Innovations in Transit?

An In-depth Case Study of the City of Monrovia/Lyft Public-Private Partnership to Increase Transit Ridership in Suburbia

June 2021

A Research Report from the Pacific Southwest Region University Transportation Center

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TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. PSR-19-19	**2. Government Accession No.** N/A	**3. Recipient's Catalog No.** N/A
4. Title and Subtitle Innovations in Transit? An In-depth Case Study of the City of Monrovia/Lyft Public-Private Partnership to Increase Transit Ridership in Suburbia		**5. Report Date** June 30, 2021 **6. Performing Organization Code** N/A
7. Author(s) Tridib Banerjee ORCID number 0000-0002-1357-0024 Deepak Bahl Andrew Eisenlohr Hue-Tam Jamme Nida Ahmed Corey Barnes Xiaoling Fang		**8. Performing Organization Report No.** PSR-19-19
9. Performing Organization Name and Address METRANS Transportation Center University of Southern California University Park Campus, RGL 216 Los Angeles, CA 90089-0626		**10. Work Unit No.** N/A **11. Contract or Grant No.** USDOT Grant 65A0674-TO034
12. Sponsoring Agency Name and Address California Department of Transportation 1120 N Street Sacramento, CA 95814		**13. Type of Report and Period Covered** Final report (04/01/2020 – 06/30/2021) **14. Sponsoring Agency Code** USDOT OST-R
15. Supplementary Notes Project page URL: https://www.metrans.org/research/innovations-in-transit-an-in-depth-case-study-of-the-city-of-monrovia-lyft-public-private-partnership-to-increase-transit-ridership-in-suburbia-		

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17. Key Words Transportation network companies, public-private partnership, innovations, first/last mile gap	**18. Distribution Statement** No restrictions.

19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 120	**22. Price** N/A

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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The Pacific Southwest Region UTC conducts an integrated, multidisciplinary program of research, education and technology transfer aimed at *improving the mobility of people and goods throughout the region.* Our program is organized around four themes: 1) technology to address transportation problems and improve mobility; 2) improving mobility for vulnerable populations; 3) Improving resilience and protecting the environment; and 4) managing mobility in high growth areas.

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Disclosure

Professor Tridib Banerjee, Principal Investigator, and Adjunct Associate Professor Deepak Bahl, Co-Principal Investigator conducted this research titled, "Innovations in Transit? An In-Depth Case Study of the City of Monrovia/Lyft Public-Private Partnership to Increase Transit Ridership in Suburbia" at the Price School of Public Policy, University of Southern California. The research took place from April 1, 2020 to June 30, 2021 and was funded by a grant from the California Department of Transportation in the amount of $93,179.99. The research was conducted as part of the Pacific Southwest Region University Transportation Center research program.

Acknowledgements

The research project team is extremely grateful for the support and cooperation of the following organizations and individuals in conducting this project. We are highly appreciative of their expertise and insights including access to data and survey dissemination, which has been instrumental in shaping our research findings and conclusions.

California Department of Transportation (Caltrans)

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Abstract

This report presents several analyses that examine the implementation of the GoMonrovia program, a public-private partnership between the City of Monrovia and Lyft. These analyses and the questions that motivate them fall across two dimensions. First, what is the socioeconomic and demographic profile of first/last mile users, and to what extent does the program meet the first/last mile needs of especially those with low incomes and/or transit dependency? And second, to what extent has the GoMonrovia program reduced personal vehicle usage? In response to these questions, we confirm that households without regular access to a personal vehicle are significantly more likely to use GoMonrovia as a first/last mile mechanism. The same holds true for those living beyond one mile of Monrovia's Metro station. At the same time, we fail to generate evidence that those of prime working age or retirement age, as well as those who are relatively low-income, utilize GoMonrovia similarly. Further, we do not observe a significant substitution effect between GoMonrovia and personal vehicle usage. Based on these results, we make several policy recommendations for enhancing the community benefits of GoMonrovia and improving its replicability in other suburban areas of Southern California.

Innovations in Transit?

An in-depth case study of the City of Monrovia/Lyft Public-Private Partnership to Increase Transit Ridership in Suburbia

Executive Summary

In this report, we present an in-depth case study of the GoMonrovia program, a partnership between the City of Monrovia and the transportation network company (TNC) Lyft. The City of Monrovia is a suburban community of the Los Angeles metropolitan area connected to the Metro transit system since March 2016. In March 2018, the City launched the GoMonrovia program, which provides Monrovia residents with subsidized Lyft rides within the City boundaries. We took advantage of this opportunity to examine whether such a program helps support transit use, and therefore reduces automobile dependence within a sprawling suburban context. We focused, in particular, on the potential that such a partnership may address the infamous first/last mile issue, with a focus on whether it serves low-income transit-dependent populations in particular.

Throughout this report, we present several analyses that examine the implementation of the GoMonrovia program. Overall, these analyses are not exhaustive and could only be extended if additional data (*e.g.*, Monrovia Metro station ridership statistics). Nevertheless, they illuminate the program's outcomes across two dimensions. The first dimension is an equity one: what is the socioeconomic and demographic profile of first/last mile users, and to what extent does the program meet the first/last mile needs of especially those with low incomes and/or transit dependency? The second dimension is an environmental and transit system one: to what extent has the GoMonrovia program reduced personal vehicle usage? The answers to these questions can help us understand the program's level of success and its replicability in other suburban communities.

To answer the first question regarding equity – does the GoMonrovia program increase transit capabilities of disadvantaged households – we began conducting analysis at the neighborhood scale. We implemented a cluster analysis that sorted Monrovia neighborhoods (i.e., census block groups) into five distinct groups based on their sociodemographic and housing characteristics. We then studied the extent to which neighborhoods' group assignments explained variations in GoMonrovia use to/from these neighborhoods, both generally and to/from the Gold Line Metro station area. Our results suggest a

significant association for travel to/from the station area, although they do not reveal individual household traits driving GoMonrovia usage as a first/last mile mechanism. After all, our cluster analysis incorporated 15 sociodemographic and housing characteristics.

We then pursued this question at the individual household scale via responses to our survey. Relative to all respondents, those who used GoMonrovia at least weekly to access the Gold Line station were: less likely to have regular access to a personal vehicle; more likely to live beyond one mile from the station; more likely to be in prime working age (25 - 44 years old); and less likely to live in a household earning at least $100,000. From a descriptive perspective then, usage of GoMonrovia as a first/last mile transit mechanism seems attractive to households that are more transit-dependent, lower income, relatively young, and outside convenient walking distance to the Metro station.

The results of regression models run on the same survey responses, however, qualify these descriptive findings. We confirm that transit-dependent households (i.e., those without regular personal vehicle access) and those living beyond one mile of the Metro station are significantly more likely to use GoMonrovia as a first/last mile mechanism. But we fail to generate evidence that those of prime working age or of retirement age are more likely to use the program similarly; and in fact, we uncover consistent evidence that they are less likely to do so. Meanwhile, we also fail to generate evidence that lower-income households are more likely to use the program as a first/last mile mechanism. Therefore, our results suggest that GoMonrovia has served as a first/last mile mechanism not for households with economic challenges or mobility issues (i.e., the senior population) but instead for those lacking a personal vehicle and/or living far from the Metro station.

To answer that second question regarding environmental and transit benefits – does GoMonrovia encourage households to substitute Lyft rides for personal vehicle usage – we fail to find meaningful evidence based on households' survey responses. More specifically, our regression modeling does not reveal a significant substitution effect for those who used GoMonrovia at least weekly. That said, the effect's estimated coefficient is negative in direction and has a level of significance near the 10% confidence level. Therefore, it is possible that a larger sample of survey responses would indicate a significant substitution effect.

Before considering the larger conclusions regarding the ongoing feasibility and replicability of the program, we note two substantial limitations to our findings. First, survey responses were collected during the COVID-19 pandemic, and so we asked households about their current characteristics (e.g., employment status) as well as their current and pre-pandemic usage of the GoMonrovia program. As a result, we predicted households' pre-pandemic travel behaviors using their current characteristics, yet some of those characteristics may have changed between pre-pandemic and the present day. Second, our regression model specifications are relatively parsimonious in nature, and that is due to the low number of survey responses we were able to collect, i.e., we had a sample size of approximately 200 for these models.

Collecting a larger number of survey responses after the pandemic subsides, preferably via probability sampling, would accomplish three things. First, we would be able to explore variations in travel behavior uninfluenced by COVID-19 concerns using respondents' contemporaneous characteristics, addressing the first limitation above. Second, we would be able to specify less parsimonious regression models, which would allow us to explore relationships between respondents' travel behaviors and their characteristics on more granular scales. For example, instead of employing a single indicator of household income (i.e., households earning at least $100,000), we could employ multiple indicators (e.g., households earning $25,000 - $49,999; households earning $50,000 - $99,999, etc.). Further, the near-significant substitution effect we estimate between GoMonrovia and personal vehicle usage may, in fact, be deemed significant once a sufficient sample size becomes available for analysis. And finally, the use of probability sampling rather than convenience sampling would mitigate issues of bias in our descriptive and regression analyses.

Introduction

Over the last 3-4 years, a number of studies have explored whether transportation network companies (TNCs), such as Uber and Lyft, could be the "missing link" in conventional models of public transportation, by providing door-to-door on-demand mobility services for the first/last mile of a transit station. This issue is of particular significance in suburban contexts, where a) there has been a renewed emphasis on transit investments over the last two decades, and b) automobile dependence remains high and bus service rather poor. Indeed, the vast majority of households living in American suburbs are car dependent. Very few of them live within walking distance from a rail transit station, making the first/last mile issue critical for increasing transit ridership—thus, reducing vehicle-miles traveled (VMT)—and equitable access to opportunities (Boarnet et al., 2017).

However, there is little evidence to date about whether partnering with a TNC can help enhance transit access in the suburban context. In this study, we focus in particular on the equity issue associated with the first/last mile challenge in suburbia. Indeed, little is known about the extent to which TNCs hold potential to promote transit use for most transit-dependent populations. This study aims to contribute to existing research focused on ways TNCs meet a need for equitable and sustainable transportation in the ubiquitous urban sprawl around the country.

