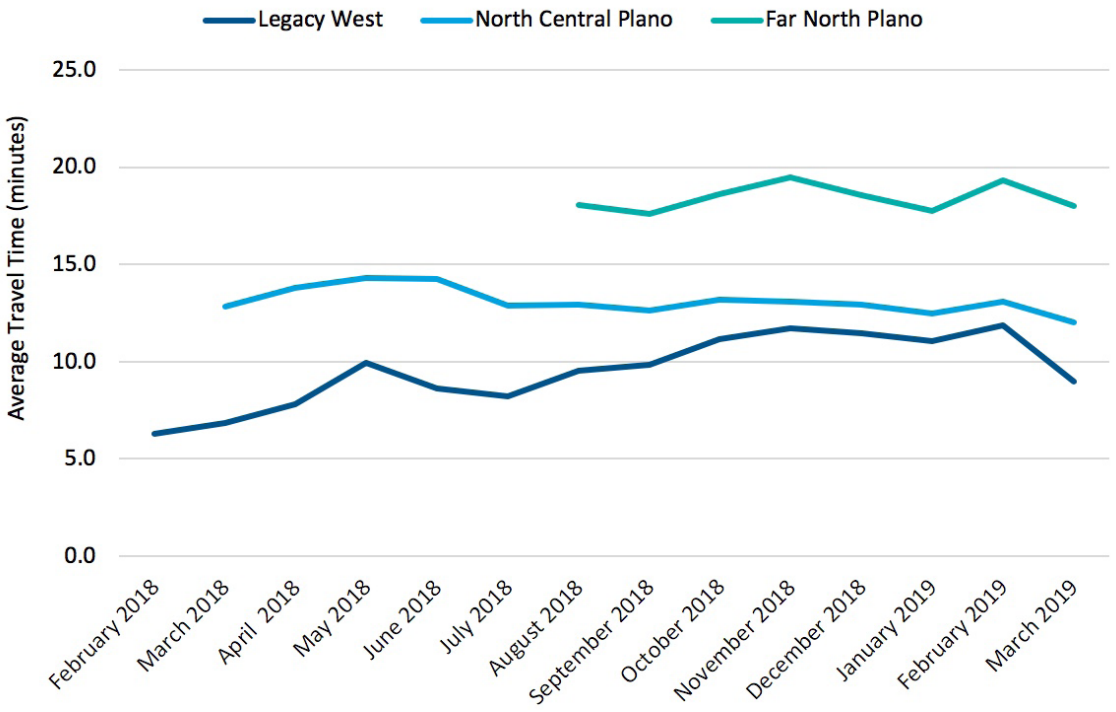


Figure 3-13

Average travel times by zone for all GoLink trips

Figure 3-14 shows average travel times across all three Plano zones for the GoLink shuttle between February 2018 and March 2019 and for the UberPool option during March and April 2019 (due to its later introduction). Although the period is shorter for UberPool, the times can be compared during the overlapping period. During the weeks in which the data were collected overlapping the study period, UberPool reported an average travel time of 8.2 minutes per trip. This compared with an average travel time of 11.2 minutes per trip for the GoLink shuttle. The results suggest that the UberPool option generally had lower travel times than the GoLink shuttle service. Note that the series starts with an average travel time of just above 6 minutes because only one zone was operating during this first month of February. As other zones with larger travel times come online, the overall average travel time rises sharply.

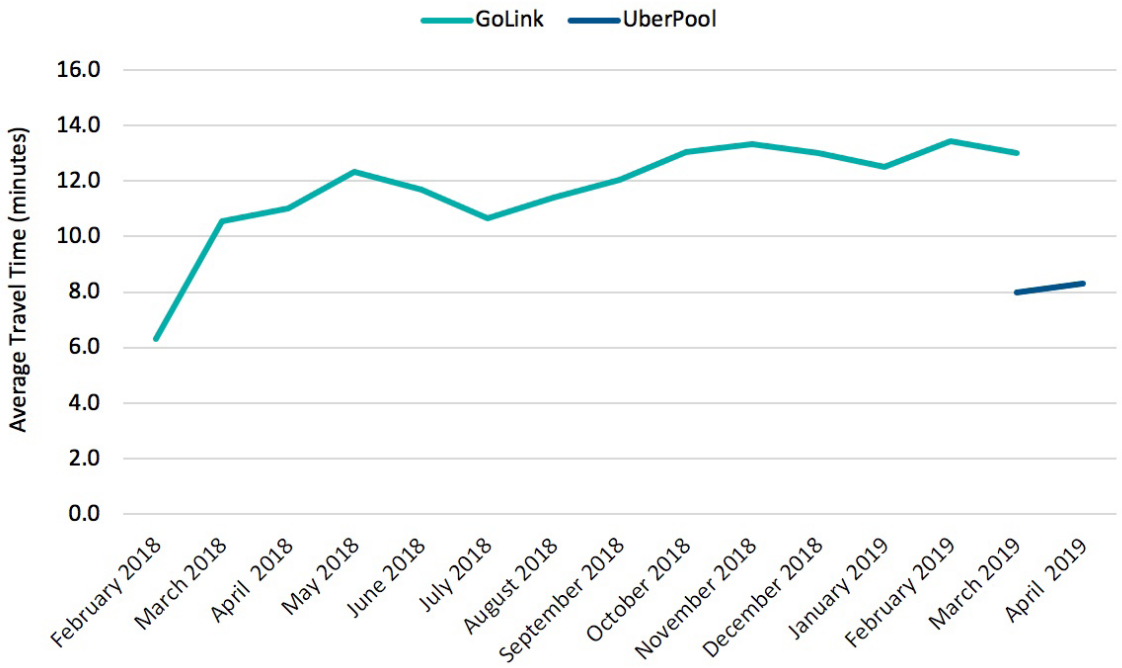


Figure 3-14

Average travel times of GoLink and UberPool options (all Plano zones)

Also explored were average trip times of GoLink trips made by using other forms of transportation, such as driving or using existing public transit options (e.g., bus). These data allowed comparison of whether overall trip times (including wait time and in-vehicle travel time) were lower for DART GoLink trips compared to other transportation modes.

To determine what trip times for users' GoLink trips would have been using these other transportation modes, the Google Maps Distance Matrix API and input origin and destination locations were used to calculate the driving and public transit trip times for each trip. Public transit trip times included an aggregation of wait and in-vehicle travel times; driving trip times did not include a wait time component. Of note is that about one-quarter of GoLink origin and destination pairs did not output valid transit directions using the Google Maps API. This may be due to transit service gaps or COVID-19-related shutdowns (Google Maps API allows for querying of transit directions only from about a week prior; thus, queries were made assuming September 2020 travel dates). Nonetheless, a majority of GoLink origin-destination pairs returned valid public transit outputs.

Figure 3-15 shows the average total trip times (including wait and in-vehicle travel time) for each month for DART GoLink trips and for driving and public transit trips between the same and origin and destination pairs.

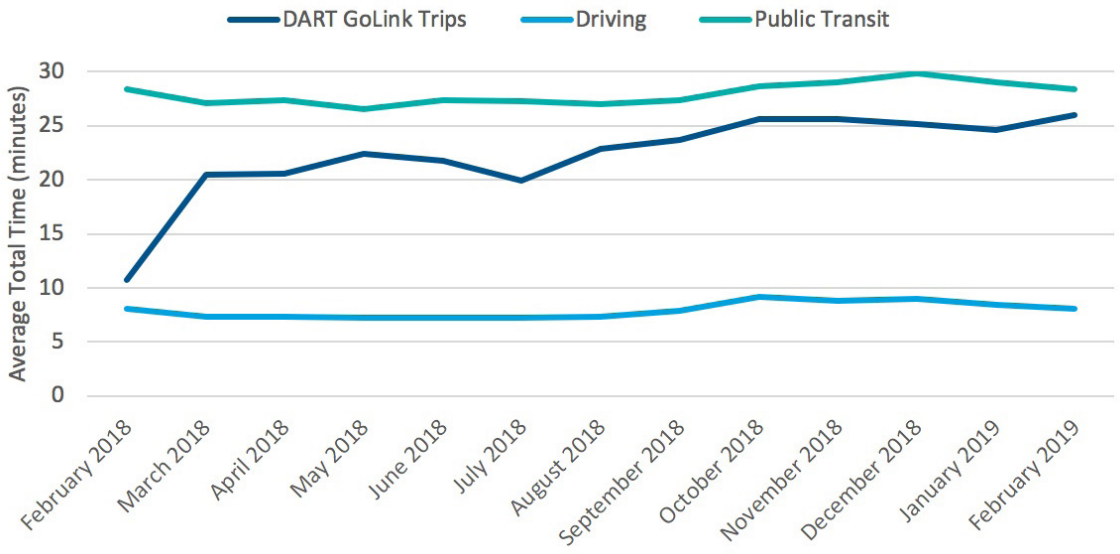


Figure 3-15

Average total trip time comparisons for GoLink, driving, and public transit (all trips)

As shown, whereas driving was much faster than DART GoLink or existing public transit options, GoLink had lower total trip times than other public transit options, ranging from 2 to 7 minutes faster, on average, depending on the month. Although it is an expected outcome that driving is faster than GoLink and public transit options, the fact that GoLink has lower total average trip times than existing public transit services generally supports Hypothesis 5b.

The results suggest that users were generally satisfied with GoLink in-vehicle travel times with both the GoLink shuttle and UberPool options. Although average travel times fluctuated modestly over the study period for which data were available, the data suggest that users considered their travel times to be better than average. The comparison of total trip times to other transportation modes shows that the GoLink shuttle was faster, on average, than existing public transit options but slower than driving. Taken together, these findings generally support Hypothesis 5b.

Hypothesis 6: App users experience better FMLM (access and egress) mobility to DART transit in the form of reduced travel times for FMLM trips.

Performance Metric	Key Finding
Measured and perceived travel time for access and egress travel to DART transit	The majority of survey respondents perceive their FMLM mobility to transit stations has improved as a result of GoLink

.

To test whether app users experience improved access and egress mobility to DART transit in the form of reduced travel times, average travel times for FMLM trips and survey results regarding users' perceived accessibility were examined. As shown in Figure 3-16, average travel times for FMLM trips fluctuated modestly during the study period, ranging from 11 to 14 minutes.

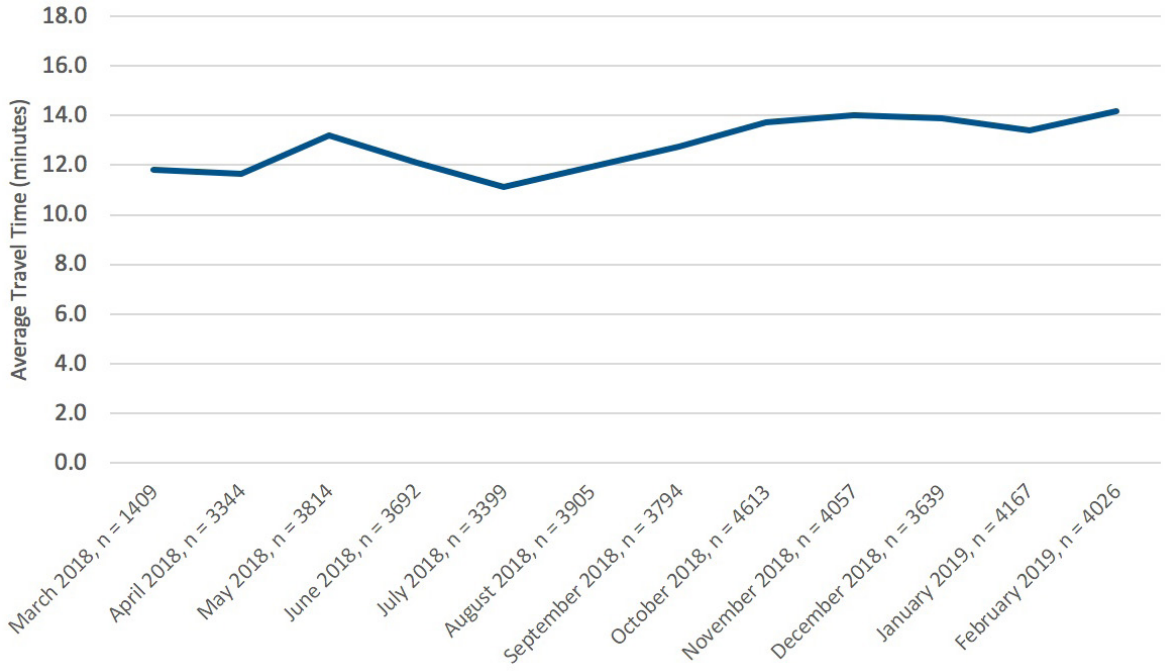


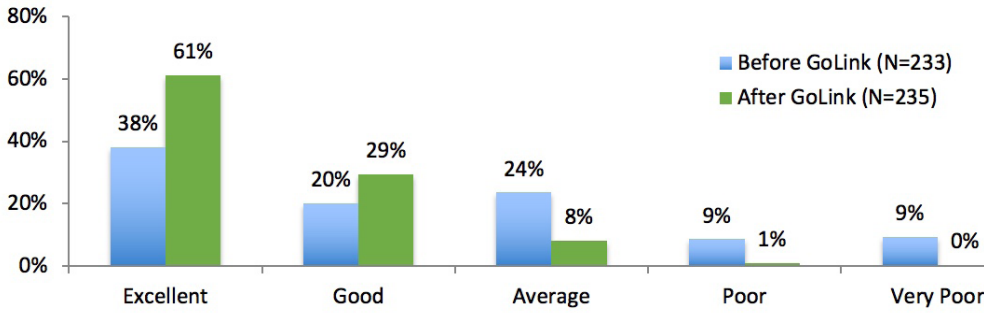
Figure 3-16

Average DART GoLink travel time by month for FMLM trips

To examine app user perceptions of access and egress mobility to DART transit, the first survey asked respondents to rate their access to DART's transit stations (bus stops, transit centers, light rail stations) before and after implementation of GoLink; results are shown in Figure 3-17.

Figure 3-17

Ratings for access to DART bus stops, transit centers, and light rail stations (data labels rounded)



The results suggest that app users' access to DART transit stations improved, on average, after implementation of GoLink. Before GoLink, 58% of app users rated their access to DART stations above average compared to 90% of users who rated their access to stations as "excellent" or "good" after the implementation of GoLink. Almost one-quarter of respondents considered their access to DART transit stations to be average before GoLink as compared to just 8% who considered their access as average after GoLink. Additionally, 18% of respondents felt their access to stations was "poor" or "very poor" before GoLink implementation compared with only 1% who felt the same after pilot project implementation.

Similar to the analysis shown in Figure 3-15, examined were whether GoLink users experienced lower overall trip times (including wait time and in-vehicle travel time) compared to other transportation modes such as driving and public transit. A similar analysis to that in Figure 3-15 was conducted but included only GoLink FMLM trips to determine how FMLM trip times compared to the same FMLM trips if they were made using different modes. Figure 3-18 shows similar results, in that driving trips are much faster than GoLink, on average, but GoLink FMLM average trip times are slightly lower than if those FMLM trips had occurred on existing public transit services. This analysis suggests that users who previously used public transit services for FMLM trips experienced improved overall FMLM trip times due to DART GoLink, generally supporting Hypothesis 6.