This research is an in-depth case study of a public-private partnership (PPP) between Lyft and the City of Monrovia. Lyft, based in San Francisco, is an on-demand transportation company providing ride-hailing services in different cities. The City of Monrovia is a suburban community located 20 miles northeast of downtown Los Angeles, in the foothills of the San Gabriel mountains. According to the 2017 American Community Survey (ACS), Monrovia has a population of 38,787, with a median age of 39, 41% Hispanic, 35% non-Hispanic White, 14% Asian, and 5% non-Hispanic Black population. This relatively diverse population spends 31 minutes on average commuting to work. More than 85% of the population commutes by car, and only 3% use public transit, as illustrated by the 2017 modal split shown below:

- 77% of residents drove alone to work
- 9% carpooled
- 3% used public transit
- 11% bicycled or walked
- 61% of households owned two or more vehicles

In March 2016, the City of Monrovia was connected to the LA Metro rail system when the Metro Station opened in Downtown Monrovia, as part of the rail transit network expansion in the Los Angeles metropolitan area. Over the last two decades, the network has expanded to include six different lines, twenty cities, and ninety stations comprising some 100 miles of rail network. We are beginning to see a variety of local responses to augment transit ridership, as documented in a recent Metrans study (Banerjee et al., 2018). Here, we focus on one such local initiative: the GoMonrovia program, a PPP between Lyft and the City of Monrovia.

Launched in March 2018, GoMonrovia was designed to provide an innovative way to bridge first mile/last mile connections between transit stops and origin/destinations as well as to provide residents a more convenient, faster, and personalized public transportation. Lyft serves as Monrovia's primary public transit provider for all non-ADA related services. Before March 2020 and the offset of the COVID-19 pandemic, the PPP was so successful that it produced a significant deficit in the transportation budget of the City, resulting in two successive price increases for non-transit-related rides since the beginning of the PPP. The program continued in a much-reduced capacity during the pandemic.

This study's focus is on the subgroup of Monrovia residents who request Lyft rides to/from the Monrovia light rail station, supposedly as a way to cover the "first/last mile" of transit ridership. The study addresses the following research questions in particular: 1) What is the socioeconomic and demographic profile of the first/last mile users? 2) To what extent does the program meet the first/last mile mobility needs of Monrovia residents, especially those of low-income and/or transit dependent residents? 3) Can the PPP be considered a new model of "transit suburb," where subsidized TNC rides support transit ridership and reduce automobile dependence? 4) From an institutional and sustainability perspective, what are the lessons learned, and how might this model be replicated in other suburban communities?

The data includes existing trip data from Lyft, provided by the City of Monrovia. Additionally, the research team has worked with the City and Lyft to develop a survey of GoMonrovia riders and the general population to collect individual demographic and ridership data for both users and non-users. Respondents were recruited through the Lyft online "app" as well as through the City's social media channels and Newsletter. The survey yielded 203 responses. Subsequent analysis of this data is reported in Chapter Five.

For the remainder of this report, we analyze the context for and outcomes of the GoMonrovia program. Chapter 1 reviews the relevant literature on TNCs, with a focus on their potential to serve as "first/last mile" mechanisms and to reduce personal vehicle usage. Chapter 2 first reviews current literature on PPPs between municipalities and TNCs generally; it then presents the GoMonrovia program specifically and outlines the local context for its implementation. Chapter 3 outlines our motivating research questions, along with the data and methodologies we employed.

Chapter 4 traces GoMonrovia ridership over time, paying particular attention to the effects of service area changes, price changes, and the COVID-19 pandemic. It also assesses trends in GoMonrovia travel to/from the Monrovia Gold Line Metro station at the neighborhood level. Chapter 5 examines household-level survey data to understand which communities use GoMonrovia as a first/last mile mechanism and to identify whether users are significantly substituting GoMonrovia rides for personal vehicle trips. Chapter 6, the final chapter, presents overall findings, general conclusions, and corresponding policy recommendations.

Chapter 1 – Transportation Network Companies and Transit: What Do We Know To-date?

This literature review broadly considers existing scholarship on ride-hailing transportation network companies (TNCs) as a potentially equitable first/last mile travel mechanism, in alignment with aspirations to reduce overall VMT as required by California's Senate Bill 375. The review focuses on TNC impacts and implications for users and cities, along with demographic characteristics and equity considerations in TNC communities. Almost exclusively, attention is paid to ride-hailing services (mainly, Uber and Lyft) in American communities. Other shared and on-demand mobility options such as car- and bike-sharing systems and e-scooters are omitted. Furthermore, this review focuses on the demand side of ride-hailing (users' perspectives); it does not consider writings on the supply side (TNCs' and its labor issues).

The First/Last mile issue and the Potential Role of TNCs

Introduction to the "First/Last Mile" issue

Meeting first/last mile passenger transportation needs efficiently has been a growing concern for transit agencies, especially since the expansion of rail transit networks in the sprawling cities of the American Southwest. In its 2015 report on first/last mile transportation solutions, the Utah Transit Authority (UTA) defined the first/last mile gap as "a barrier that discourages potential riders from using transit because a station cannot be easily accessed from home, work, or other destinations" (p. 1-1).

Private and public transportation options exist to serve as the first or last mile connection to one's travel involving use of transit. Research is currently examining various other options currently available, ranging from bike sharing programs, e-scooters, e-bicycles, automobile sharing programs, autonomous vehicles etc. Kaufman et al. (2015) showcase the latent demand for first/last mile mobility when such options as Citi Bike, New York City's bike sharing program, are available as an effective first/last mile solution. They note that the busiest bike stations are typically "adjacent to major transit hubs," including commuter rail lines and subways. During rush hour, they observe that Citi Bike users "are often connecting from commuter rail or bus stations in the morning, and returning after work" (Kaufman et al., 2015). But not all cities have the density of New York, and bicycles do not work for all people and all climates. UTA suggests that the "best practice is to pursue multiple strategies" (p. 1-1).

TNCs: A Potential Solution?

Existing research has highlighted the potential for ride-hailing services, as operated by TNCs like Lyft and Uber, to promote public transportation as a viable alternative to personal vehicles (Schaller, 2019). In theory, ride-hailing services are especially promising as a first/last mile solution in the suburban areas of historically car-oriented cities. For example, the Regional Transportation District (RTD) in Denver identifies suburban stations as needing the most attention for first/last mile strategies (UTA, p. 3-21).

Appearing in 2009, Uber was the first app-based ride-hailing service. Lyft appeared three years later, in 2012. Today, the two companies are the largest of their kind in the United States. Made possible due to "widespread adoption of smartphones embedded with GPS, combined with the availability of digital road maps through APIs" (Clewlow et al., 2017, p. 4), the services became defined by their convenience of use and other advantages, especially when compared to traditional taxis. Through one's smartphone, a user can request a ride, gather information about the driver and vehicle, see the route, and pay through the app. With their increasing popularity, the California Public utilities Commission designated app-based ride-hailing services as transportation network companies in 2013 (Clewlow et al., 2017). The development of autonomous vehicles is a large component of the business model of Lyft and Uber, building on the "big data" generated by their on-demand mobility services (Casilli, 2019).

Autonomous Vehicles: The Future of First/Last Mile Mobility?

Autonomous and automated vehicles (AVs) and the role they can play in transit and in first/last mile connectivity is of growing interest.[1] For example, Gurumurthy et al. (2020) studied shared autonomous vehicles (SAVs) as a potential solution for first-mile/last-mile connections to public transportation in Austin, Texas. Their simulation compares three policy approaches to SAV integration: door-to-door, which delivers riders to their final destination with no connection to public transit; first-mile/last-mile, which connects riders to public transportation; and a combination of both door-to-door and first-mile/last mile,

[1] Note that both Uber and Lyft recently sold their autonomous technologies. Nevertheless, they did so for financial constraints (perhaps induced by COVID-19) and they haven't pulled out of investment all together. Uber is still investing $400 million in the startup that bought their autonomous driving division—a company named Aurora, which was founded by former Google, Tesla, and Uber executives. Lyft sold its division to Toyota subsidiary Woven Planet which was just founded this year. It is trying to be startup-like and brands itself as "blending the best of Silicon Valley innovation with the quality-driven values of a trusted Japanese company." It conducts research on "mobility solutions." GM subsidiary Cruise acquired Voyage (an autonomous vehicle startup) earlier this year as well. Waymo, which is a subsidiary of Google, is still investing in R&D for autonomous vehicles. While this does show that R&D for autonomous vehicles is a costly pursuit, the fact that major auto manufacturers like GM and Toyota are buying these units may suggest that autonomous vehicles are expected to proliferate in the future.

which "intends to capture the combined effect and to measure if SAVs are supplementing or complementing transit" (p. 642). Their simulations, which are based on 5% of Austin's population and transit data provided by Austin's transit agency, suggest that if relatively cheap SAVs are widely available for door-to-door trips, "transit service demand may reduce significantly" (p. 645). This serves as a warning for transit agencies and policy makers to prepare policies so that public transportation remains attractive. The simulations also find net benefits to transit coverage when SAVs are used for first-mile/last-mile transportation exclusively and when combined with high door-to-door SAV fares.

SAVs could reveal a first/last mile solution especially relevant for less dense areas. In Austin, Texas, Huang et al. (2021) simulate SAVs as first-mile/last-mile connections to light-rail transit stations. Their simulation serves "10% of central Austin's trip-makers near five light-rail transit stations" (p. 135). The trips begin or end within two "geofenced areas (called automated mobility districts [AMDs])" (p. 135). Huang et al. provide early research on extending the AMD concept to larger networks (p. 146). They measure on-board time, wait time, walking time, and travel distance for SAV users versus transit-only users; they also compare mobility mode share and vehicle miles traveled at different SAV fleet sizes and different time intervals between trains. Notably, they find that with SAV use, VMT increases and average vehicle occupancy decreases, primarily due to SAV's empty-vehicle travel. They also estimate that "3.71% of current person-trip-making would shift from private-car modes to the SAV-and-ride mode, leading to more than 10 times increase in the use of transit [i.e., a projected increase from 0.35% of respondents using transit to 4.06% of respondents using transit] with stable walk-and-ride mode share" (p. 146). They observe that travel is one directional at rush hours, resulting in SAVs running empty to reach the user, thus they call for the development of deadhead minimization routines (*i.e.*, configuring routes so that minimal SAVs are returned with zero energy) (p. 147). Importantly, they also find that "SAVs were utilized more when train service was more frequent. Lower train headways also lowered SAV on-board time, wait time, and average trip length" (p. 147).

Scholars have called for a proactive approach to the advent of SAVs, with much emphasis on the need for policy regulation. Schaller (2019) warns that traffic congestion is sure to increase in big cities with the introduction of automated vehicles, unless policy makers take a proactive approach. Further, he notes that there is greater potential for inequities in an automated future "for those left behind in this transportation transformation – those without smartphones, disabled persons, and TNC drivers whose profession will slowly disappear" (p. 34).

AVs may be the future of TNC vehicle mobility services, but their adoption may present a disparate impact on lower-income groups. In the Netherlands, Yap et al. (2016) surveyed the attitudes of multimodal train trip riders regarding potential automated vehicles use to cover the last mile of their journey. The results from 761 respondents suggest that first-class train carriage passengers prefer automated vehicles over bicycles and other public transportation options (p. 14). Second-class passengers, however, prefer cycling and bus/tram/metro travel over automated vehicles as last mile transportation. These are very early findings about a technology with which respondents were not familiar, as it was not available yet. Nevertheless, they raise the question of which communities benefit most from new travel modes.

TNCs and Equity Issues

Recent research has shown that TNCs are associated with equity issues that affect all users, including drivers and riders. This section, like the rest of this review, focuses on the demand side (users) only. Who are the users of TNCs today, in their pre-AV and SAV versions? How equitable are TNCs as a transportation service? What has been their impact on existing transportation systems? These are some of the questions that existing literature has already addressed and that our study further answers.

Users' Profile, Use Frequency, and Location

The significant predictors of the adoption of ride-hailing service include age, income, education, land use mix and activity density (population or job density), car ownership, and familiarity with information and communication technologies (ICT), according to Circella et al. (2018). Drawing on an online survey with more than 2,000 respondents conducted in fall 2015 in California, they found that the largest class of users (53%) is composed of independent millennials (who do not live with their parents) living in highly transit-accessible and walkable neighborhoods and who tend to be multi-modal travelers. The smallest class of users (10%) are affluent suburbanites with an environmental-friendly attitude that use ride-hailing services to access public transit stations instead of driving private cars.

In particular, income and urban location of residence are significant predictors of TNC use, as shown by multivariate regression analyses of the 2017 National Household Travel Survey (Circella et al., 2018; Grahn et al., 2020a) and other related studies (Barajas & Brown, 2021; Circella & Alemi, 2018; Clewlow et al., 2017; Hampshire et al., 2017).

Regarding trip frequency, Grahn et al. (2020b) argue that most users do not use ride-hailing services as a regular commuter mode. Data from a representative sample population (N=4,094) surveyed online in seven major metropolitan areas in the United States (Boston, Chicago, Los Angeles, New York, San Francisco/Bay Area, Seattle, and Washington D.C.) indicate that the majority of TNC users used the services from 1 to 3 times a month (41%) and 34% used them less than once a month, while 41% of respondents reported utilizing the services on a weekly to daily basis.

Most studies report an unequal spatial distribution of ride-hailing trips between urban and suburban areas, with the majority of ride-hailing trips happening within cities (Circella & Alemi, 2018; Clewlow et al., 2017; Grahn et al., 2020b). Furthermore, TNC trip patterns differ depending on time and location. The volume of ride-hail trips typically peaks on weekend nights, which may be associated with the decline in alcohol-related traffic accidents (Barajas & Brown, 2021; Barrios et al., 2018). Drawing from survey research (N=3,835) and trip data in Chicago, Los Angeles, Nashville, Seattle, and Washington, D.C., Feigon et al. (2018) find that on weekdays, three-quarters of all trips occur during non-peak hours, and most of them take place in an urban core.

Focus on Low-Income Users

In terms of user cost, ride-hailing services are typically pricier than other travel modes (walking, biking, using public transit, or even owning a personal vehicle). The inception of ride-pooling by TNCs, with UberPool and LyftLine, represents a response to that dynamic. These "shared" rides offer a more affordable option than the original taxi-like ride-hailing service. In particular, this service tier allows TNCs to group riders of separate parties with similar origins and destinations and therefore spread trip cost across a greater number of users. Riders usually need to walk to a nearby designated area to board. This low-cost option may provide low-income residents access to TNC services that would otherwise be unaffordable for them. Indeed, Lazarus et al. (2021) found that heavy ride-pool users (defined as those utilizing a ride-pooling service more than three times a week) in metropolitan areas in California (N=2,434) are disproportionately low-income (annual household income less than $35,000) and less likely to own a personal vehicle. This finding corroborates another study in the Los Angeles area, which found that low-income neighborhoods are more likely to use ride-pooling services than other communities (Brown, 2018).

In addition to the direct cost of transportation, TNCs incur the indirect cost of having a smartphone with internet access, which may be another limiting factor for low-income individuals. For those without smartphones and those uncomfortable using them, Deakin et al. (2020) write about smartphone subsidies, training classes, and concierge services. To address banking concerns, they discuss "pre-paid debit cards, free money management cards, centralized billing system, training classes on use of credit or debit cards" (p. 31), and specifically for those who prefer cash, "money management cards that allow cash deposits that are then charged for each trip" (p. 31). Extra financial assistance could be provided to low-income users and those with frequent travel needs (p. 32).

TNCs may also confer greater employment access to low-income neighborhoods. Boarnet et al. (2017) studied tract-to-tract travel times for very low-income census tracts and spatial distribution of low-wage job accessibility. The results show that very low-income tracts have the shortest transit travel times in comparison to the other tracts and that low wage workers' accessibility to employment is dependent on transportation network structures, the travel modes, and the spatial distribution of jobs and residences. The very low-income census tracts are near low wage jobs, indicating that residents are relatively more able to reach their workplace by transit. Additionally, when the last-mile to transit is replaced by bike or car, (or carshare/bikeshare), the gap between the number of jobs accessible within a 30-minute trip is narrowed by 58% (p. 307). Boarnet et al. finds that using a car for the first-last mile to transit increases access to jobs by 30% when compared to residents that walk to transit, and recommends policies that introduce or increase ridesharing, such as with TNCs, and bike sharing for first/last mile access in low-income neighborhoods to increase job accessibility.

Focus on Senior and Disabled Passengers

Agrawal et al. (2020) conducted a study on Californians over the age of 55 to learn how older adults use ride hailing services. They found that 46% used ride-hailing at least once and 30% "had booked a ride themselves" (p. 2). They also found that of those age 75 and older, 37% had a ride-hailing app; of the youngest respondents (55 to 64 years old) 51% had a ride-hailing app. Demographically, they note that among older adults "most likely to ride-hail are college-educated, ride transit, live in households with incomes over $100,000 a year, and live in urban settings" (p. 4). While they report 52% of urban older adults use ride-hailing compared to just 26% of rural adults (pp. 45-46), they emphasize that even in rural communities, use of such scale suggests it "deserves consideration" (p. 47). Additionally, they find that riding transit within the past month is correlated with having used ride-hailing across all metrics, though they find no meaningful correlation between driving oneself within the past month and ride-hailing use (p. 46). Their comprehensive study includes many metrics and provides detailed findings, but ultimately shows that older Americans of all identities, though at a lower rate than younger Americans, use TNCs. Additionally, and importantly, their survey identifies opportunities for ride-hailing apps to better meet the needs. These include the incorporation of a company helpline to call (70% of respondents), booking over the phone (63% of respondents), accessible vehicles (60%), and alternative payment options (61%) (p. 48). Their survey faces some limitations, as they conducted it online, which excludes 14% of Californians and presumably those least likely to use TNCs (p. 49).

Deakin et al. (2020) reviewed US examples of subsidized taxi programs, considered case studies of potential solutions, and interviewed "program sponsors, service providers, and users" of TNCs as subsidized mobility. They elaborate several challenges for the elderly and disabled, including physical assistance, smartphones, users without a bank/credit card or prefer cash, the expense, frequent travel needs, and trip distances/boundaries (p. 31). Other equity concerns include visually impaired individuals and those who do not speak English (p. 25). They identified some potential solutions such as wheelchair accessible vehicles with door to door assistance and driver training to accommodate those with mobility issues (p. 31).

When reviewing case studies of TNC partnerships, Sather (2018) identifies meeting Title VI and ADA requirements as challenges for TNC partnerships with public transportation. Echoing both Agrawal and Deakin, she identifies that paying with cash and reserving a ride over the phone must be available to be in accordance with Title VI (p. 28). The ADA stipulates that "public transit agencies must provide wheelchair accessible rides with comparable response times to TNCs, unless this service is guaranteed by TNCs themselves" (p. 28). If partnered with TNCs, transit agencies have two options to offer comparable paratransit services, writes Sather. Both involve using a third party, with one option providing a dedicated wheelchair accessible vehicle to the service area, with an employee staffed full-time during operating hours. The other option is to reimburse a third-party transportation provider each time a user needs a wheelchair accessible vehicle (p. 28).

Focus on Racial Disparities

There has been very little work on the racial disparities among TNC users. One exception is Ge et al. (2016) who conducted an experimental study in Boston and Seattle and found that African American users in Seattle faced a longer wait with UberX or Lyft to get a trip request, and a longer wait time for an UberX vehicle to arrive than white passengers. With Lyft the arrival wait times were the same. Hughes and Mackenzie also studied Seattle yet reached a different conclusion. They report that when controlling for density and income, "there is essentially zero relationship between the waiting time for an UberX and the percentage of minorities in a census block group" (p. 42).

In Boston, Ge et al. (2016) focused on cancellations and found that "UberX drivers are nearly three times as likely to cancel a ride on a male passenger upon seeing that he has a 'black-sounding' name" (p. 19). In the extreme cases, which are in low population density areas, drivers are more than four times as likely to cancel on an African American male passenger than on a white male passenger. They conclude "using the most direct measure (observed cancellations in Boston) there appears to be evidence that African American passengers receive worse service, compared to white riders, in TNC or ride-hailing based services such as Uber and Lyft. This discrimination is not the result of any policy by ride hailing providers, but rather the behavior of individual TNC drivers." (p.19).

TNC: An Equitable Solution?

In sum, there is little and mixed evidence that TNCs can provide an equitable mobility solution, especially to address the first/last mile issue. Only a few recent articles have focused whether TNCs can mitigate socioeconomic inequities in terms of transit access to opportunities.

Reck and Axhausen (2020) find that there are socioeconomic inequities in using TNCs as a first/last mile solution. When wait and transfer times are considered, the "surcharges often still exceed [value of travel time savings (VTTS)] despite subsidies" (p. 72) so that mostly higher earners, who have the means to place a higher value on their time, are the ones benefiting from TNCs as first-mile/last-mile trips. They attribute the low ridership of many of these programs to this inequity. They find that the most equitable subsidy, defined as one that has surcharges below VTTS for most public transit users, is "full fare integration offering first/last mile rides for free *if previously or subsequently public transportation is used*" (p. 73). Additionally, they encourage incorporating the smart card system used by many cities' public transportation systems into first-mile/last-mile TNC operations to discourage users from abusing subsidy by taking rides without previously or subsequently using public transportation (p. 73).