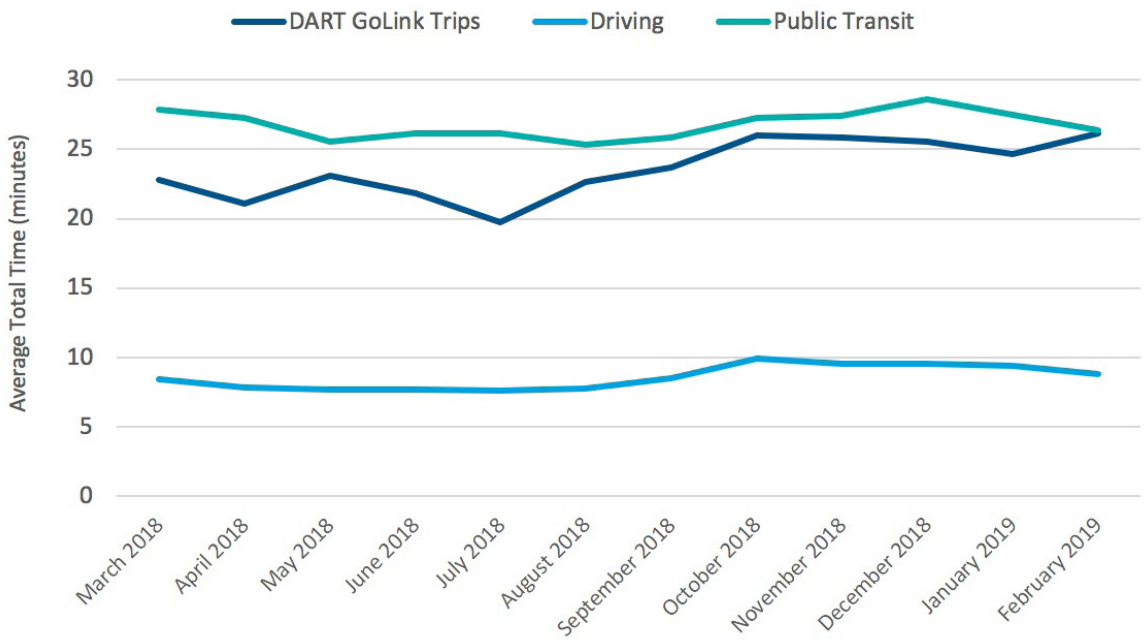


Figure 3-18

Average total trip time comparisons for GoLink, driving, and public transit (FMLM trips)

The analysis suggests that average FMLM travel times remained somewhat consistent during the GoLink pilot period and that most respondents perceived their FMLM mobility to DART transit stations as improved due to GoLink. The results of this analysis generally support Hypothesis 6.

Hypothesis 7: The geographic scope of locations reachable by DART transit services is increased.

Performance Metric	Key Finding
A measure of area considered accessible via DART with and without the app	The geographic coverage of locations reachable by DART transit services increased, and survey respondents rated their ability to reach areas within the GoLink zone as favorable.

To measure whether the geographic scope of locations reachable by DART transit services increased as a result of GoLink, the spatial scope of the DART transit system was assessed, and survey results of users' perceived ability to reach locations were analyzed. Figures 3-19 and 3-20 show DART's transit coverage area in Plano before and after MOD pilot project implementation. This mapping was done by DART and provided to the evaluation team and shows the region that was accessible by DART bus lines covered by a catchment area of about 0.4 miles street network walking distance (shaded in green). The dots on roads within the shaded regions are bus stops, and the dotted outline is Plano. Figure 3-19 shows that before March 2017, 44% of Plano was considered accessible via DART transit services.

Figure 3-19

DART transit Plano coverage area before March 2017 (Source: DART)

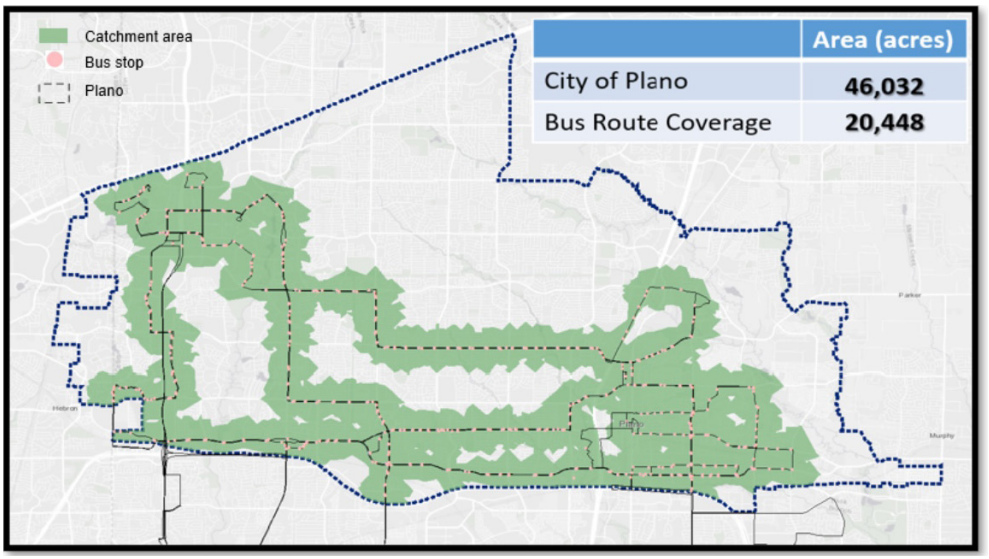
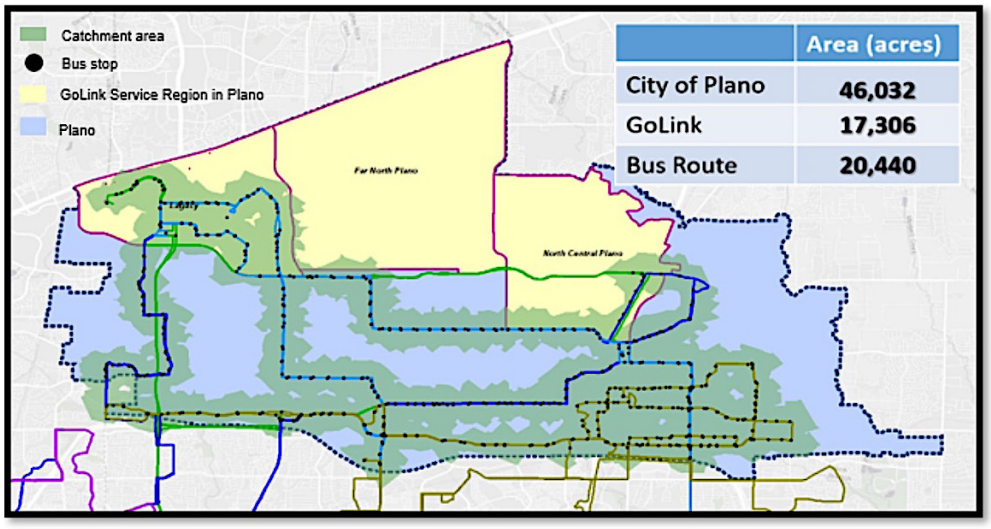


Figure 3-20, also developed and provided by DART, shows coverage of the GoLink system in Plano. After implementation of GoLink, 82% of Plano was covered by the DART transit system (as of May 2019) and included the coverage of GoLink, plus the non-overlapping coverage of the fixed-route buses. Overall, the change reflects an 85% increase in DART's coverage area in Plano and shows that the geographic area of DART coverage increased as a result of GoLink.

Figure 3-20

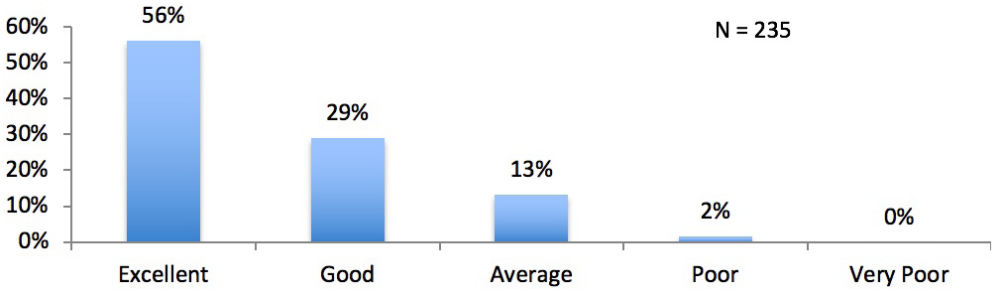
DART transit Plano coverage area as of May 2019 (Source: DART)



To examine whether users perceived that the geographic scope of locations accessible by DART transit service had improved, respondents were asked to rate their ability to get to areas within their respective GoLink zone. The first survey asked respondents to rate their ability to access areas within the GoLink zone and found that 85% of respondents rated it as above average, 13% rated it average, and only 2% rated it poor.

Figure 3-21

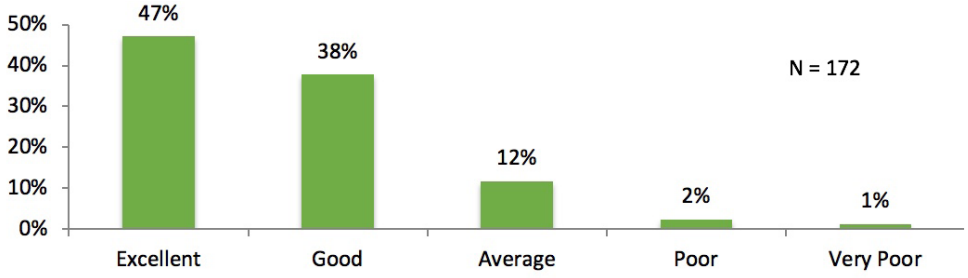
Ratings for ability to get to areas within GoLink zone (N = 235) (data labels rounded)



In the second survey, respondents were asked to rate their ability to access areas within their respective DART MOD Sandbox Demonstration zone since UberPool became available. Similarly, 85% of respondents rated their accessibility as above average, as shown in Figure 3-22. Overall, the results in Figures 3-21 and 3-22 suggest that most respondents perceived their ability to get to areas within GoLink as favorable.

Figure 3-22

Ratings for ability to get to areas within GoLink zone since availability of UberPool (data labels rounded)



Based on the findings of the survey and the maps of geographic coverage of the DART transit system before and after GoLink, results suggest that the geographic coverage of locations reachable by DART transit services increased and survey respondents favorably rated their ability to reach areas within the GoLink zone. Hypothesis 7 was supported.

Hypothesis 8: The costs of fixed-route transit are higher than the MOD services on a per-rider basis.

Performance Metric	Key Finding
Cost per rider of DART bus routes; cost per rider of GoLink service providers within the app	Subsidy per rider data suggest that the GoLink services are cost- competitive with low ridership fixed-route services that operate in the same region and similarly competitive with paratransit services that operate in the same region and more efficient than the costs of DART paratransit system-wide. GoLink was not more cost-efficient than DART fixed-route transit more broadly.

To evaluate whether the costs of fixed-route transit were higher than the costs of MOD services on a per-rider basis, DART provided data on subsidy per rider across the different services. Figure 3-23 shows the subsidy per rider over time for each of the three GoLink zones in the Plano area. The average subsidy per rider during the timespan for which data were available in each zone was $13.70 in North Central Plano, $15.71 in Legacy West, and $24.67 in Far North Plano. The higher average observed in Far North Plano was due to the fact that it is a lower-density area more distant from key destinations of interest served by GoLink, including the Parker Road DART station and the NW Plano park-and-ride. The overall average subsidy per rider was $16.37 across Plano during this time.

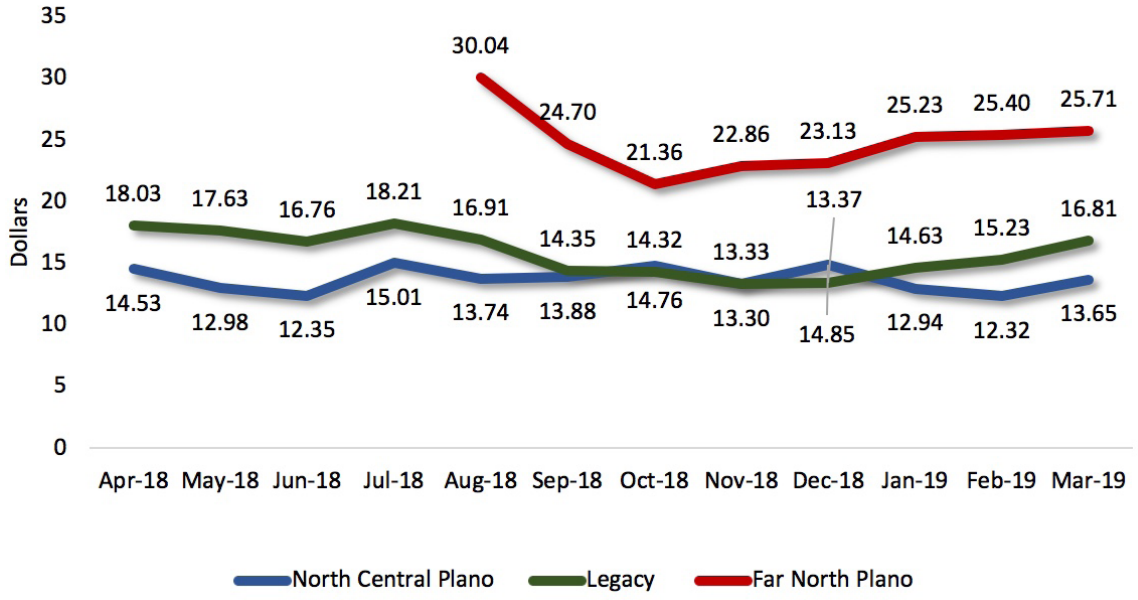


Figure 3-23

MOD service provider subsidy per rider by zone (data labels rounded)

When examining how cost per rider differs between specific MOD services offered, initial data suggest that the average subsidy per rider was higher for the GoLink shuttle than for UberPool. Figure 3-24 shows that the average subsidy per rider for the GoLink shuttle was $17.85 but only $4.98 for the UberPool option. Because of the later introduction of UberPool, there are fewer data revealing the trend of subsidies for that service. However, the difference between the subsidies per rider for the two services is so large that it is unlikely that additional data would reveal a conclusion different from the apparent lower subsidy per rider for UberPool.

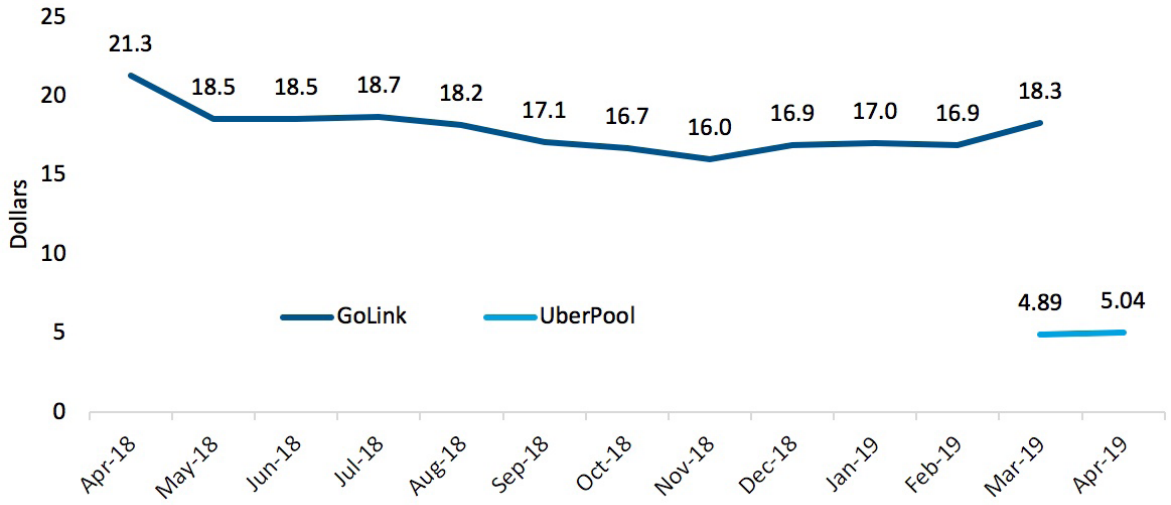


Figure 3-24

GoLink Shuttle and UberPool subsidy per rider (data labels rounded)

When comparing the subsidy per rider of MOD services to DART's systemwide fixed-route transit and bus services, the costs of MOD services are higher than the cost of fixed-route and bus transit services, on average. As shown in Table 3-3, the average subsidy per rider for MOD services in Plano is $16.37; the average systemwide subsidy per rider was $8.28 for bus services and $6.80 for fixed-route transit services (bus, light rail, commuter rail). This system-wide average includes bus routes and rail with high utilization averaged alongside lower-performing routes systemwide.