To further exacerbate the socioeconomic inequities, Ge et. al (2016) find that in Boston, UberX drivers are more likely to cancel on passengers attempting to hail a ride near a subway station, "perhaps because a passenger at a subway stop is either a low-income passenger, or a subway stop indicates a multi-modal journey with a lower expected revenue" (p. 19). Similarly, based on the multivariate analysis on Chicago Transportation Network Providers trip database, census tract-level demographic data from the 2014-2015 5-year American Community Survey (ACS), Barajas & Brown, (2021) found that the number of ride-hailing pickups and drop-offs was most strongly associated with median household income rather than public transit accessibility.

Schwieterman and Livingston (2018) suggest offering discounts "to and from select outlying rail stations at times when bus service is weak" (p. 20). They note that this will aid disadvantaged neighborhoods in attracting development by "restoring some of the mobility lost to gradual cuts to CTA bus service" (p. 22). Budgets are tight for transit agencies and Schwieterman and Livingston have little hope that new transportation infrastructure will increase mobility in the near future; they see TNC discounts as a solution for depressed communities.

DeGood and Schwartz (2016) explore the potential of TNCs to provide equitable access to opportunity, acknowledging that "access to affordable transportation . . . is an essential part of moving out of poverty" (p. 2). They provide a methodology "to subsidize ridesharing services for low-income individuals and families" (p. 4) who are outside of a reasonable walking distance from transit stops by conducting a theoretical test case for Metropolitan Atlanta Rapid Transit Authority (MARTA). They break down their methodology into the following steps: 1) define the boundaries; 2) determine eligibility; and 3) setting subsidies. They emphasize that implementation of these steps depends on local factors; for Atlanta they initially consider including households that are greater than a half mile radius away from a rail station or a quarter mile radius away from a bus line connecting to a rail system yet no farther than three-and-a-half miles away from a rail station (p. 5). DeGood and Schwartz discuss various options for eligibility for the program, but all prioritize the neediest members of the community. They also present considerations for setting a subsidy amount, but do not have a strong conclusion as this depends on unique, local factors. Ultimately, they urge pilot programs to test this service but acknowledge that due to fixed budgets there will likely be trade-offs with other services.

Complement or Substitution to Other Modes?

In addition to the equity question, whether TNCs can help promote transit and reduce automobile dependence is another core (and related) issue that our study addresses. This section reviews the literature that has looked into the trade-offs between TNCs and other travel modes, from a travel behavior perspective.

TNCs and Transit

The potential substitution/complement effect of the emergence of TNCs imposes on public transit has been a controversial topic. On one hand, the characteristics of ride-hailing service, including affordability and on-demand service, could help riders solve the first-/last-mile problem by improving their access to public transit. On the other hand, the ride-hailing service could also compete with the public transportation system with its advantages of convenient on-demand service. The relationship between TNCs and public transit ridership has been explored in previous studies. Most of the studies focus on metropolitan areas in the United States. Generally, there could be four types of relationships that exist: complementary, substitutional, no interaction, and mixed.

Based on a convenience sample of 4,500 respondents in major metropolitan areas across the United States, two national scientific academies found that ride-hailing services could complement public transit in in situations where public transportation is less accessible (Transportation Research Board & National Academies of Sciences, Engineering, and Medicine, 2016). Similarly, drawing from the National Transit Dataset (NTD) and Uber penetration index across all Metropolitan Statistical Areas (MSAs) in the US that Uber had entered, Hall et al. (2018) conducted a regression analysis and found that a one standard deviation increase in Uber's market penetration index for a given area could lead to a 1.38% increase in bus ridership. That figure could increase to 5% after five years, with a larger effect in larger cities as well as in municipalities with smaller bus agencies. Conversely, the authors concluded that an expansion in TNC services was more synergistic with large rail transit systems.

There is more evidence of a substitutional relationship between TNCs and transit, based on results from survey analyses conducted in various US metropolitan areas. Research conducted by Schaller (2018) indicates that TNC is a competitor against public transit. The author used data from the cities of Boston, Chicago, Denver, Los Angeles, New York, San Francisco, Seattle, and Washington DC, and a statewide survey in California that collected 264,000 TNC users' responses. Clewlow et al.'s (2017) study discovered that ride-hailing services lead to a 6% drop in bus ridership and a 3% reduction in light rail services through survey research in the cities of Boston, Chicago, Los Angeles, New York, San Francisco Bay Area, Seattle, and Washington, D.C. (N=4,094). Compared to this effect magnitude, Graehler et al. (2019) expected a 1.7% and 1.3% decrease in bus and rail ridership respectively in a regression analysis that covers 22 large transit agencies in the US. Babar & Burtch, (2020), on the other hand, argued in a study that a one-mile increase in average trip distance is associated with a 0.5% reduction in bus ridership when Uber entered the market, while the correlation coefficient is not statistically significant for rail transit ridership in areas where Uber entered from 2012 through 2018. A survey conducted by Hampshire et al. (2017) in Austin, TX showed that three percent of respondents would turn to public transit after TNCs exited the market (N=1,840, non-probability sampling). The result of an intercept survey conducted in San Francisco, CA demonstrated a stronger substitutional effect that 33% of TNC riders would switch to transit (bus or rail) if they were not using ride-hailing services (N=380). Finally, one article discussed found no relationship between public transit ridership and TNCs, based on data from the top 50 U.S. agencies (Malalgoda & Lim, 2019).

TNCs and Cars

The relationship between ride-hailing services and car ownership remains uncertain. Circella et al. (2018), Clewlow et al. (2017), and Diao et al. (2021) argued that TNCs and car ownership have a negative relationship, while other studies revealed that there is no significant relationship between the two (Graehler et al., 2019; Shokoohyar et al., 2020).

Past research has suggested that TNCs generate additional vehicle-miles traveled (VMT) and greenhouse gas emissions and are therefore detrimental for the environment and road congestion. Clewlow and Mishra (2017) find that "half of ride hailing trips are ones that would have been made by walking, biking, transit, or avoided altogether" (p. 29). This means that ride hailing is likely causing increases rather than decreases in VMTs in major cities. Indeed, Henao (2017) conducted a survey of Lyft and Uber passengers in the Denver, Colorado area with 311 respondents; he found that "ridesourcing vehicle miles traveled is approximately 184.6% of what it would have been without Lyft/Uber" (p. 66).

In San Francisco, Erhardt et al. (2019) find that although TNCs claim to alleviate congestion, they are the "biggest contributor to growing traffic congestion" (p. 1). They write that although some vehicle trips are being replaced by TNCs, overall "most TNC trips are adding new cars to the road" (p. 10). They conclude that TNCs exceed the combined effects of "population growth, employment growth, and network changes" (p. 10) in reducing travel time reliability and increasing congestion.

TNCs and Walking and Biking

Some literature points out that TNC services may be a substitute to walking and biking (Baker, 2020; Circella et al., 2018; Circella & Alemi, 2018; Clewlow et al., 2017; Graehler et al., 2019; Qian et al., 2020; Schwieterman, 2019). Circella & Alemi (2018) found the substitution effect is larger on frequent users (use ride-hailing service on a weekly basis) of TNC services and millennials.

TNCs in Low-Density Suburbia

TNCs appear as an emerging first/last mile policy solution to promote transit use in the suburban context, typically associated with automobile dependence and low bus and transit connectivity. Indeed, in recent years, there has been an increasing number of PPPs between transit agencies and suburban communities such as the partnership between Lyft and the City of Monrovia featured as a case study in this report (see Case Studies in Chapter 2). However, to the best of our knowledge, there have been only two previous studies focusing on the suburban context.

For a research report, Curtis et al. (2019) garnered 38 responses from 37 transit agencies (one agency offers two different partnerships) to a detailed survey they implemented. They record that 75% of agencies express that a goal of their partnership is to provide first mile/last mile connections and that 25% of partnerships were motivated by the goal to provide mobility in suburban areas; agencies can list more than one goal so there may be overlap in those numbers. 69% of the agencies described at least part of the service area as suburban and 51% identify their target customer as "people in areas difficult to cover by fixed-route services" (p. 122). Partnerships with TNCs, he finds, help cities with an official mandate to provide transportation overcome low farebox recovery ratios using fixed routes by providing more affordable, point to point service. Interviews, conducted with 20 of the survey respondents, provide additional insight into success, opportunities, and lessons from these partnerships, on we draw when formulating our recommendations (Chapter 6).

Sather (2018) evaluates TNC partnership opportunities to replace underperforming fixed-route bus service in Western Riverside County, California. She outlines a methodology to calculate cost changes after switching the underperforming routes to TNCs and applies it to 5 zones in the county. To estimate ridership of the TNC pilot programs, she assumed that 80 percent of current bus riders will adopt the TNC pilot, 100 percent of current Dial-a-Ride trips within the TNC service zone will be fulfilled by the TNC pilot, and new riders would be attracted due to the lower cost from the subsidized rides. After testing in the 5 zones, her methodology shows that TNC partnerships "present a cost-effective alternative to fixed-route transit in situations where subsidies per boarding are extremely high" (p. 61). However, her findings are based on simulations rather than real-world tests, so the estimates are uncertain; furthermore, they may not be universally applicable outside of Western Riverside County.

Chapter 2 – The Monrovia/Lyft Partnership and Other PPPs with TNCs

This chapter first presents the GoMonrovia Program featured as a case study in this report. Most information about the Program was provided by the City (City of Monrovia, CA, 2019). Second, a review of other such PPPs is presented, with a focus on their impact on transit use.

The GoMonrovia Program: A PPP Between the City of Monrovia and Lyft

The City of Monrovia: A Suburban Community

Monrovia, California, incorporated in 1887, is a suburb of Los Angeles and the fourth oldest city in Los Angeles County. According to 2021 estimates, Monrovia's population is 38,479 (California Department of Finance) and the median annual household income is $71,373 (Southern California Association of Governments [SCAG]). Its 13.74 square miles of land area is largely comprised of single-family homes (both attached and detached), which make up 66.3% of the entire housing stock (California Department of Finance). The median existing home sale-price is $685,000 (SCAG). Many households are car dependent, with 77.1% of the population driving alone to work and only 6% of households owning no car (SCAG). The Metro Gold (L) Line connected the city to the greater Los Angeles area in 2016.