Table 3-3

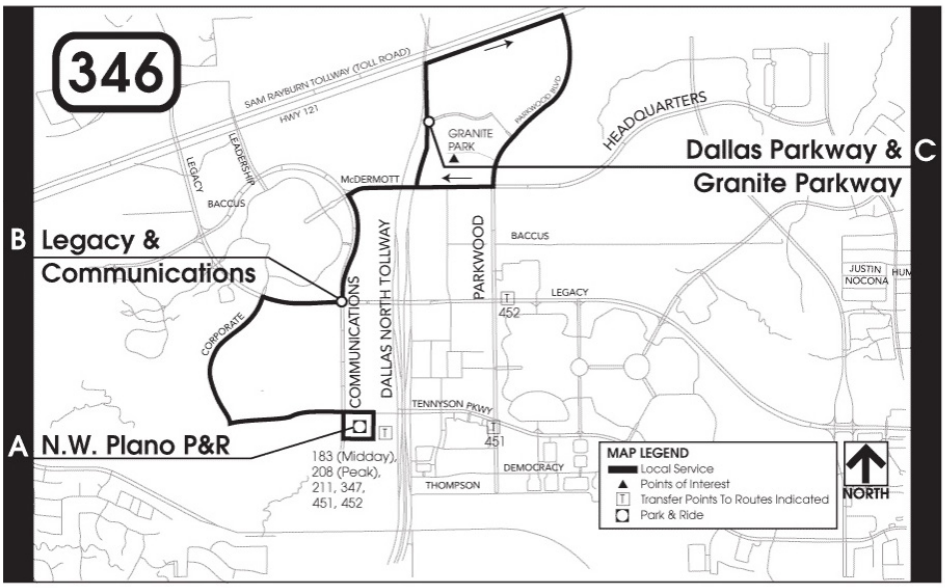
Comparative Average Subsidies per Rider for Key Benchmark Services

Service	Average Subsidy per Rider
DART Paratransit (Overall)	$44.97
Eliminated Bus Route 346 in Plano	$33.71
Far North Plano GoLink	$24.67
GoLink Plano (Overall Average)	$16.37
Legacy West GoLink	$15.71
NC Plano GoLink	$13.70
NC Plano On Call	$11.43
DART System-wide Bus Transit	$8.28
DART System-wide Fixed-Route Transit (bus, light rail, commuter rail)	$6.80

Plano, as an end-of-line suburban city of the Dallas metropolitan region, is subject to lower transit ridership and lower overall utilization of services; thus, a comparison of GoLink operations in this environment to system-wide fixed-route averages is arguably not a fair one. As part of the GoLink component, DART removed Route 346, which operated predominantly in the western Legacy zone 16 times per day at 30-minute headways. This low ridership route, shown in Figure 3-25, required a subsidy of $33.71 per rider (as averaged from the 1st and 2nd quarters of FY 2018). DART paratransit services required a systemwide subsidy of $44.97.

Figure 3-25

Eliminated Route 346 (Source: DART)



More locally, the paratransit service of NC Plano On-Call, which GoLink replaced, had a subsidy per rider of $11.43 compared to the $13.70 subsidy per rider noted for NC Plano GoLink in the same region. However, among other operational differences, the size of the regions of the NC Plano On- Call service and NC Plano GoLink were different. Figure 3-26 shows the zones of On-Call

and GoLink for North Central Plano; two regions overlap, but the GoLink service region is about 50% bigger extending northward. These and other differences may explain the modest difference of subsidy in On-Call's favor.

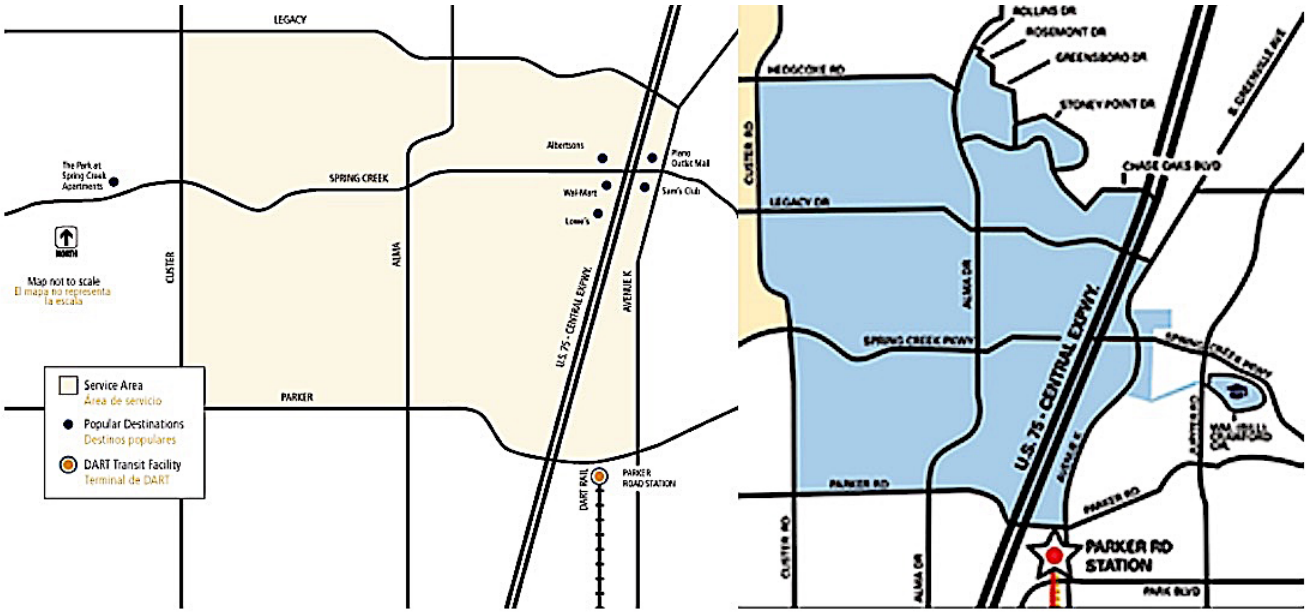


Figure 3-26

NC service regions of Plano On-Call (left) and NC Plano GoLink (right)

Table 3-3 is a summary of key benchmarks in subsidy per rider for the project, showing the average subsidy per riders in decreasing order. The results suggest that GoLink is generally competitive on a subsidy-per-rider basis with paratransit overall and fixed-route public transit in low-density and low-ridership environments. These types of services that GoLink can deliver are better and more efficient than alternatives previously available for the same use case. The results also show that GoLink, or similar services, may serve as a more efficient replacement for fixed-route public transit services more broadly, at least not at the use levels experienced within this project. This latter point is an important qualifier in that GoLink is relatively new and comparing it with services with well-established routines and ridership patterns may be pre-mature.

Overall, the results of the Hypothesis 8 analysis suggest that overall, the costs and subsidies required of the GoLink services were competitive with or lower than the subsidies required of fixed-route public transit of similar services operating in the same region. GoLink was found to be far more cost-efficient on a per rider basis than the low-ridership fixed-route service that was replaced in the Legacy region. However, these results should not be misinterpreted to conclude that GoLink was more cost-efficient than fixed-route public transit overall, as such services across the DART system delivered riders at about

half the required subsidy per rider. Taken together with this caveat, the results suggest that the hypothesis is partially supported overall.

Hypothesis 9: The average lead time for trips with WAVs that are scheduled for demand-responsive travel declines.

Performance Metric	Key Finding
Average scheduled lead time from paratransit and MOD services for WAVs	Average lead times (wait times) were an improvement over wait times from existing paratransit services. Average wait times minus given ETAs were also an improvement over the same paratransit wait times previously provided.

One of the key objectives of GoLink service was to improve the wait times experienced relative to paratransit services. There are two ways to compute wait time. One is through a computation of the lead time, which the time between when a ride is requested and when a ride begins. This interpretation of lead time assumes that the time requested is when the individual wants to travel on-demand. However, riders were also given a vehicle ETA. This ETA, subtracted from the lead time, could be another interpretation of wait time, in that the rider knows how much time will pass for the anticipated arrival of the vehicle. These two interpretations of average wait times are plotted over the course of the project in Figure 3-27.

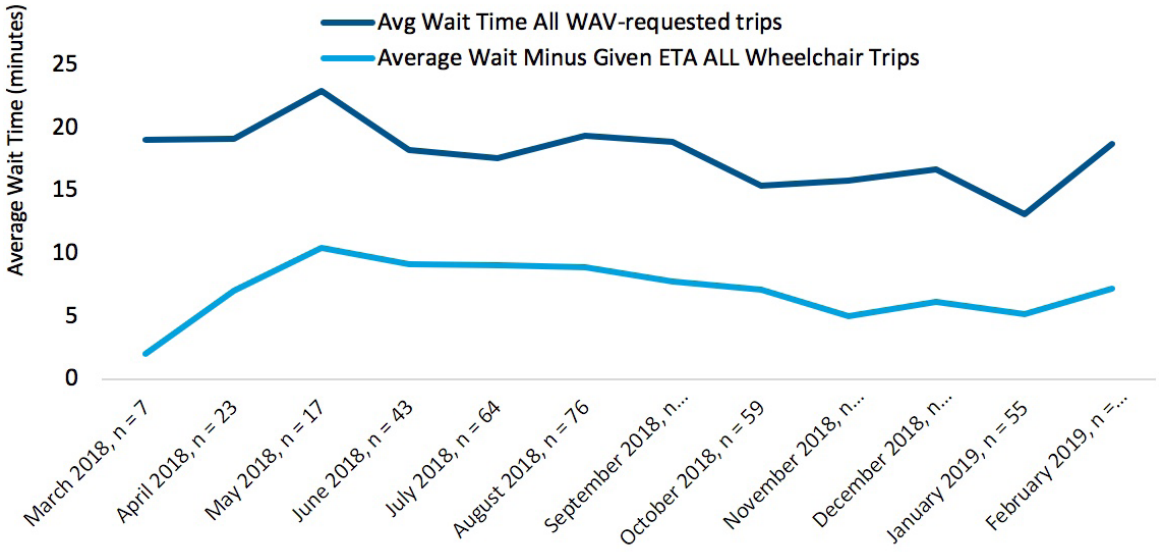


Figure 3-27

Average DART GoLink lead time (wait time) and (wait time minus given ETA) for persons with disabilities

Average lead times (overall wait times) fluctuated between 13 minutes (January 2019) and 23 minutes (May 2018) during the period for which activity data were available. Across this entire series, the average wait time was 18 minutes. For wait time minus the given ETA, the average was 7 minutes. The scheduling wait

time for DART paratransit services prior to GoLink (and at the time of this report) was between 1 hour and 7 days before the scheduled trip. Hence, the wait times exhibited by the GoLink service easily clear this. Taken together, these results suggest that GoLink produced wait times for persons with disabilities (requiring a wheelchair) that were far superior to the previously available paratransit service, suggesting a confirmation of Hypothesis 9.

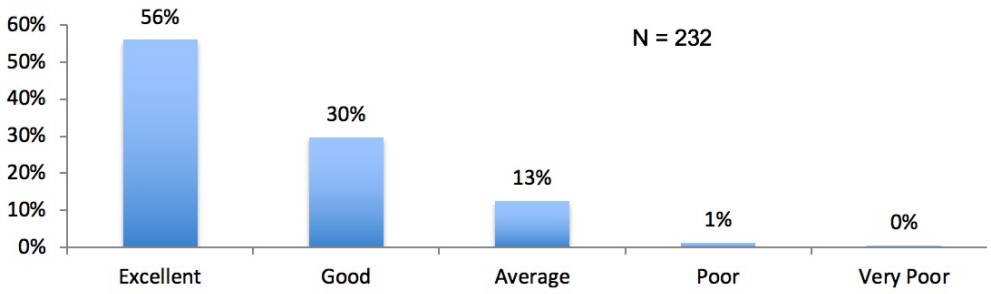
Hypothesis 10: Customer satisfaction increases as a result of the project.

Performance Metric	Key Finding
Reported customer satisfaction of DART riders	Analysis of survey results shows that the majority of respondents rated their experiences overall and with specific aspects of the GoLink service as above average, suggesting that customer satisfaction increased.

To evaluate whether customer satisfaction increased as a result of the project, respondents were asked to rate their experiences with DART GoLink. The first survey asked respondents to rate their overall experiences using DART GoLink; responses are shown in Figure 3-28. In total, 86% rated their overall experience using DART GoLink as above average, 13% rated it as average, and less than 2% rated it as below average.

Figure 3-28

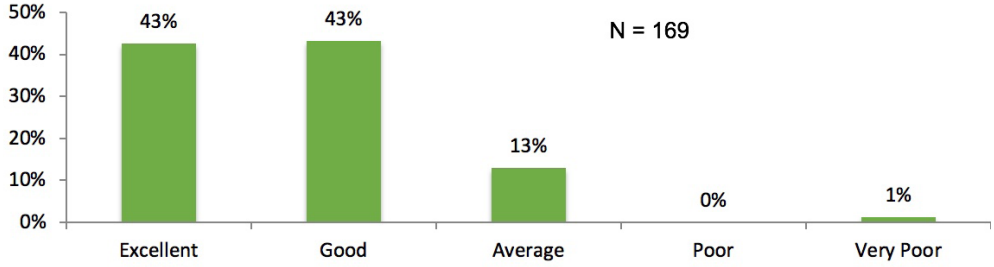
Ratings for overall experience with DART GoLink (data labels rounded)



The second survey asked respondents a similar question to rate their overall experiences using DART GoLink since the UberPool option became available. As shown in Figure 3-29, 86% of respondents rated their overall experience using DART GoLink since UberPool became available as above average, 13% rated it as average, and under 2% rated it as below average.

Figure 3-29

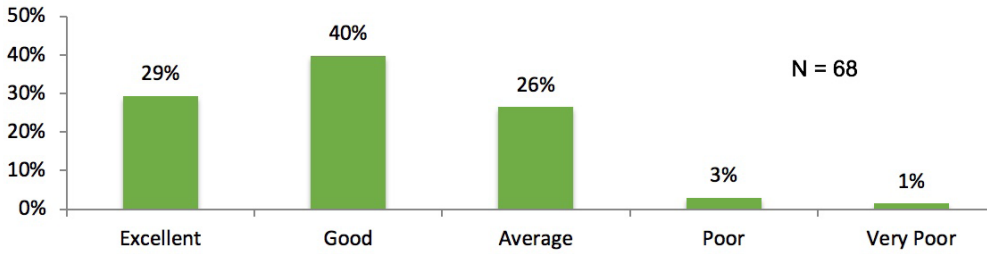
Ratings for overall user experience with DART GoLink since UberPool available (data labels rounded)



The second survey also queried respondents who had used UberPool through GoPass in the past to rate their experience for the portion of the trip provided by UberPool. As shown in Figure 3-30, results show that 69% rated their trip as above average. About one-quarter rated the UberPool portion of their trip as average, and 4% of respondents rated their trip as below average.