PPP Rationale and History

With the expectation of population growth and a shortage of parking/traffic congestion in the near future, the City of Monrovia launched a public-private partnership program, GoMonrovia. The municipality partnered with two TNCs, Lyft (an on-demand ride-hailing company) and Lime (a bike-sharing company), offering subsidized rides within designated geographic areas. This research is limited to the experiences and impacts of the Lyft partnership. In particular, it focuses on whether the Lyft component of GoMonrovia meets the need to provide first/last mile connectivity with the Gold Line station.

Before partnering with Lyft, the City of Monrovia developed its own ride service, DIAL-A-RIDE, which covers the entire city and its surrounding areas. The service is provided by a city-owned fleet of nine vehicles, each equipped with an ADA-approved wheelchair lift. The price for DIAL-A-RIDE is relatively low: $1.00, $0.75 for senior citizens and passengers with disabilities, and free for children under 2. Reservation is required before using the service and hours of service are limited and closed on major holidays. Additionally, DIAL-A-RIDE provided a shuttle service between Old Town and Station Square (two hot spots in the city) on Friday & Saturday evenings. DIAL-A-RIDE served about 107 riders per day with an average cost of USD 19.70 for each passenger. The old program is now restricted to disabled users, with others encouraged to use GoMonrovia, a partnership with the TNC Lyft.

To reiterate, the GoMonrovia program is primarily intended to augment the public transit infrastructure of Monrovia. Riders use either the Lyft smartphone application or call a dedicated hotline ("concierge service") to reserve a trip. Until the COVID-19 pandemic, three tiers of service were available for reservation: (1) "Classic" rides, where the trip is not shared by any other travelers; (2) "Shared" rides, where multiple travelers share the same vehicle, although they may have disparate trip origins or destinations; and (3) "Shared Metro / Downtown" rides, where multiple travelers share the same vehicle and all travelers are either picked up or dropped off by Monrovia's Gold Line Metro station or its core downtown area, known as Old Town.

The GoMonrovia program, which charged $0.50 for a shared ride and $3.00 for a classic ride (exclusive to other riders in one trip), allowed the City to save nearly 70% on costs per passenger compared to DIAL-A-RIDE; per the City's calculations, from an average subsidy of approximately $19.70 per DIAL-A-RIDE trip down to approximately $5.80 per Lyft trip.[2] The on-demand ride-hailing service provided by Lyft is also more flexible and convenient. Riders can join the program by applying promo code and get subsidies for qualified trips. This program can also address late-night and holiday service interruptions. The GoMonrovia program has been popular among residents and visitors in the City. From March 2018 when the program was first launched to February 2019, about 1,450 rides were completed everyday through the program. Furthermore, the program also might have bridged the first/last mile gap, since about 20,000 rides started or ended at Old Town/Gold Line per month, which comprises 30% of all rides. 97% of all trips were under four miles, and 59% of all rides were under two miles. With usage of GoMonrovia dispersed evenly across the day (AM peak, midday peak, PM peak), the program might primarily be used for commutes and after work errands.

At its inception, GoMonrovia included trips that either began or ended in LA County. Since 2020, though, the program's service area falls essentially within Monrovia city limits. Regarding the community context of Monrovia, most community destinations are located north of Foothill Highway (Route 210) and south of the foothills themselves. Additionally, many of these destinations are not within walking distance of the Metro station.

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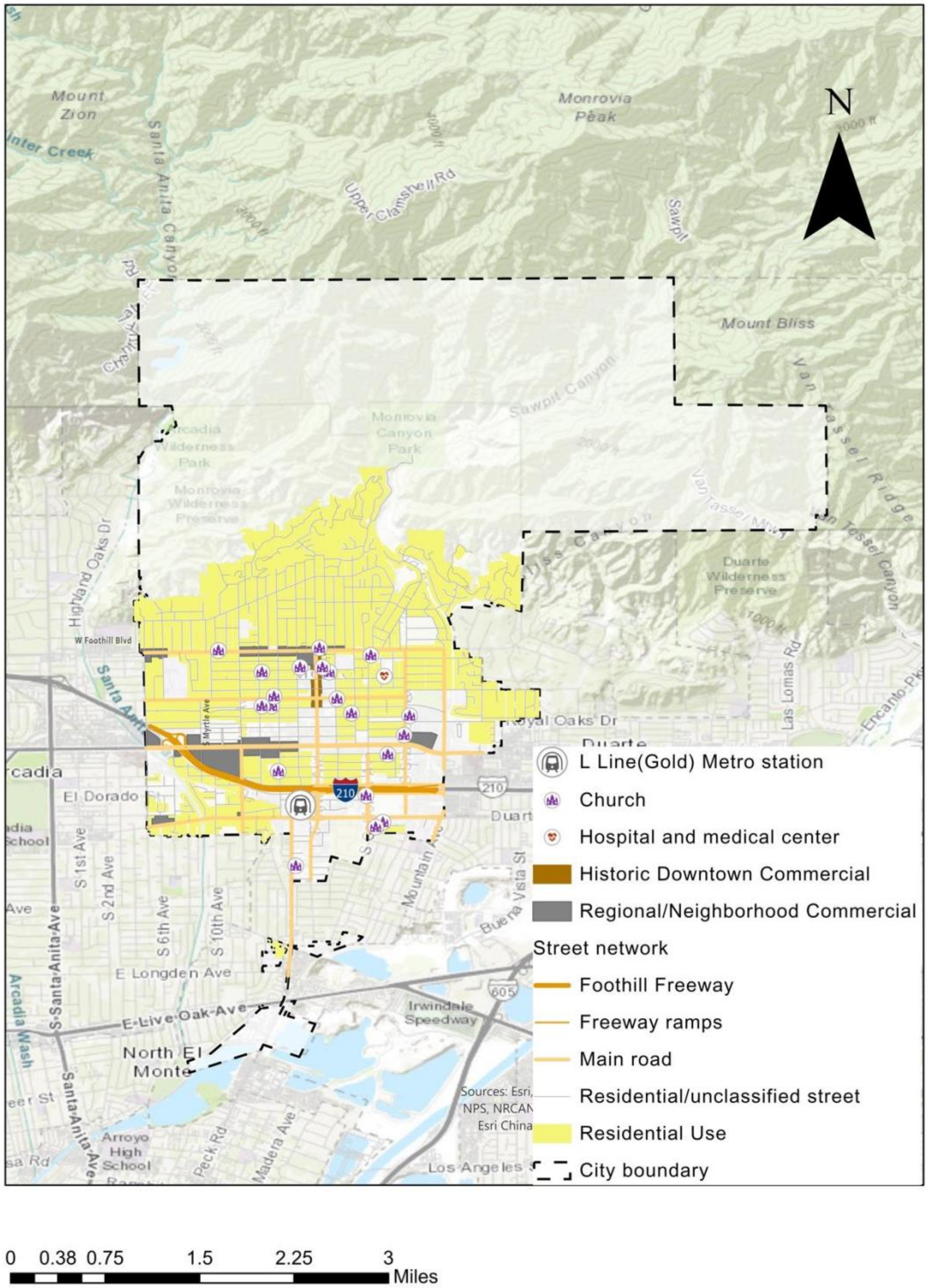
[2] A New Model of Suburban Mobility: City Partnerships With TNCs, City of Monrovia, February 2019 (PowerPoint Presentation)

Figure 1: Community Destinations within Monrovia



Pricing and Subsidies

Regardless of the length of trip – both geographically and in terms of time – riders pay a flat fee for a given tier of service, as determined by Monrovia. The city subsidizes rides by paying Lyft the difference between a rider's flat fee and the actual total cost of the trip (*i.e.*, the price that would normally be charged to a rider by Lyft).

When the GoMonrovia program began, riders paid the same flat fee for all three service tiers ($0.50). In addition, rides were allowed to begin or end throughout Los Angeles County ("LA County"). Since that time, Monrovia has adjusted the flat fees paid by riders five times and reduced the program's service area twice. Overall, the flat fee adjustments have produced a differentiated pricing system, where a Classic ride costs the most, a Shared ride the next most, and a Shared Metro / Downtown ride the least. A chronological summary of those program changes is available in Table 1.

Table 1: GoMonrovia Program Changes Since Inception

Month – Year	Classic Ride	Shared Ride	Shared Metro / Downtown Area	Service Area Change
Mar 2018*	$0.50	$0.50	$0.50	n/a
Sep 2018	$3.00	$0.50	$0.50	n/a
Feb 2019	$3.50	$1.00	$0.50	n/a
Apr 2019	$3.50	$1.00	$0.50	LA County removed**
Jun 2019	$5.00	$2.50	$0.50	City of Bradbury removed
Nov 2019	$5.00	$3.00	$1.00	n/a
Mar 2020***	$3.00	n/a	n/a	n/a

Notes:
* Beginning of program
** With the exception of City of Bradbury, which remained in service area until June 2019
*** Program adjustments due to COVID-19 pandemic; all Shared rides eliminated

Financing

The program is funded by multiple sources. Monrovia receives roughly $3 million in restricted Los Angeles County transportation funds on an annual basis, of which about $1.8 million is reserved for ongoing capital projects/agreements, including one with the dial-a-ride operator. GoMonrovia's Lyft partnership is left with the remaining $1.2 million. In addition, local return money is available in Los Angeles County. Los Angeles County has four voter-approved ½ cent sales tax measures for transportation: Prop A, Prop C, Measure R, and Measure M. LA Metro returns a portion of this funding to local municipalities each year in a process called local return dollars to be spent on transportation projects approved by LA Metro. After ongoing extensive discussions and negotiations with Metro's CEO, all transportation local return dollars are now eligible for use towards Lyft subsidies. This determination by Metro effectively opens Prop A, Prop C, Measure R and Measure M local return dollars for use in employing rideshare companies (such as Lyft) as a public transportation services provider.[3] Despite the additional access to funding, the initial success of GoMonrovia patronage led to deficits in the budget. As a result of financial constraints, the city adjusted its pricing strategy as described above (see Table 1).