Figure 3-30

Ratings for overall user experience of UberPool trip through GoPass (data labels rounded)



Overall, the findings displayed in Figures 3-28, 3-29, and 3-30 suggest that the majority of respondents rated their experiences overall and with specific aspects of the GoLink service as above average. Additionally, nearly all survey respondents had above average experiences using the GoPass app (as discussed in Hypothesis 5a). These above-average ratings suggest that customer satisfaction increased as a result of the project, supporting Hypothesis 10.

Hypothesis 11: The perception of the DART brand improves as a result of the project.

Performance Metric	Key Finding
Reported brand perception of DART	Analysis of survey results suggests that most respondents view both GoLink shuttle and UberPool services as favorable enough to recommend to their peers.

To examine whether perception of DART's brand improved as a result of the project, questions were asked in both surveys that gauged whether respondents would recommend the GoLink shuttle and the UberPool option to a friend or family member. In Table 3-4, 88% of respondents to the first survey said they would recommend GoLink service to a family member or friend, 11% said maybe, and 1% said they would not.

Table 3-4

Would Users Recommend GoLink to Friends and Family?

Would you recommend the GoLink service to a family member or friend? (N = 243)	
Answer	**Percent**
Yes	88%
Maybe	11%
No	1%

In the second survey, respondents were asked whether they would recommend the UberPool option to a friend or family member. In total, 73% said that they would recommend the UberPool service, 22% said maybe, and 5% said they would not.

Table 3-5
Would Users Recommend UberPool Service to Friends and Family?

Would you recommend the GoLink UberPool service to a family member or friend? (N = 187)	
Answer	**Percent**
Yes	73%
Maybe	22%
No	5%

These results suggest that although most respondents viewed both GoLink shuttle and UberPool services as favorable enough to recommend to their peers, a slightly greater portion of respondents would recommend the GoLink shuttle service than would recommend the UberPool option. Collectively, the responses to these questions suggest that DART's brand was improved at least among users of the GoLink service. As there is little reason why DART's brand would have worsened among the broader population or riders as a result of the service, the findings suggest that Hypothesis 11 is supported.

Hypothesis 12: The process of deploying the project will produce lessons learned and recommendations for future research and deployment.

Performance Metric	Key Finding
Lessons learned and recommendations	Expert interviews identified best practices and lessons learned, including to 1) identify potential projects ahead of time, 2) define clear service goals, 3) enact a collaborative planning process, 4) have broad contract terms, 5) right-size vehicles, 6) have carefully crafted marketing, and 7) collect and share relevant data.

The evaluation team interviewed members of the DART project team to better understand challenges, barriers, successes, and broader lessons learned from the implementation of the project. Section 4 provides a synthesis of those interviews and the findings related to Hypothesis 12.

Wait and Travel Time Comparisons of WAV Trips and Non-WAV Trips

The evaluation team conducted an analysis comparing wait times and travel times for WAV trips and non-WAV trips made using the GoLink shuttle service. All GoLink shuttles (cutaway buses) were wheelchair accessible. Overall, wait and travel times were measured for 58,226 trips during this period, which included

57,652 non-WAV trips for ambulatory passengers (non-WAV passengers), and 574 WAV trips for persons with disabilities requesting WAVs (WAV passengers).

The distribution of the travel times for all trips is shown in Figure 3-31 for both Non-WAV and WAV passengers. The distributions overlap to a considerable degree across travel times. The WAV passenger travel time distribution is shown to have shifted, reflecting a slightly higher average in travel time. The difference in average travel times between WAV and non-WAV trips was 2.9 minutes.

Figure 3-31

Distribution of travel time across all Plano zones

A similar distribution is drawn for wait times, as shown in Figure 3-32. The overlap in distributions shows that both WAV and non-WAV trips experienced a similar range of wait times. The rightward shift of the WAV trip wait times reflects an average wait time that is slightly higher, by 6.3 minutes. Note that this analysis does not consider the ETA adjustment for wait times; it is only the difference between the requested time and the vehicle arrival time.

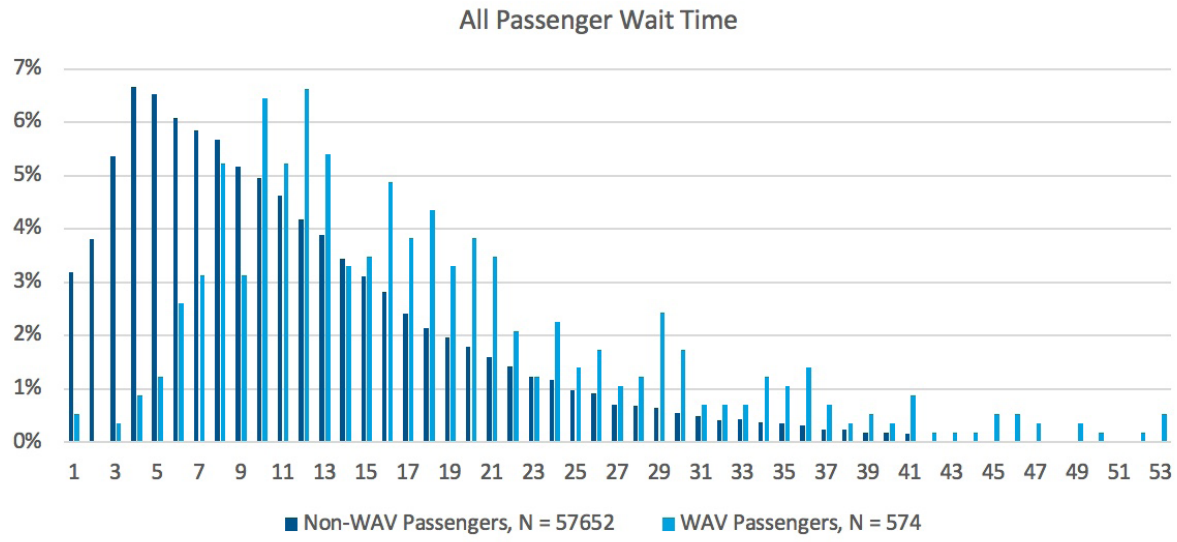


Figure 3-32

Distribution of wait time across all Plano zones

Overall, these findings suggest a relatively common range of experience across WAV and non-WAV travelers using the system. Travel times and wait times for WAV trips were, on average, higher than non-WAV trips, but the shapes of the distributions are similar and the overlap is considerable. A perfect overlap of these times is not to be expected nor is an alignment of averages. There are often additional steps required for the dispatching of WAV vehicles and for the execution of travel activity, which can insert additional minutes into the process. Wait times reflect the difference between the requested pick-up time and the actual pick-up time as recorded in the data. This actual pick-up time was also effectively the departure time of the vehicle (not the time at which it arrived to the passenger). Hence, wait times recorded would include any time needed to load and secure a wheelchair passenger. For this general reason, there is a right-shift in the WAV passenger wait time distribution. Given these qualifications, the distributions generally suggest that passenger within both WAV and non-WAV trips had a similar experience using GoLink.

SECTION

4

Lessons Learned from Project Partners

The evaluation team interviewed nine members of the DART project team to better understand challenges, barriers, successes, and broader lessons learned from the implementation of the project. Interviewees represented agency c-suite personnel, department heads, and practitioners representing the offices of Innovation, Service Planning, Scheduling, Paratransit Operations, and Marketing. Each expert interview was conducted in August 2019 and lasted approximately one hour. The private sector partners declined to be interviewed at the time of this report. This section documents the findings of these interviews.

Key Findings

The goal of DART's Sandbox project was not to compete with fixed-route service but rather to provide mobility services in areas where fixed-route service is so expensive it does not make economic sense. At service inception, DART had a few key goals. One was to have 80% of GoLink users booking rides through the app. Since service inception, DART has averaged 60–65% of all rides booked through the app. The service discontinued walk-up rides in August 2019, which previously accounted for approximately 10% of ridership. Dial-a-ride services have been one of the biggest challenges for DART; DART anticipated that call volume would decrease, but call volume actually increased, in large part due to increasing ridership and the addition of new service zones.

DART also hoped to drive costs down by shifting riders to non-dedicated service providers (e.g., TNC service) due to the lower service cost per a ride. DART estimates that it costs $41 per a rider on a typical under-performing bus route, $15–$17 per a rider on GoLink, and $5–$7 per a rider using a TNC. As such, DART had a goal of 75% of users using TNCs. However, TNCs only accounted for approximately 20% of the program's ridership (and 43% in the North Plano area). As such, while the program was reducing costs below fixed-route service, the costs were not as low as DART wanted them due to the relatively high number of riders using GoLink. Of note, TNCs are listed as the last option available on the GoPass app. DART hopes to rank TNCs higher in the choice list on the app to increase their use. DART is also leveraging its higher-than-anticipated call volume by having scheduling and dispatch advise people that Uber is another available option with the same pricing that can have reduced wait times, if a person opts to use a TNC. Additionally, as part of DART's effort to drive costs lower, the agency is also changing its contract terms from paying its dedicated provider on a revenue hour basis to a per trip basis (hence the need to discontinue walk-up service due to the difficulty logging these rides). In doing

so, DART hopes to pay for the services they use instead of waiting for a driver to wait at anchor stations for walk-up riders.

Over the course of the pilot, a number of data challenges were encountered. DART would like to get origin and destination data for all trips booked through the GoPass app; however, the agency has been unable to get these data from its TNC partner. At present, DART receives only general trip data for journeys between a zone and a rail anchor. DART has no origin or destination information for any trip that occurs within a zone, which presents a number of challenges for DART to reconcile and validate trips. Because TNC trips are booked outside the GoPass app and DART does not see the trip origin and destination, DART does not have full visibility of a trip and does not know if a user changes the origin and destination. Additionally, the contractor responsible for providing GoLink service had different definitions of wait and travel times different than DART, resulting in inaccurate reporting. DART is working with the contractor to update its software.

One complaint that DART has received about the program is that it is generally skewed into higher-income areas because of its emphasis on serving lower-density built environments (generally demographically more suburban and upper income). According to the expert interviews, the GoLink service was not intended to replace better-performing fixed-route service (often in more urban and lower-income neighborhoods). However, DART did attempt to address these concerns by adding additional service areas in both Plano and Southern Dallas.

Measuring Program Performance

The expert interviews identified a variety of potential metrics for measuring program success:

- Administrative metrics
  - Meeting project schedules
  - Vendor responsiveness (including a commitment to ongoing program maintenance)
- Transportation service metrics
  - Number of people using the GoPass app (DART had a goal of 80% of GoLink users using the app; since program inception, approximately 60–65% of users have used the app)
  - Improving average wait time
  - Improving average travel time
  - Ridership (total number of riders and trips, riders and trips per hour of service, increase in riders and trips within each zone)

- Equity metrics
  - Service for disadvantaged communities (including but not limited to underbanked, digitally-impoverished, people with disabilities, etc.)
- Financial metrics
  - Service costs and subsidies (e.g., total cost, cost per mile, subsidy per passenger, etc.)
  - Agency cost savings

Best Practices and Lessons Learned

Over the course of the Sandbox demonstration, DART encountered three key challenges: 1) those specific to working with their TNC partner; 2) those associated with their technology provider; and 3) those establishing agency-led services intended to integrate into the GoPass platform.

DART described a number of early challenges working with its TNC partner Uber prior to establishment of a dedicated public transit partnerships team. DART had lengthy discussions about data sharing, including origin and destination data, levels of aggregation and granularity, and protection of customer information. DART wanted TNC pick-up and drop-off location to be equivalent to its current contract with its GoLink and paratransit provider (e.g., origin and destination latitude and longitude for every trip, trip start and end time, wait time from ride request). DART wanted additional information to optimize bus routing, adjust zone size and shapes, and validate accuracy of agency charges. However, Uber expressed concern that providing detailed information could allow the ability to discern individual identities. Uber ultimately agreed to share with DART the number of people between an anchor station and a particular zone and the number of people traveling within a particular zone. Another challenge was that Uber Central (Uber's platform for scheduled rides made by third parties) worked with UberX (Uber's main service with only one party booking a ride) but not for UberPool (service with the possibility for multiple unrelated parties to match and share a ride). This required that users create an Uber account, thereby needing to have a smartphone and a credit card, to access the service. As such, users that were strictly call-in would not have same access.

One of the challenges that DART confronted was that it changed technology providers in the middle of the pilot. DART had spent approximately six months testing and demonstrating different applications. Because operations were not included in this early testing and demonstration, the technology provider ultimately changed mid-stream, which was a disruptive element for DART. Interviewees said that it is critical for operations to be involved in the technology testing and procurement process.

With respect to the third challenge, DART had hoped to integrate two services—carpooling and a service known as Public On-Demand (essentially a DART-operated TNC service). Both initiatives encountered notable challenges, primarily driven by advice of DART's legal counsel over concern about unclear definitions between carpooling and TNCs. Plainly stated, DART's legal counsel interpreted carpooling as TNCs and wanted carpool drivers to be held to the same legal requirements (e.g., requiring drivers to undergo background checks and maintain a minimum level of insurance). After only three drivers were willing to complete background checks, the agency was forced to abandon the effort in spite of large rider interest in carpooling. Similarly, DART had hoped to initiate a public TNC service using DART drivers and vehicles; however, this initiative also had to be abandoned based on DART's legal interpretation of State law that would have required an expensive insurance policy.

The expert interviews identified seven best practices and lessons learned:

- **Pilot Project Planning** – Due to limited time to respond to grant applications, public agencies need a vision for potential projects in advance of a funding opportunity becoming available.
- **Clear Service Goals** – Public agencies need to have clear goals to determine if there is sufficient ridership for a particular service offering and metrics for when to increase, decrease, or terminate service.
- **Collaboration** – One of the notable successes with DART's project is that it established a multidisciplinary team of 20–25 agency stakeholders that met on a regular basis (typically weekly) throughout the planning and implementation of the project.
- **Contracting** – Broad contract terms (such as "coordination of services") provided DART staff procurement with flexibility with all-encompassing language. For example, GoLink's larger vehicles required a commercial driver's license and a new driver pool and pay structure. By having flexible contract terms, staff did not have to go back through the procurement process. Additionally, public agencies should not wait until the end of the contract period (e.g., 5–7 years) to update service features. Broad contractual language can allow for more flexible and responsive service changes to customer needs.
- **Vehicle Right Sizing** – Initially, DART launched GoLink service with large 30-ft buses that had difficulty maneuvering and were inefficient for demand-responsive service. The vehicles were to be replaced with minivans and cutaways now that the agency understands GoLink ridership patterns.
- **Service Area Planning** – As part of the Sandbox, DART transitioned an existing demand-responsive program (On-Call) into GoLink by expanding the geographic size of existing zones and eliminating restrictions that required

one vehicle per zone. However, DART acknowledged that removing a service area size limitation may not be the best approach operationally. In one zone, the service area is 23 square miles, which may be too large as the zone has longer travel and wait times.

- **Marketing** – When marketing services, the public agency needs to understand the channels with which customers interact (e.g., retailers, employers, special events, direct-to-traveler, etc.). Additionally, when branding a new project or program, public agencies should carefully consider whether their current marketing is considered forward looking or out of date to determine how to market new app-based and demand-responsive services. Additionally, public transit agencies need to evolve from measuring individual trips (i.e., connectivity between Point A and Point B) to measuring their "mobility relationship" with their customers (i.e., loyalty to using not only public transportation but also affiliate, partner, co-branded, and new service offerings).)
- **Data** – More data are needed to understand how customers move around the metropolitan area, the maximum number of modal connections a traveler is willing to make, and the cost acquisition per DART customer. GoLink will be included in DART's five-year origin and destination survey that may help shed additional light on travel behavior. Finally, a public agency needs more frequent internal data markers to identify opportunities and challenges throughout the pilot project so changes can be made as needed.

Concluding Thoughts from Project Partner Interviews

DART believes the Sandbox program continued to drive ridership, possibly changed consumer perceptions of public transportation, and added flexible mobility options where fixed-route transit does not make physical, logistical, or economic sense. In doing so, DART believes the project provided customers with additional mobility options that expand the catchment area beyond end-of-line rail stations. DART also believed the service has broadened employment options for carless households; however, more research is needed.

The expert interviews revealed a marked transformation from project inception in 2016. Over the course of the Sandbox, DART evolved as an agency taking on numerous initiatives (some successful, others unsuccessful, e.g., carpooling integration) intended to make GoPass the metro's leading mobility platform. In doing so, DART tried to expand the travel options available to its customers, expand DART services to greater customer segments, and replace underperforming fixed-route public transit service. Additionally, the expert interviews revealed an evolution with their private sector service providers. Interviewees described initial challenges working with TNCs at the outset, but that over the course of the project the TNC partner evolved, adding a dedicated transit team that has helped enhance collaboration and responsiveness.

In May 2020, DART's Board awarded a three-year contract to Uber to supplement the GoLink service. As of November 2020, DART had expanded GoLink to 16 service areas. In the future, DART hopes to incorporate shared micromobility (e.g., bikesharing and scooter sharing into the GoPass app). However, the lack of enabling State legislation presents challenges. More proactive federal guidance can help provide local agencies with the tools needed to collaborate with innovative and emerging modes in the absence of enabling state legislation.

Finally, the interviewees acknowledged that it takes longer to implement projects with public-private partnerships than previously anticipated when the project was initially proposed. DART identified for-hire service partners and began the Request for Proposals process in late 2016. It took approximately a year to get partners into contract (October 2017) for FY2018. TNC service integration with GoPass did not start until March 2019. Initially, DART believed that the process would be easier because they did not need to go through a competitive procurement process. However, data negotiations and technology integration took ample time. Experts recommend that FTA add more lead time for these negotiations and 4–6 weeks of beta testing the service.

SECTION

5

Conclusions

The evaluation determined that the DART project achieved a number of its objectives, as indicated below.

The pilot project expanded the geographic scope of locations reachable by DART transit services. In the Plano area, DART's transit coverage expanded by 85% after implementation of GoLink. Prior to March 2017, only 44% of Plano was accessible via DART transit services. After pilot project implementation, 82% of Plano was covered by the DART transit system (as of May 2019). Survey respondents also rated their ability to reach areas within the GoLink zone as favorable, on average.

Users were generally satisfied with the GoLink service and experience improved FMLM mobility. Activity data provided to the research team showed that average GoLink wait and travel times fluctuated modestly during the period of study. However, survey results of GoLink users suggest that the majority of users were satisfied with in-vehicle travel times and perceived that their FMLM mobility improved as a result of GoLink.

Persons with disabilities experience improved access to DART transit. Persons with disabilities experienced overall travel times that were superior to options available from existing fixed-route transit options. Furthermore, 63% of trips that requested a WAV (WAV trips) completed by GoLink shuttles could not be completed by existing fixed-route transit. This strongly suggests improved access to DART as a result of GoLink. Additionally, the distribution of response and travel times among persons with disabilities requesting WAVs (WAV trips) and ambulatory users (non-WAV trips) were generally of the same shape and exhibited considerable overlap. Taken together, these results suggest that persons with disabilities experienced improved access to DART as a result of the project.

Customer satisfaction and the perception of DART's brand likely increased as a result of the project. Analysis of survey data shows that most respondents rated their overall experiences with GoLink and satisfaction with the GoPass app as above average. In addition, the majority of respondents claimed that they would recommend the GoLink shuttle and the UberPool option to their peers, suggesting that customers were generally satisfied with the pilot project and that DART's brand image was favorable.

The costs of the MOD services were competitive with low-ridership fixed-route bus services operating in the region. Based on a comparison of subsidy-per-rider data for the expanded GoLink in Plano and subsidy-per-

rider data across DART's fixed-route public transit system, the assessment found that the costs of MOD services were higher than the cost of fixed-route and bus transit services, on average. The average subsidy per rider for MOD services in Plano was $16.37. This was compared to the subsidy per rider of a bus route operating in Plano, which was $33.71. The GoLink shuttle was more cost-effective than this low-ridership bus route and was more cost effective than the average paratransit services provided by DART. The DART system overall operated with a subsidy per rider of $8.28 for bus services and $6.80 for fixed-route transit services (bus, light rail, commuter rail), which includes highly-utilized routes. Hence, the GoLink shuttle was not cost-effective compared to fixed-route public transit in general but it was more cost-effective than fixed-route public transit services in low-density environments.

The DART project offered lessons learned to build on future projects. Expert interviews with DART personnel revealed several lessons learned and recommended practices. Key institutional lessons learned include:

- **Pilot Project Planning** – Public agencies should have a vision for potential projects in advance of a funding opportunity becoming available so agencies can have ready, willing, and able partners to respond to notices of funding;
- **Broad Contracting Terms** – Broad contract terms (such as "coordination of services") may be able to provide flexibility in the procurement process and reduce potential delays associated with contract amendments.
- **Clear Service Goals** – After a demonstration project is funded, public agencies should have clear metrics for determining if vehicle size, service area, or frequency of service should be increased, decreased, or terminated.
- **Marketing and Understanding the Customer** – Public agencies should understand the needs of their travelers and evolve from measuring individual trips (i.e., connectivity between Point A and Point B) to measuring their "mobility relationship" with their customers (i.e., loyalty to using not only public transportation but also affiliate, partner, co-branded, and new service offerings). Additional data can help public agencies understand consumer preferences, such as the maximum number of modal connections a traveler is willing to make.

These and other insights emerged from the DART GoLink service. The lessons learned from the pilot project not only have helped DART to take the next steps in improving the project but should allow for future projects to build on this experience and advance common objectives with similar initiatives within other public transit systems.

APPENDIX

This section contains survey results from the February 2019 survey of DART GoLink shuttle users (in blue) and the April 2019 survey of user experiences with the UberPool option (in green). The figures shown are not included in the body of the evaluation report, and those in the main report are not shown in this appendix. Where applicable, data labels for figures included in the appendix have been rounded to the nearest whole number for display purposes.

Figure A-1

How do you usually access GoLink service? (choose all) (N=251)

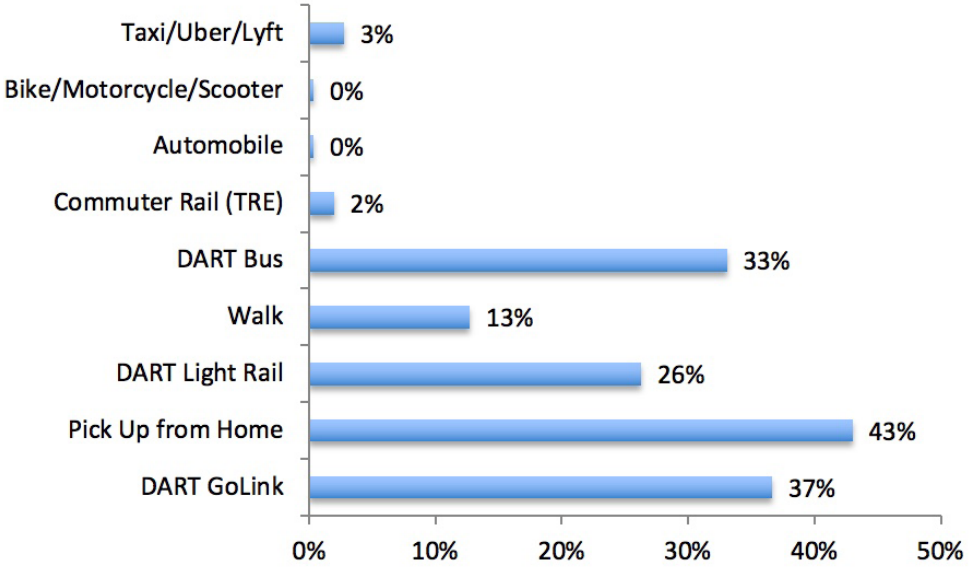


Figure A-2

What is the purpose of your trip? (N=250)

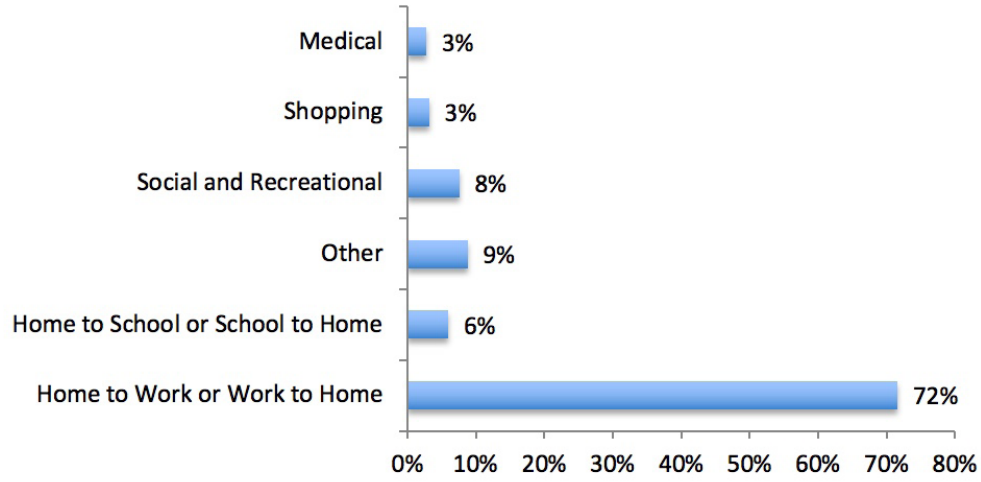


Figure A-3

How often do you ride with GoLink service? (N=251)

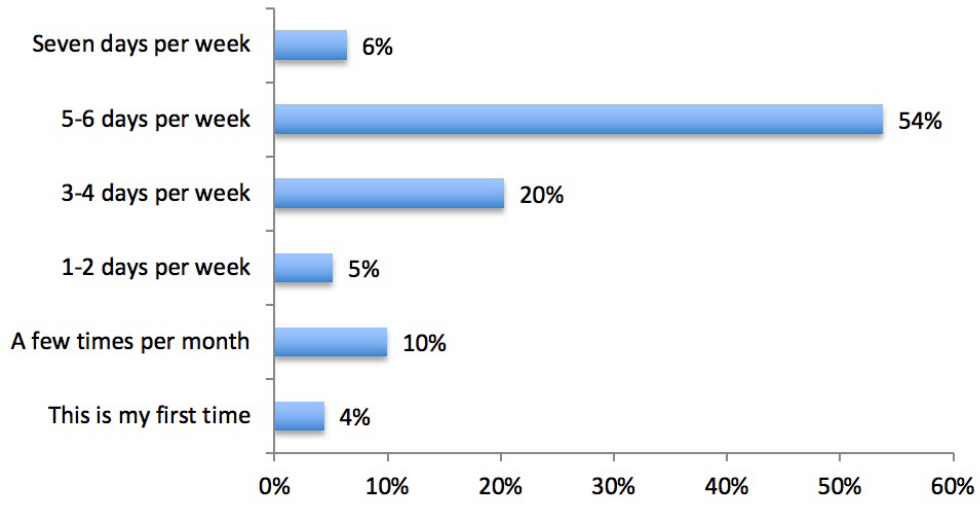


Figure A-4

How do you schedule your trips on GoLink? (choose all) (N=240)

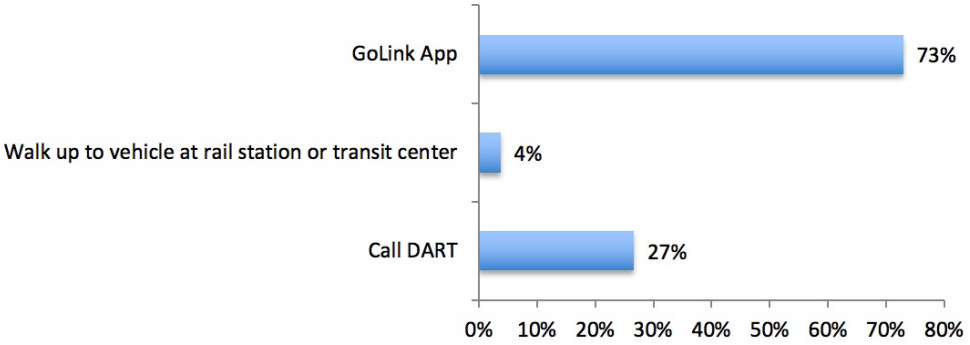


Figure A-5

Do you use GoPass App to schedule your trip? (N=244)

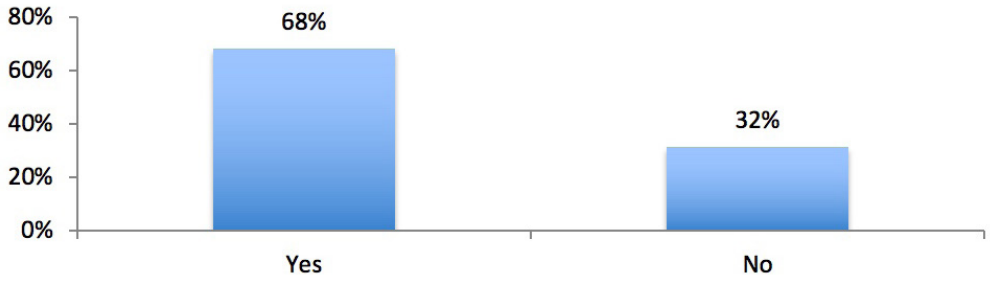


Figure A-6

If YES, what types of information or service do you get from GoPass? (N=167)

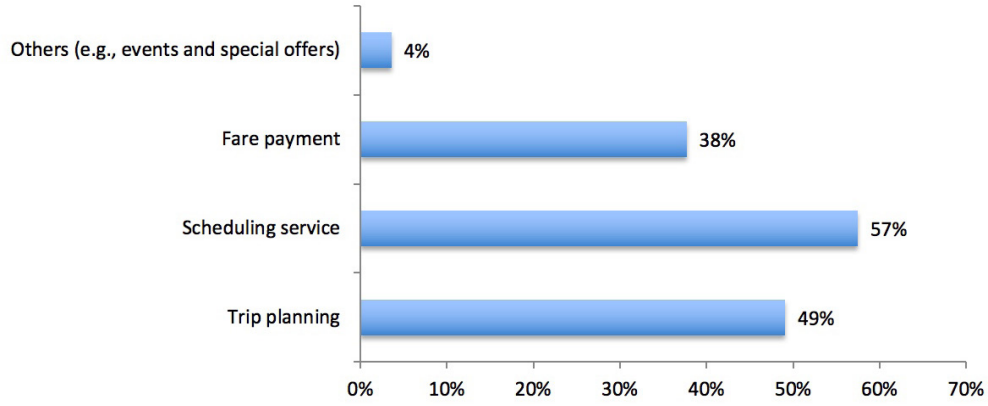


Figure A-7

If NO, what keeps you from using the app? (N=77)