Lessons Learned to Date

The City of Monrovia learned several lessons from the success of the GoMonrovia program. They achieved substantial cost savings per ride compared with dial-a-ride service while also achieving high program participation within the community. The program serves to address community concerns related to traffic and parking resulting from recent new developments and achieves higher occupancy per vehicle—with shared rides counting as public transit. Furthermore, the city takes pride in the greenhouse gas emissions reducing potential, as every Lyft ride is carbon neutral. They attribute the success of GoMonrovia to the simple program design which allow for any ride that starts and ends in the service area to be eligible for the discounted ride. Furthermore, they note that the focus on development and execution of an effective marketing campaign contributed to the program's success.

While the city has seen success on some metrics with GoMonrovia, they are unsure if the program is sustainable and equitable. Is the program delivering people to and from the Monrovia Gold Line Metro station, as a first/last mile solution? What are the demographics of the riders? Are there barriers limiting certain groups of the population from using the service? Are residents substituting GoMonrovia trips for personal vehicle usage? The city has yet to learn the answers to these questions, but the findings from this study may change—or solidify—the perception of GoMonrovia's success. The next page provides an overview of the GoMonrovia program.

[3] A New Model of Suburban Mobility: City Partnerships With TNCs, City of Monrovia, February 2019 (PowerPoint Presentation)

GoMonrovia's Lyft Partnership Overview

▪ Public-private partnership with ride-sharing provider Lyft to serve as the City's primary public transit provider for all non-ADA related services

▪ Provides first mile/last mile transit for Monrovia's Metro Gold Line Station

Current Prices:

▪ Classic Lyft Ride: $3

*All shared-ride options unavailable due to COVID-19

Most recent prices Prior to Covid-19:

▪ Classic Lyft Ride: $5

▪ Shared Lyft Ride: $3

▪ Shared Metro/Downtown Area Ride: $1

Current Service Area:

▪ Roughly Monrovia's City Limits

Surveyed Rider Information

▪ 57% identify as female

▪ 51% identify as Latinx or non-white

▪ 48% used GoMonrovia once per week or more Pre-COVID

Ridership Trends & Observations

▪ For about a year after inception, monthly ridership generally trended upward, peaking in March 2019 with 74,118 trips

▪ Removal of LA County from the service area in April 2019 resulted in most significant decline in ridership

▪ Subsequent price increases and the removal of the City of Bradbury from the service area reduced ridership further.

▪ The last Pre-Covid-19 Month, February 2020, had 22,747 trips

▪ February 2021 Ridership was 4,339

With the onset of the Coronavirus pandemic in North America, Uber and Lyft suspended their ridesharing services in the U.S. and Canada on March 17, 2020 (Lee, 2020). As a result, the two shared ride tiers of GoMonrovia have been unavailable to users since March 2020. The suspension was enacted with the intention of protecting both drivers and passengers by reducing interaction with other users outside of one's household.

Examples of Other Existing PPPs with TNCs and Transit Ridership

Various examples of suburban communities incorporating TNCs into their transportation systems exist in the United States. Pinellas County, FL; Centennial, CO; and Marin County, CA provide some examples of how suburban communities have incorporated TNCs into their transportation systems for first-mile/last-mile solutions. Innisfil, Ontario provides an example a complete substitution of transit in favor of a PPP with Uber.

Pinellas County, Florida: First/Last Mile Solution

The Pinellas Suncoast Transit Authority (PSTA), serving Pinellas County within the Tampa Bay metropolitan statistical area, became a trailblazer in 2015, signing the first service provision agreement with a TNC to offer "joint first/last-mile service subsidized by public dollars" (Murphy et al., 2019, p. 1). This pilot program, called Direct Connect, permits riders to use a wheelchair-accessible vehicle, taxi, or Uber to get to and from bus stops at a subsidized rate. The program replaced "two under-performing, low-frequency feeder bus routes" (p. 1) and expanded over the years to include paratransit and late-night service. Currently, Direct Connect offers a "$5 discount on Uber, Lyft, or United Taxi" (psta.net, 2021) if you begin or end your trip at a designated location. Additionally, wheelchair transport is provided a $25 discount to or from those locations. PSTA provides the service "from 5:00 am until 12:00 am, 7 days a week" (psta.net, 2021). Analysis of the program is limited due to Uber not providing extensive data (Murphy et al., 2019, p. 24) and lack of other data collection (p. 2).

Centennial, Colorado: First/Last Mile Solution

Go Centennial is a pilot program aimed at solving first-/last-mile problems in the City of Centennial, CO. It is a first-of-its-kind program operated from August 2017 through January 2018 by the City of Centennial. In this program, Lyft, City's partner, was offering free Lyft Line (a ride-pooling service, now called Shared) rides to and from the Dry Creek light rail station to residents who live or work in a designated geofenced area (3.75 square-mile), where the area was also covered by precedent Call-n-Ride service (riders dial a phone number to request a ride service). According to a report (Centennial Innovation Team & Fehr & Peer's, 2017), the program cut the traditional Call-n-ride in half yet still provided responsive service to a similar scale of population. Besides, transit ridership at Dry Creek light rail station increased 11.6%, while the two adjacent stations also increased 2.3% and 10%. There were 1,302 trips offered in this program and the average cost was $4.70, which paid by the City and the Southeast Public Improvement Metropolitan District (SPIMD).

Marin County, CA: First/Last Mile Solution

Marin County, CA is another example of establishing a PPP with Lyft to address the first/last mile problems between residential areas and Marin's SMART stations (Sonoma-Marin Area Rail Transit, six stations in Marin County). According to an immediate release (Transportation Authority of Marin, n.d.), the program began operations in September 2017 and sought extensions several times. Participants pay the first $2 fare of their shared Lyft ride to or from SMART, and the Transportation Authority of Marin (TAM) will sponsor up to $5 for the rest of the fee. Further information about the impact on transit ridership at nearby transit stations and mobility has not been provided yet.

The Innisfil (Ontario) Case: Complete Substitution to Transit

In place of a transit system consisting of fix-route services, the city of Innisfil, Ontario decided to pursue a public private partnership with Uber. The program has been popular among residents. However, with success comes cost. The average subsidy is $5.62 per ride (Schaller, 2019, p. 23) and the more people who use it, the costlier it is for the city. Leyland Cecco (2019), writing for *The Guardian*, reported that although reducing costs drove the original choice to pursue the partnership, the high ridership pushed the projected cost for 2019 to CA$1.2 million. That is greater than the CA$1 million estimate to establish a bus network and the CA$900,000 budgeted for Uber (Cecco, 2019).

Interviewed for Cecco's (2019) article, Christof Spieler, author of *Trains, Buses, People* (2018), expressed that a bus system has the advantage of having more predictable costs. He warns larger cities from making a similar decision to Innisfil's. In Portland, Oregon, the Transit Consultant Jarrett Walker is critical of Uber as a contribution to public transit. He criticizes Innisfil's model as costly, inefficient, and more detrimental to the environment. Spieler and Walker both express the need for "environmentally sustainable and financially accessible services" (Cecco, 2019). Schaller (2019) further adds that it is not reliable (p. 24). He writes "the trip completion rate was only 75 percent in November and December 2018, meaning that one quarter of prospective customers did not receive service" (p. 24).

Chapter 3 – Methodology

This chapter presents our methodology. First, we recall the research questions framing this study. Second, we present the dataset which includes trip data collected by Lyft; publicly available sociodemographic data collected through the 5-year American Community Survey (ACS); and data we collected ourselves through a survey implemented in May-June 2021. Finally, we provide an overview of the statistical methods used for data analysis. Further details about the methods used to generate results are provided in corresponding result chapters.

Research Questions

By analyzing the outcomes of GoMonrovia's implementation, we seek to answer the following core question: Does a public-private partnership (PPP) with a TNC constitute a viable and equitable option to address the First/Last mile issue in a suburban community? To develop that answer, we pursue the following more specific questions as well:

1. What is the socioeconomic and demographic profile of the first/last mile users?
2. To what extent does the program meet the first/last mile mobility needs of Monrovia residents, especially those of low-income and/or transit dependent residents?
3. Can the PPP be considered a new model for "transit suburbs," where subsidized TNC rides support transit ridership and reduce automobile dependence?
4. From an institutional and sustainability perspective, what are the lessons learned, and how or whether might this model be replicated in other suburban communities?

Data

Trip Data Collected by Lyft

We signed a data sharing agreement with the City of Monrovia that enabled us to access trip data about GoMonrovia patronage collected and compiled by Lyft on a monthly basis. The dataset includes all trips made between March 2018 (i.e., the month of the program's inception) and February 2021. Among other details, it provides the following pieces of information at the individual trip level: (1) time at which the trip occurred (e.g., "late night"); (2) method via the trip was booked (i.e., "coupon" versus "concierge"); (3) the calendar day that the trip was booked (e.g., Monday); (4) the distance of the trip from origin to destination; and (5) the total price of the trip, the amount paid by the rider, and the amount subsidized by the City, where the amount paid by the rider can often be used to infer the "tier" of service used (i.e., Classic ride, Shared ride, or Shared ride to Metro / Downtown Area only).

In addition, the dataset indicates a starting and ending "area" for each trip, but the granularity of this measure changes based on the year the trip was made. For trips made prior to 2020, the starting and ending areas of a trip are identified at the census tract level. For trips made during 2020, these areas are identified at the census block group level.

Census block groups are significantly smaller than census tracts, in terms of both population and surface area. While the typical census tract contains 1,200 to 8,000 people, the typical block group contains only 600 to 3,000 people. For example, while Monrovia contains only 9 census tracts, it contains 31 block groups, 30 of which contain permanent residents (the northernmost block group covers only wilderness areas).

We are interested in understanding variations in GoMonrovia usage, and in particular trips associated with Monrovia's Metro station. Trip data at the block group level offer greater variation and a more precise identification of trips associated with the Metro station. Accordingly, we focused on trips from 2020 and 2021 when assessing the evidence for GoMonrovia as a first/last mile travel mechanism. That said, we used the entire dataset of trips (*i.e.*, trips between March 2018 and February 2021) for analyzing other trends, such as: (a) the effect of COVID on ridership, and (b) price elasticity of demand as the fare has changed several times during this period.

The use of trips measured at the block group level is beneficial in another way as well. Because the GoMonrovia dataset does not record any characteristics of the riders using the service, analyses using those data must proxy riders' characteristics based on where a trip began or ended. Proxying socioeconomic, housing, or land use characteristics associated with a GoMonrovia user via block group measures should be significantly more precise than proxying those characteristics via tract measures.

Sociodemographic Data

Additionally, we collected sociodemographic information on Monrovia neighborhoods, at the census block group level. The data is publicly available on the U.S. Census Bureau's website.