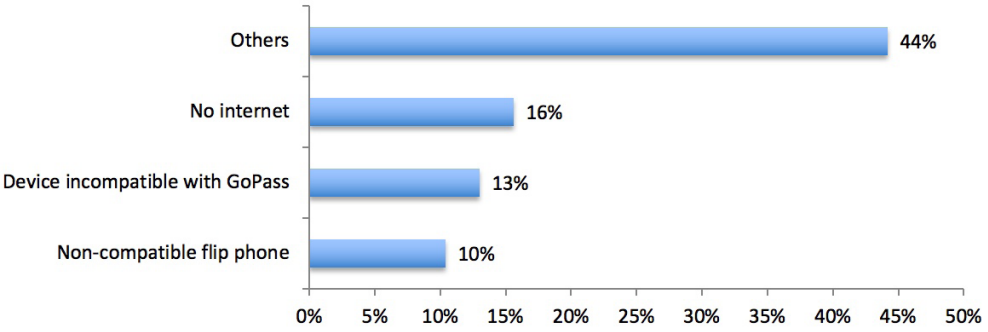


Figure A-8

Which of the following modes of transportation have you used in the Dallas area during last 12 months? (choose all) (N=245)

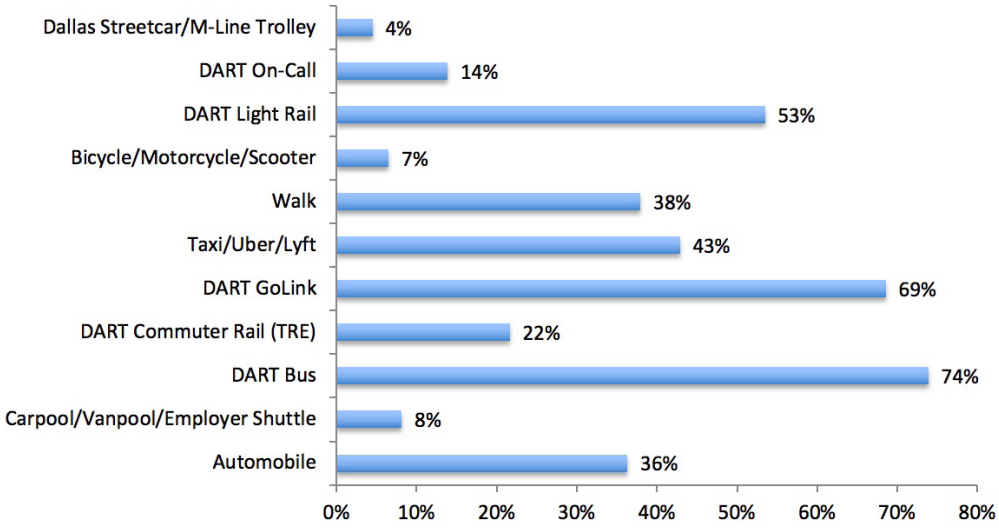


Figure A-9

What is your gender? (N=248)

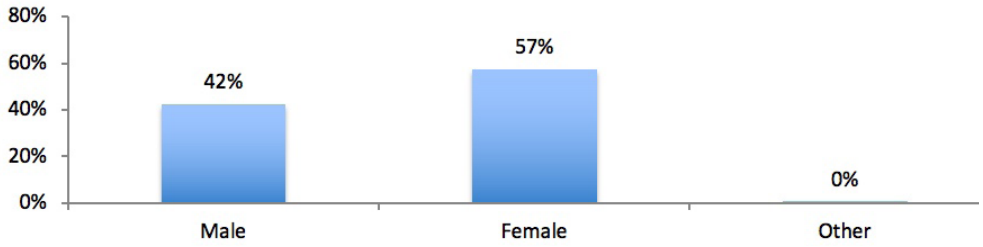


Figure A-10

Please choose your age range. (N=238)

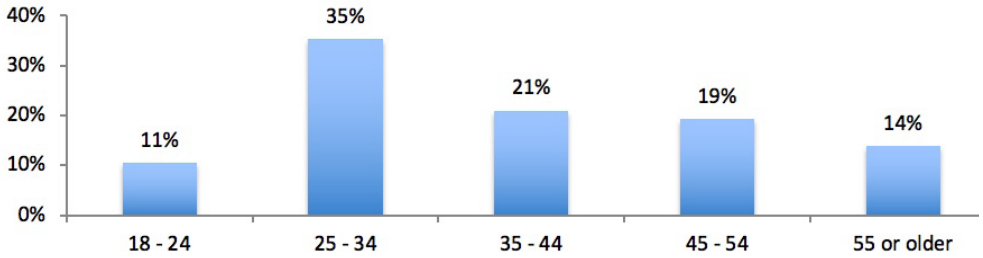


Figure A-11

Which mobility devices do you use to board public transit? (choose all) (N=239)

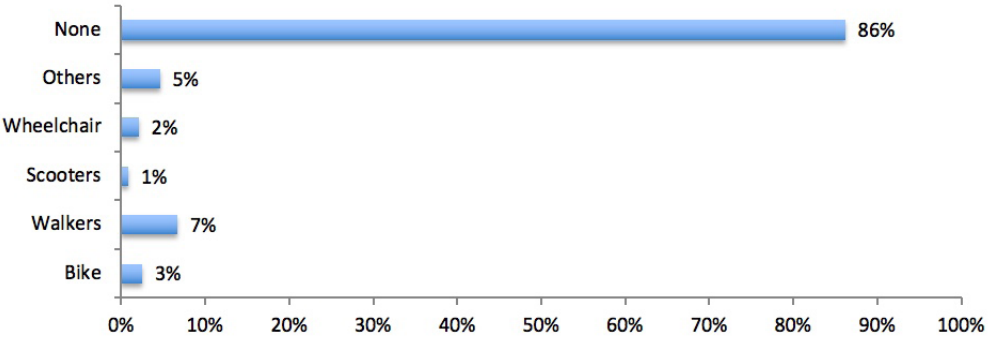


Figure A-12

What special assistance do you need to board public transit? (choose all) (N=255)

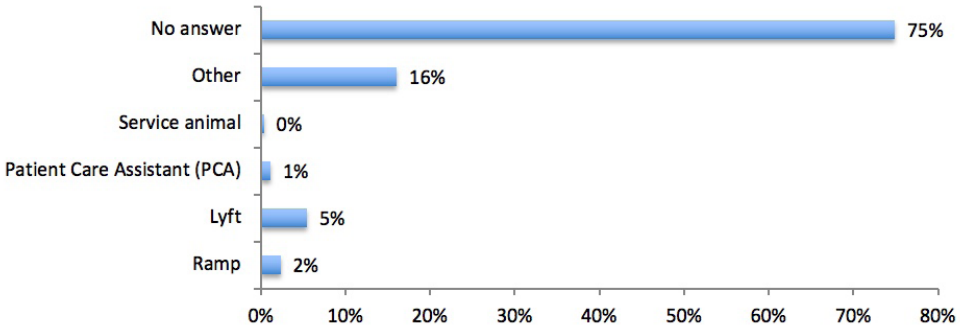


Figure A-13

What is your race or ethnicity? (choose all) (N=255)

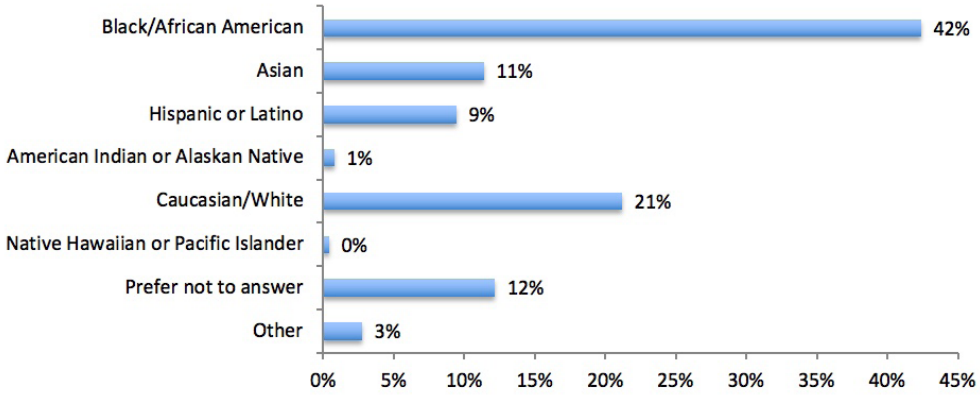


Figure A-14

Approximately what is the range of your gross (pre-tax) household income last year? (N=255)

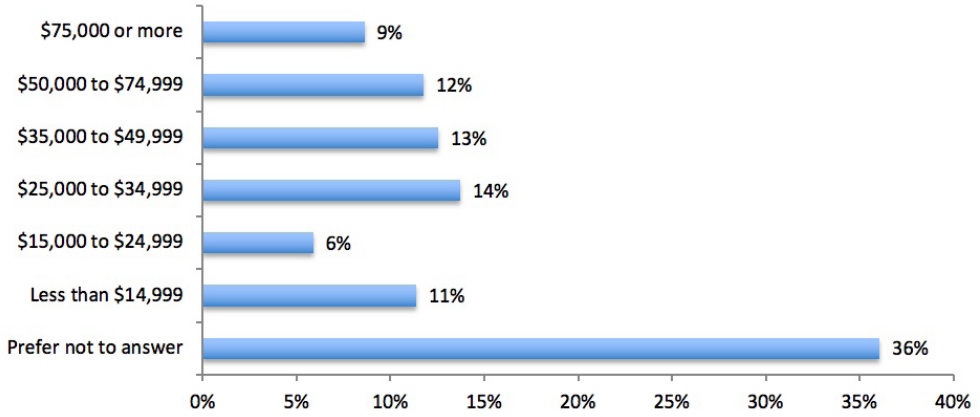
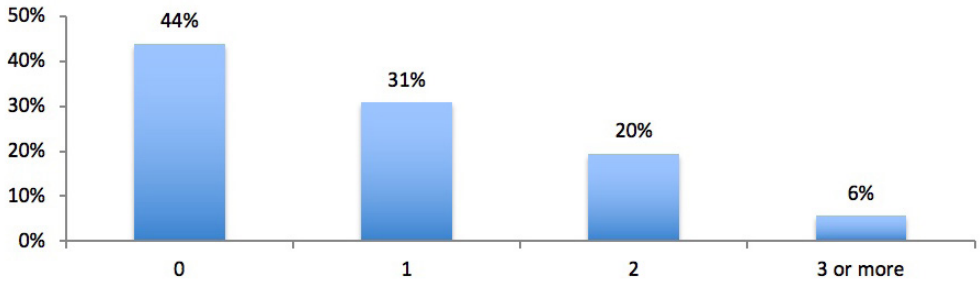


Figure A-15

How many vehicles does your household currently own or lease? (N=246)



The following figures display survey results from the DART UberPool survey from April 2019 that were not included in the main evaluation report body.

Figure A-16

Are you aware that riders can now get to/from rail stations and transit center in GoLink zones using UberPool for free? (N=193)

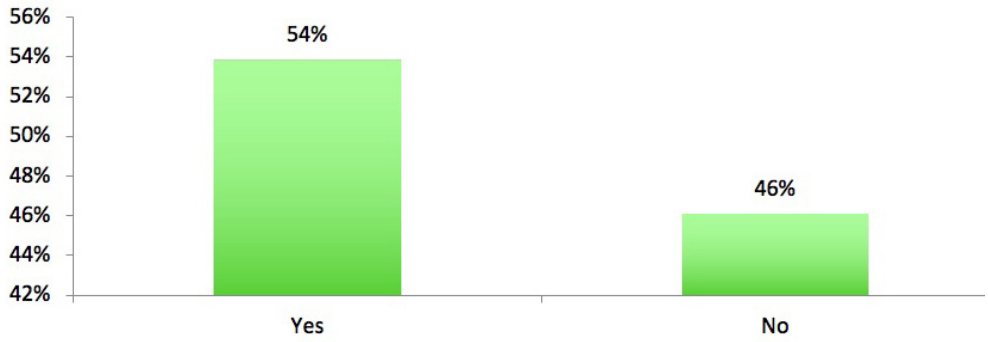


Figure A-17

Are you willing to pay $1.00 extra for an UberPool trip if you could get the service within 10 minutes? (N=194)

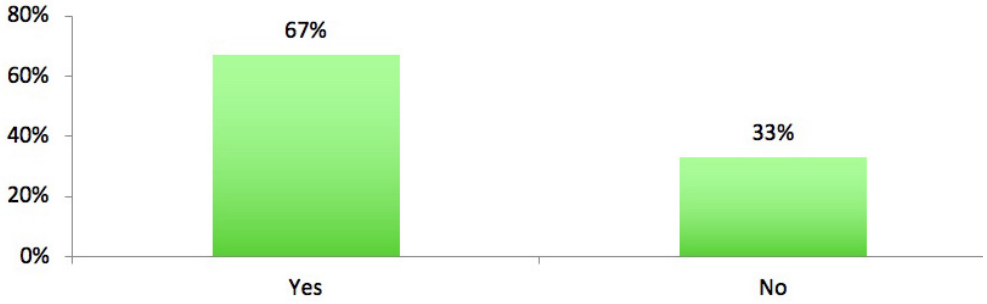


Figure A-18

Are you aware that riders can now travel within this GoLink zones using UberPool for $3.00? (N=186)

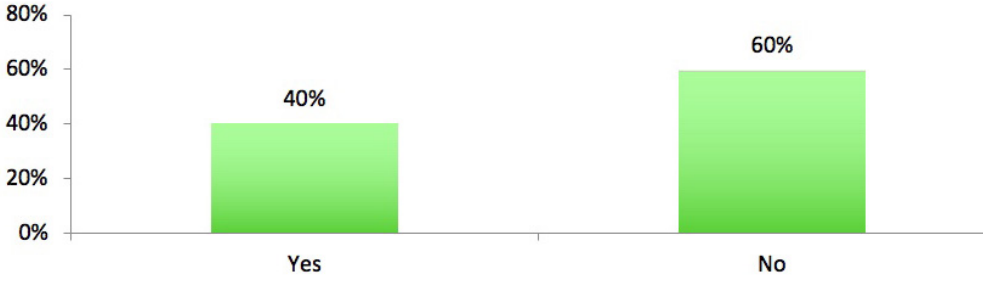


Figure A-19

Have you used UberPool in this GoLink zone yet? (N=182)

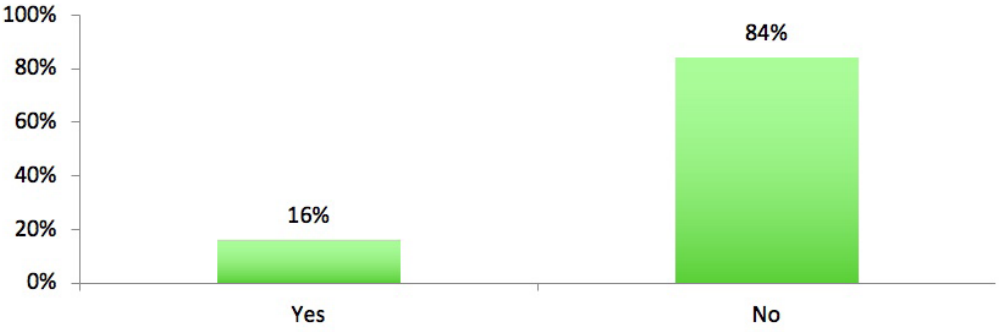


Figure A-20

Did you access UberPool through GoPass or directly through UberPool? (N=169)