Survey Data Collected from GoMonrovia Users

The survey, conducted in May 2021, includes three sections. All questions ask about pre-COVID behaviors and encompass the following categories: 1) GoMonrovia Experience (E.g., "How often did you use GoMonrovia?"; "How far do you live from the station?"); 2) Travel Habits (E.g., "What is your primary means of travel?"; "Do you have access to a personal vehicle?"); 3) Personal Background; 4) Socio-demographic information.

The survey was rolled out online, using a Google Form. The link to the survey was shared with potential participants using two main channels: 1) through an email sent by Lyft to all registered GoMonrovia users (reach: 15,000 accounts with GOMONROVIA promo code); 2) on the City's social media (Facebook, Instagram, and Twitter) and Newsletter, called the "City Manager's Update". One reminder was sent by the City on their social media accounts. The survey was conducted between May 14 and May 29, 2021.

Before continuing, we note that our survey methodology is equivalent to convenience sampling. That is, the set of GoMonrovia users who were motivated to respond may not, in aggregate, represent the overall GoMonrovia user community. In turn, the results of our statistical analyses may suffer from bias – they may not reflect travel trends and behaviors for that overall community.

In general, the statistical literature recommends either conducting probability samples outright (Acharya, Prakash, Saxena, & Nigam, 2013) or blending probability samples with convenience samples (Hedt & Pagano, 2011). Implementing these approaches can be quite costly; moreover, that approach was not possible given our short timeframe for conducting the survey (approximately two weeks) and budget limitations. Looking forward, we recommend conducting an expanded, probability-based survey of GoMonrovia users after the pandemic subsides.

Methods

The methods used for analyses are described in more detail in the result chapters. Overall, our analyses draw on a range of statistical methods (time-series regression, analyses of variance, factor analyses, and multivariate regressions), coupled with mapping in GIS.

Chapter 4 – Analysis of Demand for GoMonrovia as Reflected in the Lyft Ridership Data

This chapter addresses in particular the first research question raised by our study, about the socioeconomic and demographic profile of the GoMonrovia users. Furthermore, we conduct an analysis of the price elasticity of demand, thus addressing the question of the impact of subsidies on demand for TNC rides.

Ridership Trend Since Inception

Since its inception, the GoMonrovia program has attracted a large number of users. Some 29,000 individuals have downloaded the GoMonrovia coupon on their Lyft app. The Lyft trip data shows an average of 31,663 rides per month between March 2018 and February 2021 (*see* Table 2). Prior to the COVID-19 pandemic (*i.e.*, between March 2018 and February 2020), average monthly ridership was approximately 44,360. Since the pandemic, that figure has dropped to around 6,265 trips per month between March 2020 and February 2021 (see Appendix A).

As mentioned in the introduction to the GoMonrovia program (Chapter 2), the City has significantly reduced GoMonrovia's service area over time, first by removing broader LA County riders in April 2019 and then the City of Bradbury in June 2019. Consequently, virtually all trips in 2020 and 2021 either began or ended within City limits: 99.0% and 99.4% of all trips, respectively.

Table 2: Trip Volumes by Location and by Year

Trip Type	2018	2019	2020	2021	Total
Monrovia Metro or Downtown	53,757	60,395	2,333	129	116,614
Otherwise within Monrovia	379,952	430,709	110,916	9,407	930,984
Outside Monrovia	53,871	37,151	1,186	54	92,262
Total	487,580	528,255	114,435	9,590	1,139,860
Percentage of trips Outside Monrovia	11.0%	7.0%	1.0%	0.6%	8.1%

There have been significant fluctuations in ridership trend in relation to the following events, as seen in the Table above. First, the removal of LA County from GoMonrovia's service area in April 2019 is associated with the largest decrease in month-over-month ridership. Second, per-month ridership reached record lows since the coronavirus pandemic became widespread in Los Angeles County. Because these two events more or less coincide with price changes, it is difficult to disentangle the ridership impact of these different mechanisms. An analysis of the price elasticity of demand is provided later in this chapter.

GoMonrovia Users

The data on individual user characteristics was not available from the Lyft usage data. Consequently, as a proxy we examined levels and patterns in GoMonrovia utilization across the city's different neighborhoods and communities by mapping in GIS "macro" scale socio-demographic and trip data.

Cluster Analysis of Monrovia Neighborhoods (ACS Data)

To define Monrovia's neighborhoods and communities, we developed an array of maps that plot socioeconomic, housing, and land use characteristics across the city's census block groups (see Appendices B-T for all maps). Following up on our research questions, we are especially interested in spatial covariations between these attributes and GoMonrovia ridership. Before we explore those covariations, though, we outline the socioeconomic, housing, and land use patterns we observe across Monrovia.

As two examples, we consider the share of each block group's population (aged at least 25 years) that possesses a bachelor's degree, along with the share of each block group's housing units that were constructed prior to 1940. As evident in Figures 2 and 3, residents of Monrovia's foothills neighborhoods are significantly more likely to possess a bachelor's degree relative to residents of other neighborhoods, particularly those directly east of the Metro station. Meanwhile, neighborhoods just south of those foothill communities are most likely to contain housing constructed before 1940, with the lowest concentration of "vintage" housing stock in Monrovia's core downtown (*see* Figures 2 and 3 below).

Figure 2: Percentage of Housing Units Built Before 1940

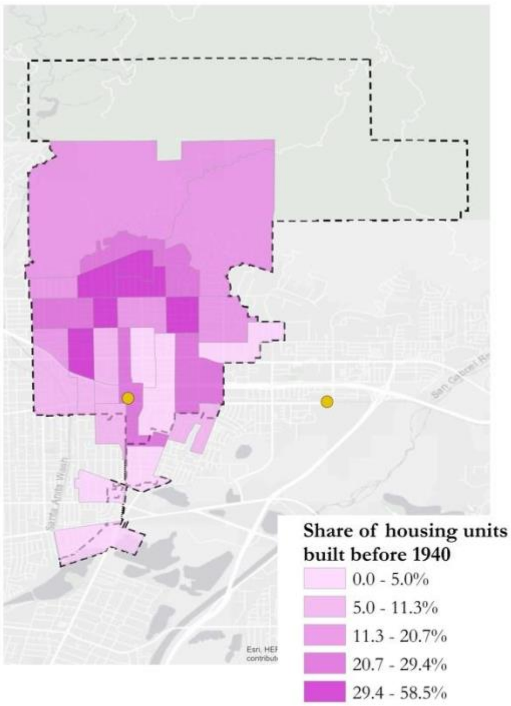
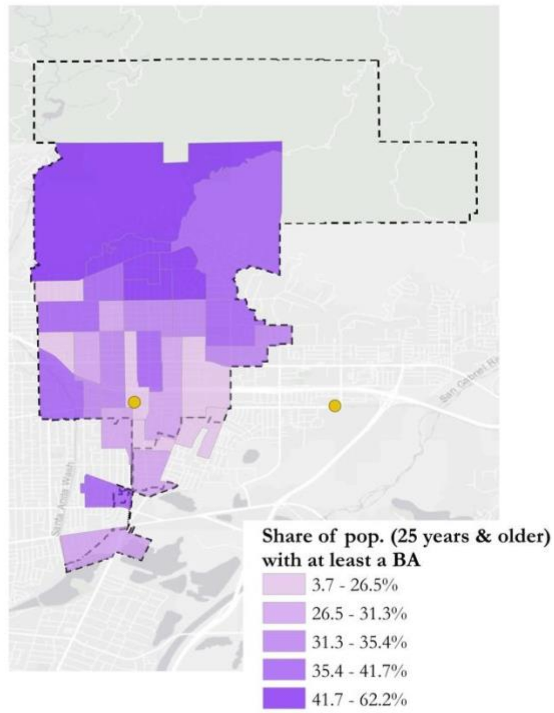


Figure 3: Percentage of Population with at least a Bachelor's



Data Source: 5-year 2018 ACS Table B15003

While exploring spatial variations in the distribution of individual socio-demographic characteristics is interesting, it is difficult to synthesize those comparisons into a meaningful grouping of relevant spatial units. To generate such a typology and assign spatial units (i.e., census block groups) accordingly, we conducted a statistical cluster analysis.

Cluster analysis is an iterative, two-step process that groups census blocks, in this case, according to similarities in their population characteristics. First, it assigns observations to preliminary clusters, with the number of clusters specified by the researcher; and it calculates a "centroid" for each preliminary cluster based on its assigned members. This centroid is typically a median or mean of members' values along specified dimensions. Second, for each cluster, it calculates the "distance" between each member and the centroid, and it reassigns members across clusters in a way that lessens those distances across all clusters. This process is repeated until aggregate distance is minimized.

For our analysis, we utilized the "k-medians" methodology, which means that we generated cluster centroids based on medians of census block groups' values. We considered block groups' values along the following socioeconomic and housing dimensions, omitting Monrovia's northernmost block group, which has 0 residents:

- Population density (people per residential-zoned acre)
- Median age of population
- Share of population aged 17 years and younger
- Share of population aged 65 years and older
- Share of population considered Latinx
- Share of population considered Asian American, non-Latinx
- Share of population considered White American alone, non-Latinx
- Share of population considered Black American, non-Latinx
- Share of population (aged 25 years and older) with at least a bachelor's degree
- Median household income (in 2018 USD)
- Share of households with 0 personal vehicles
- Housing density (units per residential-zoned acre)
- Share of occupied units that are rented
- Share of occupied units that are detached single-family residential (SFR)
- Share of units constructed pre-1940