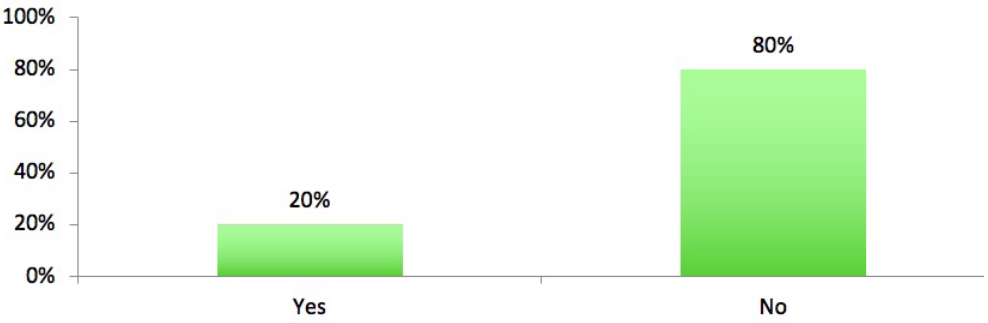


Figure A-21

How many times have you used UberPool for all or any portion of your trip in a GoLink zone? (N=189)

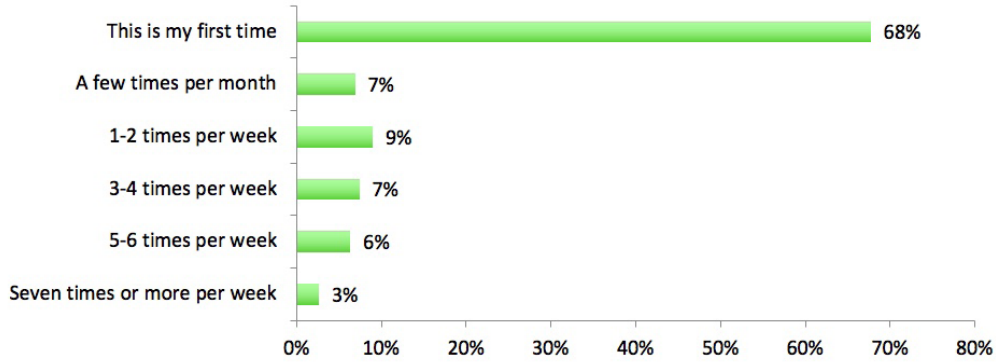


Figure A-22

How would you rate GoLink service since UberPool joined DART to provide service? (N=111)

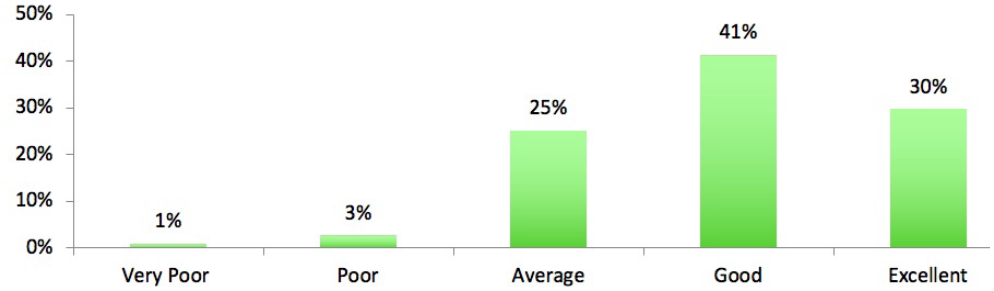


Figure A-23

How do you usually get to GoLink service? (N=182)

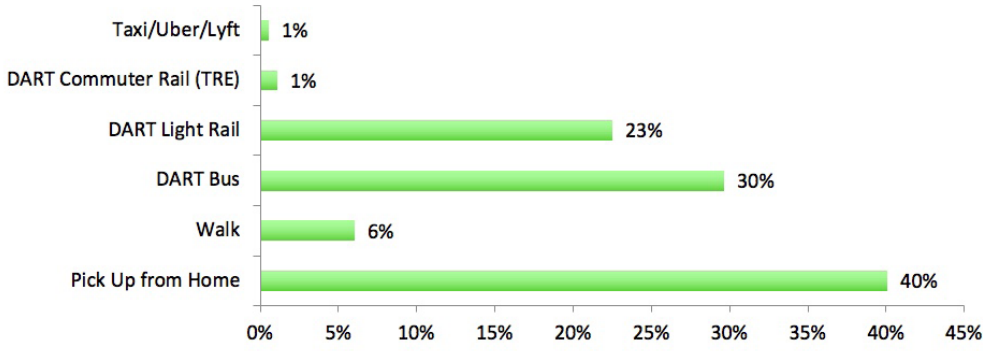


Figure A-24

What is the purpose of your trip? (N=186)

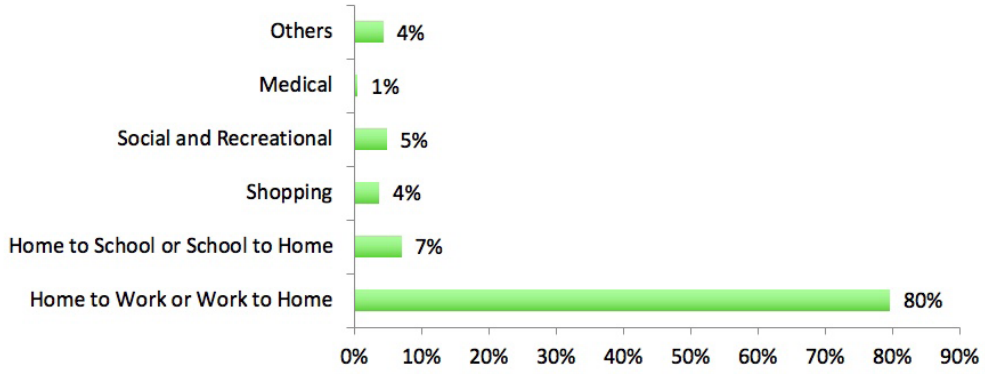


Figure A-25

How often do you ride GoLink? (N=186)

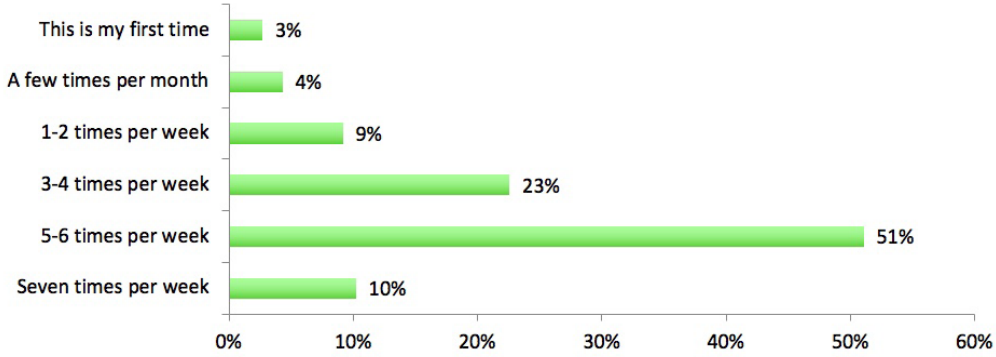


Figure A-26

How do you schedule your trips on GoLink? (N=196)

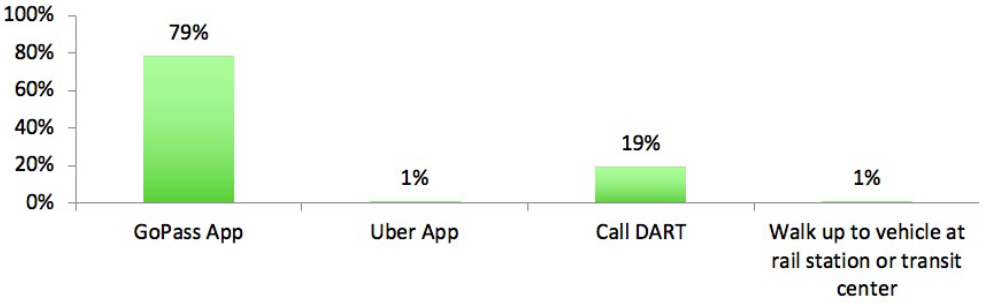


Figure A-27

How many times a day do you schedule a trip on GoLink? (N=185)

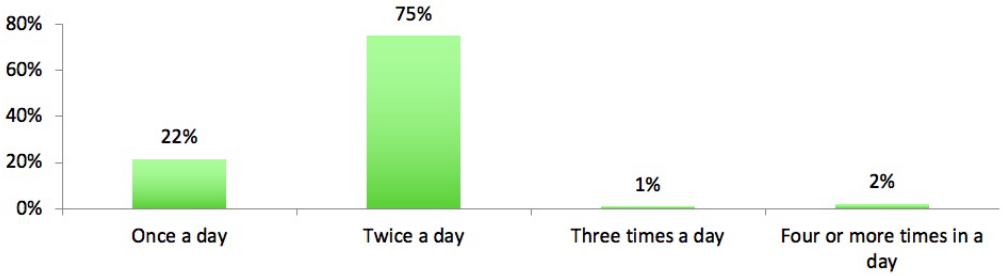


Figure A-28

After completing this trip on GoLink, are you going to use another DART transportation mode to get at your destination? (N=183)

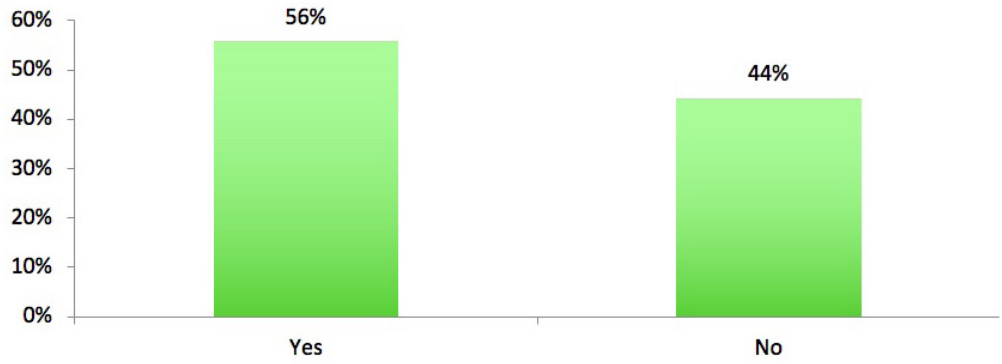


Figure A-29

If Yes, what mode? (N=105)

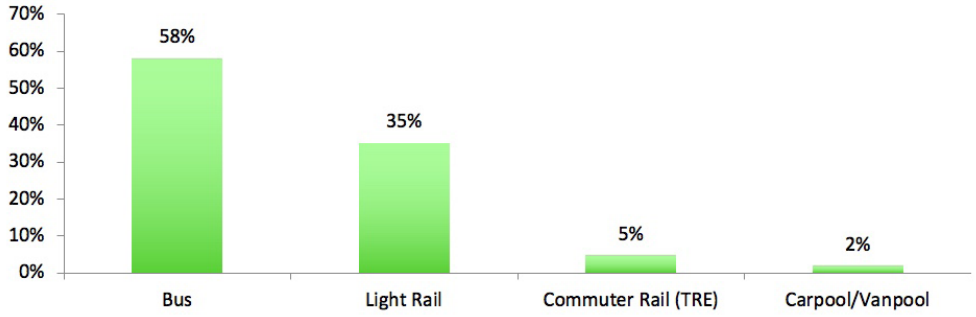


Figure A-30

Please rate your access to DART bus stops, transit centers, and light rail stations with GoLink since UberPool available. (N=169)

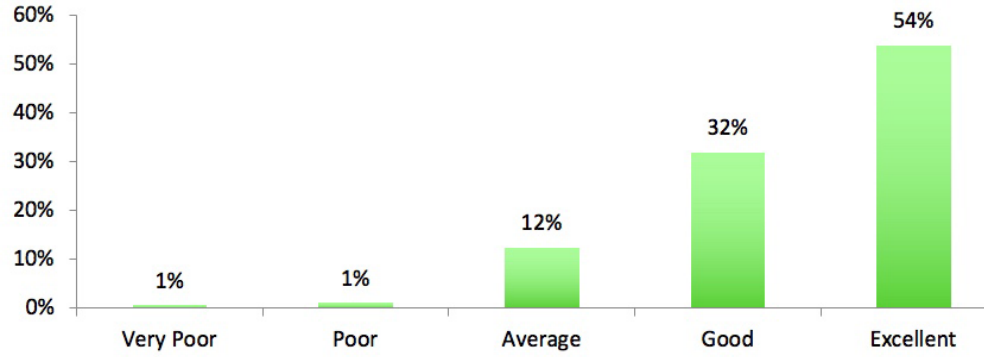


Figure A-31

Please rate your access to DART's overall bus and rail system with GoLink since UberPool available. (N=173)

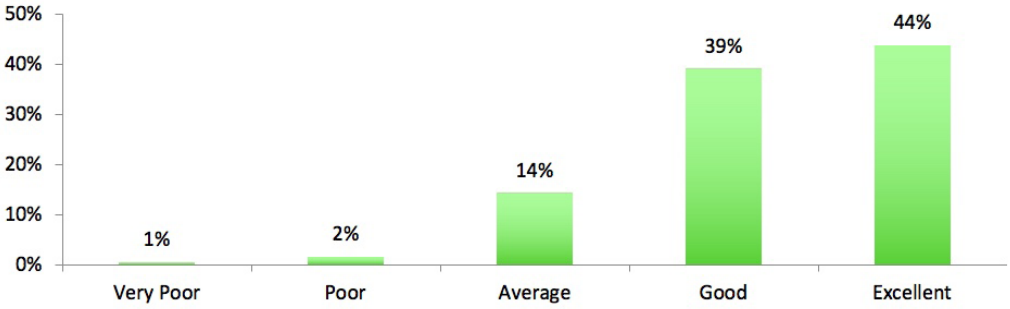


Figure A-32

Please rate your approximate waiting time with GoLink since UberPool available. (N=173)

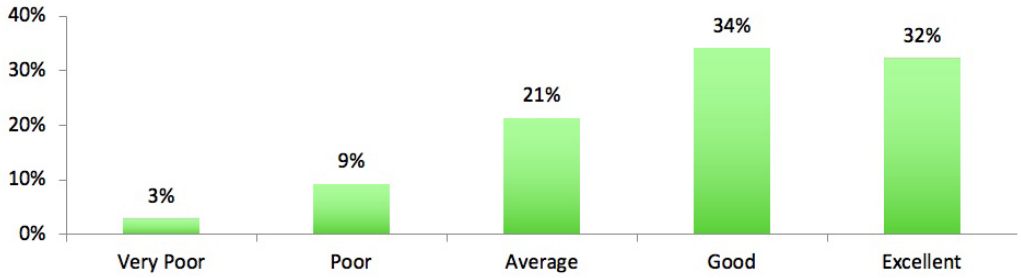


Figure A-33

Did you use GoPass App to schedule this trip? (N=183)

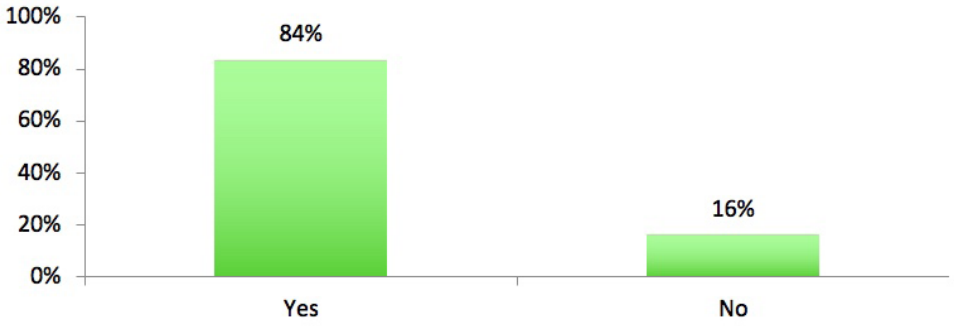


Figure A-34

If YES, what types of information or service do you get from GoPass? (N=153)

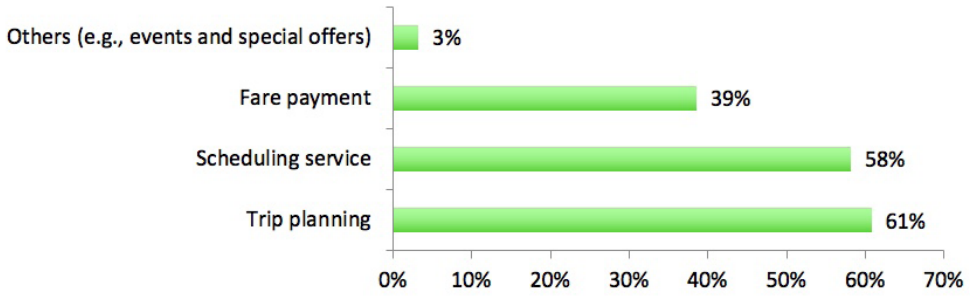


Figure A-35

If NO, what keeps you from using the app? (N=30)

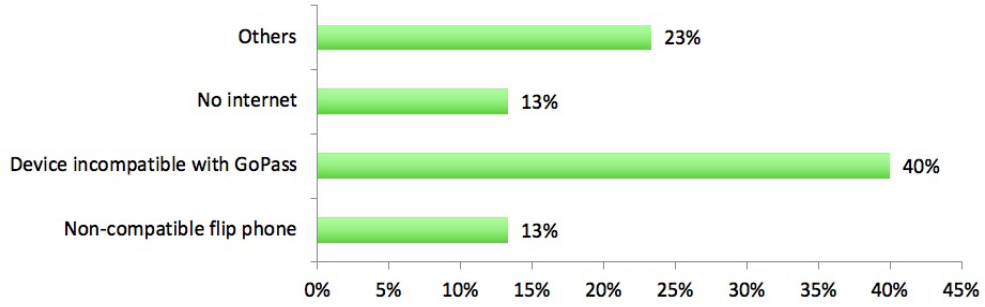


Figure A-36

Please rate your experience with accessing UberPool through GoPass app in trip planning, scheduling service, and fare payment (scale of 1 to 5; 1 = poor, 5 = excellent).

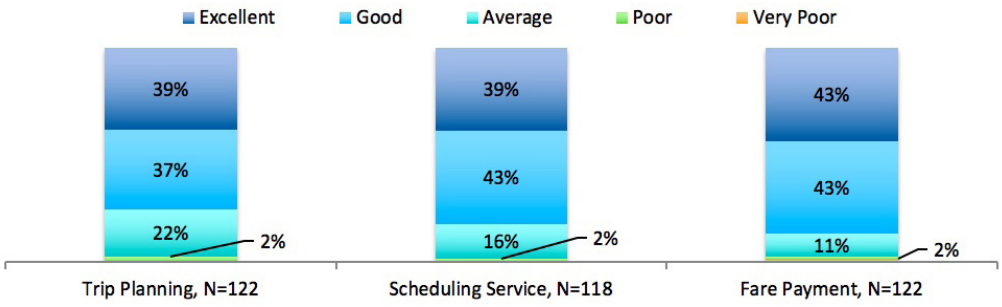


Figure A-37

Have you taken this survey before? (N=166)

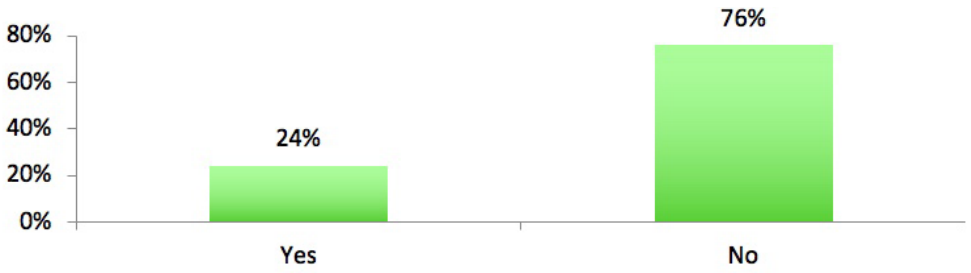


Figure A-38

Which of the following modes of transportation have you used in the Dallas area during last 12 months? (N=196)

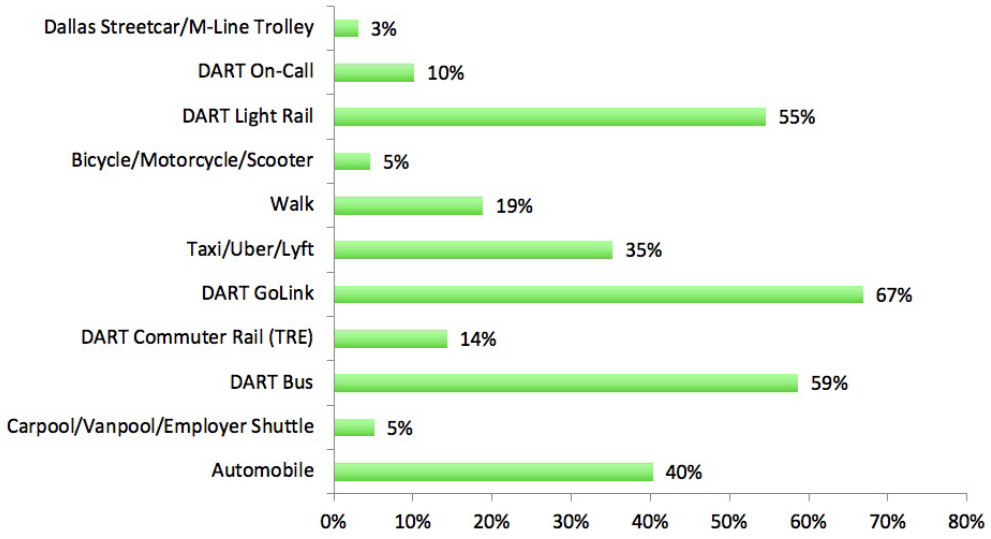


Figure A-39

What is your gender? (N=173)

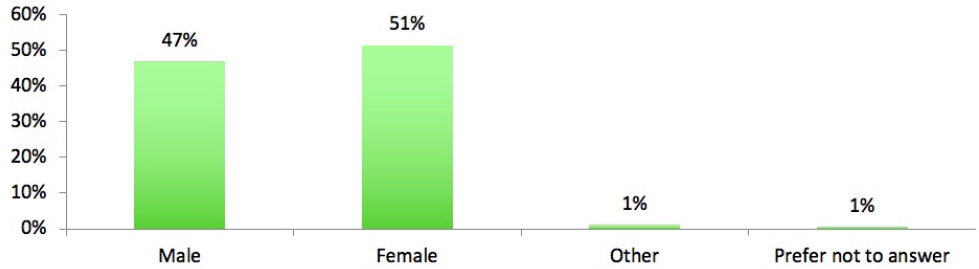


Figure A-40

Please choose your age range. (N=170)

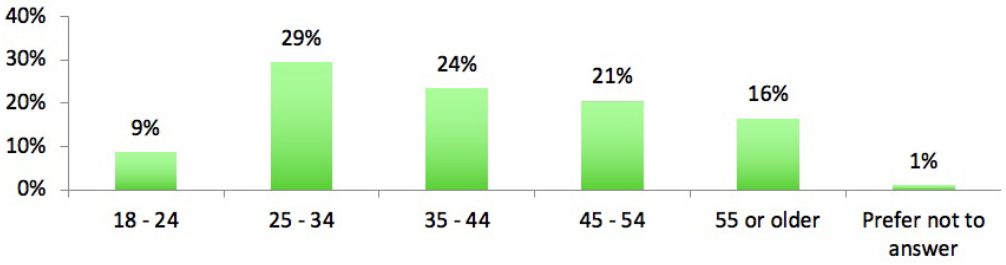


Figure A-41

Which mobility device assistance do you use to board public transit? (N=196)

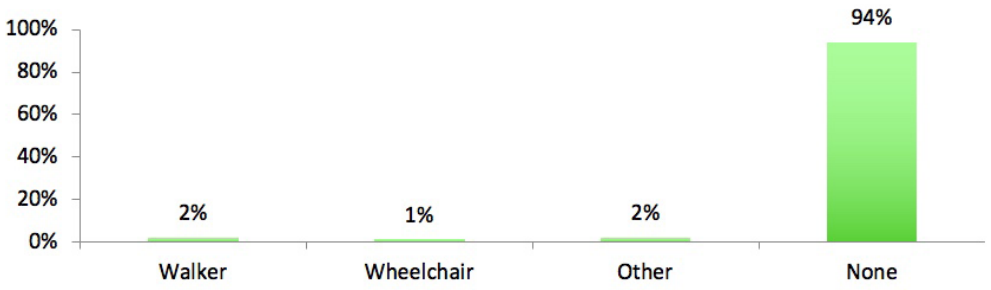


Figure A-42

What special assistance do you need to board public transit? (N=196)

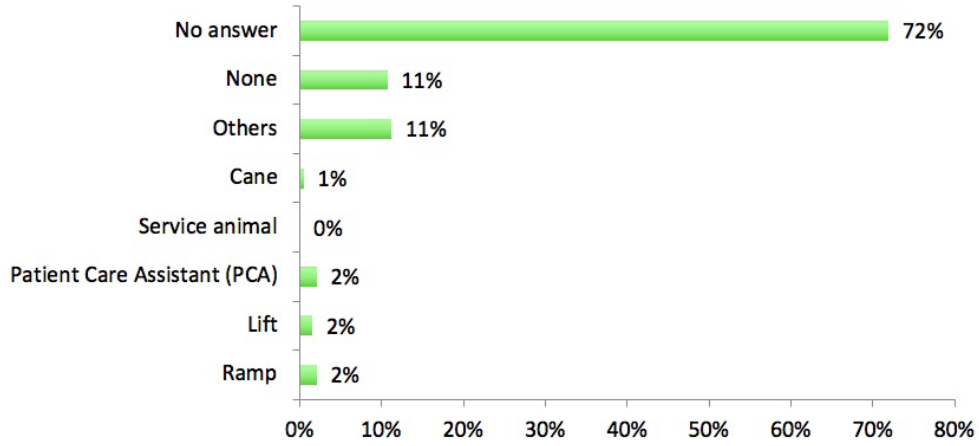


Figure A-43

What is your race or ethnicity? (Please check all that apply.) (N=196)

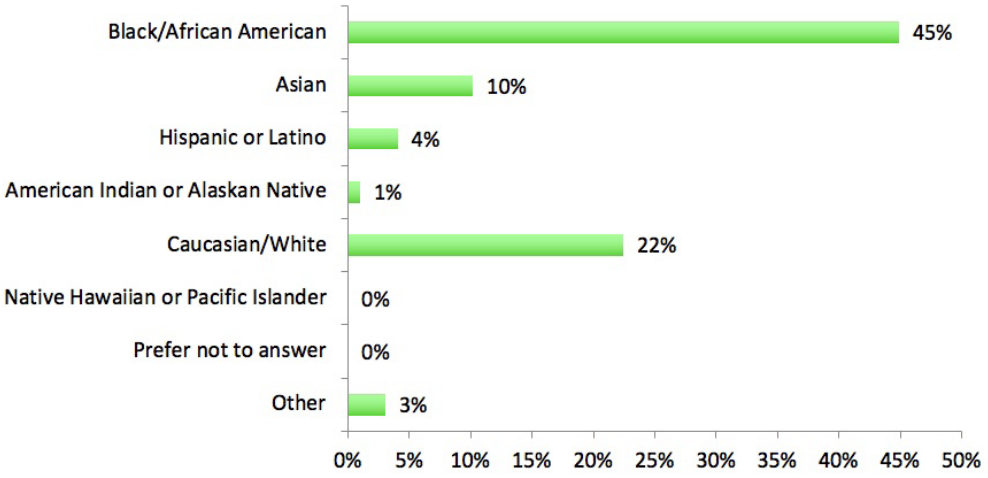


Figure A-44

Approximately what is the range of your gross (pre-tax) household income last year? (N=122)

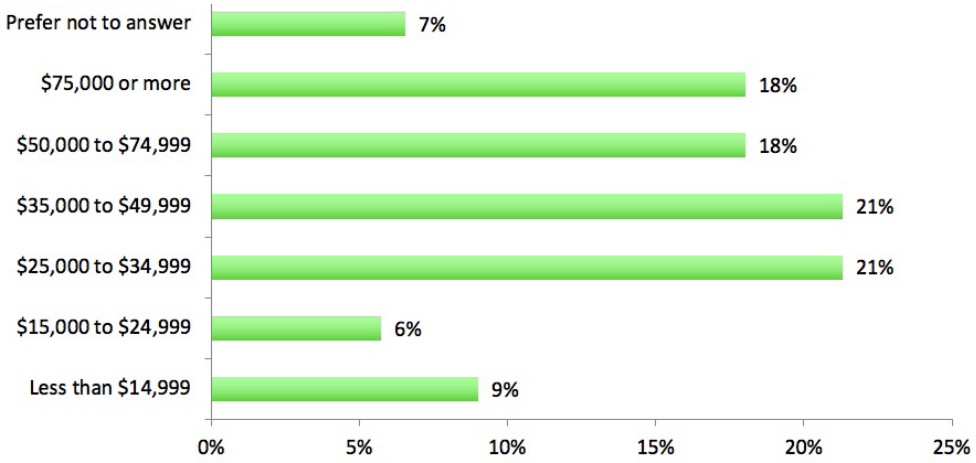
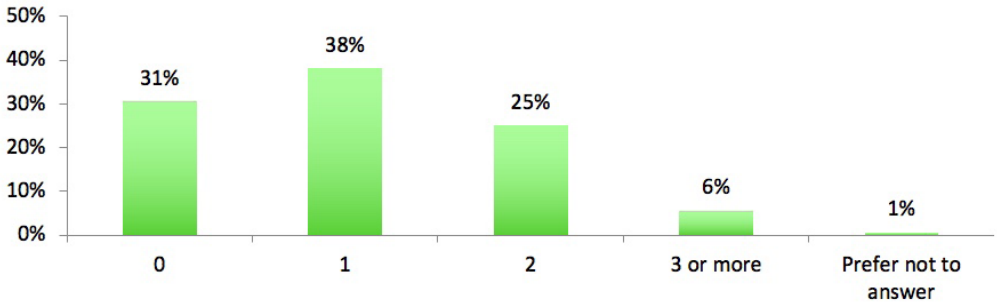


Figure A-45

How many vehicles does your household currently own or lease? (N=160)



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