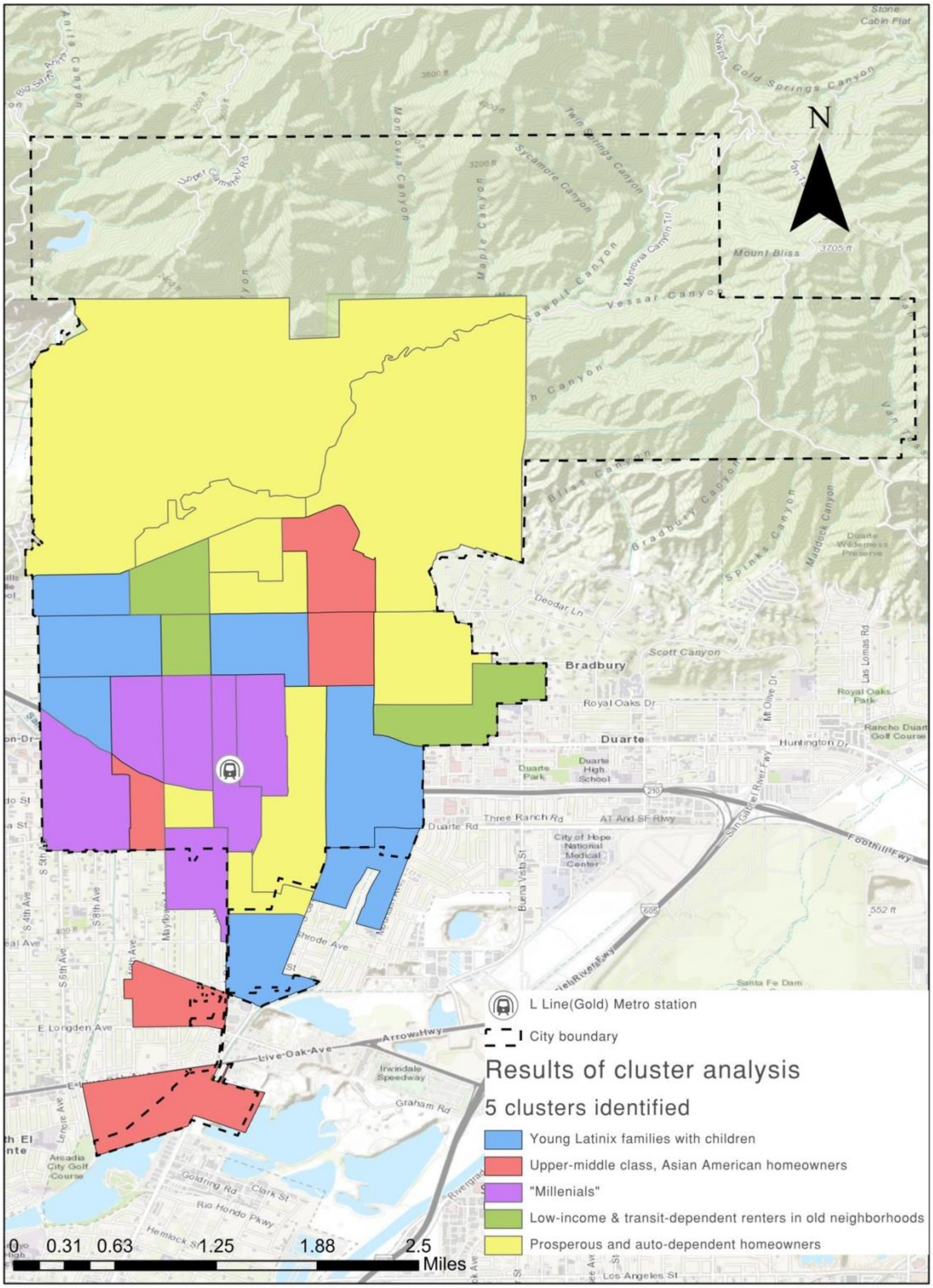
We generated different numbers of clusters and settled on 5 clusters after reviewing the results. (See Table 3).

Table 3: Cluster Typology and Statistics

Median Statistics for Sociodemographic AND Housing-Based Clusters, per 2018 5-Year ACS Data

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Population Density (people per acre)	28	24	33	16	16
Median Age of Population	35.2	44.8	38.3	42.3	43.5
Share of Population Age 17 and Below	26%	18%	16%	20%	22%
Share of Population Age 65 And Up	9%	16%	12%	13%	15%
Latinx Share of Population	57%	41%	41%	33%	24%
Asian American, non-Latinx Share of Population	12%	19%	14%	7%	9%
White American Alone, non-Latinx Share of Population	24%	33%	29%	44%	59%
Black American, non-Latinx Share of Population	8%	0%	3%	4%	5%
Share of Population (age 25+) with At Least a BA	27%	35%	33%	33%	40%
Median Household Income (2018 USD)	$60,739	$86,458	$68,813	$44,107	$113,788
Share of Households with 0 Personal Vehicles	5%	3%	3%	13%	0%
Housing Density (units per acre)	11	7	13	7	7
Share of Occupied Units that are Rented	62%	29%	65%	59%	40%
Share of Occupied Units that are Detached SFR	56%	78%	40%	63%	86%
Share of Units Constructed pre-1940	13%	10%	11%	42%	21%
# of Block Groups in Cluster	*7*	*5*	*6*	*3*	*9*
Preliminary cluster naming convention	**Young Latinx families with children**	**Upple-middle class, Asian American homeowners**	**"Millenials"**	**Low-income & transit-dependent renters in old neighborhoods**	**Prosperous & auto-dependent white homeowners**

Figure 4: Map of Clusters



We compared the centroids of the 5 clusters to develop a preliminary naming convention that reflects the similarities across the block groups they contain. Cluster 1 (highlighted in blue in the relevant figure) contains a disproportionately high number of young Latinx families with children. Cluster 2 (highlighted in red) contains far more upper-middle class, Asian American homeowners. Cluster 3 (highlighted in purple) contains a high share of “millennials”, i.e., relatively young and well-educated individuals, who are especially likely to live in dense, multi-family residential structures. Cluster 4 (highlighted in green) contains a disproportionately high number of households who: are low-income, lack a personal vehicle, rent and not own their housing unit, or reside in a unit constructed before 1940. Cluster 5 (highlighted in yellow) contains far more White individuals, college-educated individuals, and high-income households; and it contains far fewer households who rent their housing unit or lack a personal vehicle. We note that these clusters, when mapped, reveal spatial patterns as well. Cluster 1 neighborhoods (i.e., block groups) form a periphery around Monrovia’s core downtown area. Cluster 3 neighborhoods are concentrated within and just west of the core downtown area. Cluster 4 neighborhoods are transitional areas between the City’s foothills neighborhoods and its downtown. Cluster 5 neighborhoods are located throughout Monrovia’s foothills, and they are also located in some parts of the core downtown. Cluster 2 neighborhoods do not display as clear a spatial pattern, although they do comprise Monrovia’s southernmost extent. (See Figure 4).

City-Level Analysis of Trip Data

As mentioned previously, since the program's inception, slightly more than a tenth of all trips have either began in or ended in the census block group containing the Monrovia Metro station: 116,614 out of 1,139,860 rides with geolocation data, or 10.2% (See Table 2).

In this, and the following chapter, we address more directly our first two research questions, which relate to the question of first/last mile mobility: Who has utilized the GoMonrovia program to expand their access to the city's Gold Line Metro station? Does that group include transit-dependent households, such as those who are low income or do not have access to a personal vehicle?

We seek answers to those questions from two different data sources: the GoMonrovia usage provided by Lyft, and the on-line survey conducted in May 2021. In this chapter, we examine levels and patterns in GoMonrovia utilization across the city's different neighborhoods and communities – usage on the "macro" scale. In the following chapter we examine the connections between survey respondents' characteristics and their individual travel behaviors – usage on the "micro" scale.

Spatial Variations of Trips TO/FROM Downtown Monrovia

Drawing on Lyft's trip data, we examined some characteristics – population density in this instance -- of the census block groups that generate the greatest number of trips to and from the Downtown block group (See Figures 5 and 6).

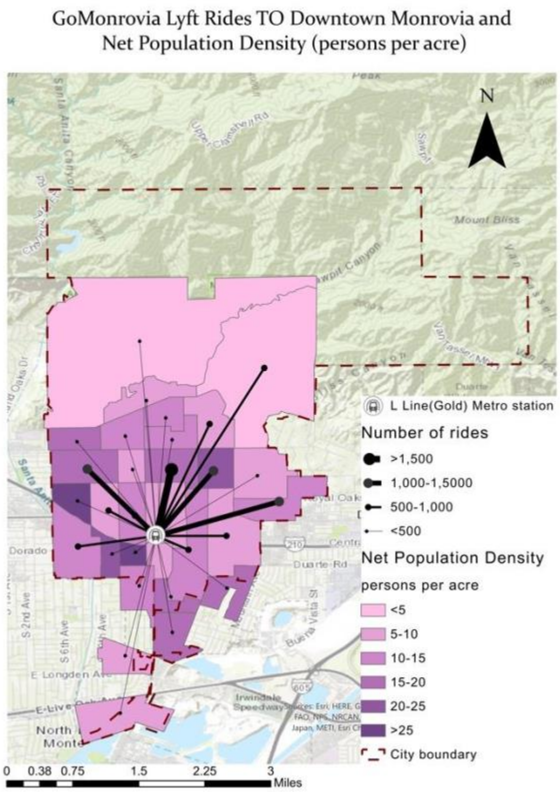


Figure 5: Ridership TO Downtown Monrovia by Population Density

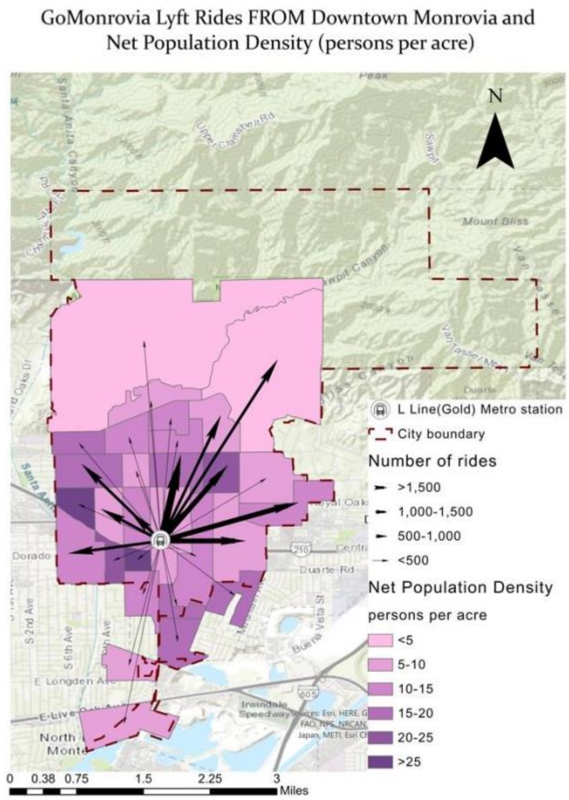


Figure 6: Ridership FROM Downtown Monrovia by Population Density

Four census block groups generate and receive large numbers of GoMonrovia trips to/from the Downtown census block group where the Monrovia Metro Station is located. These are not necessarily the densest census block groups. Note that the density displayed here is net density, that is, density of population per residential areas (non-residential areas excluded).

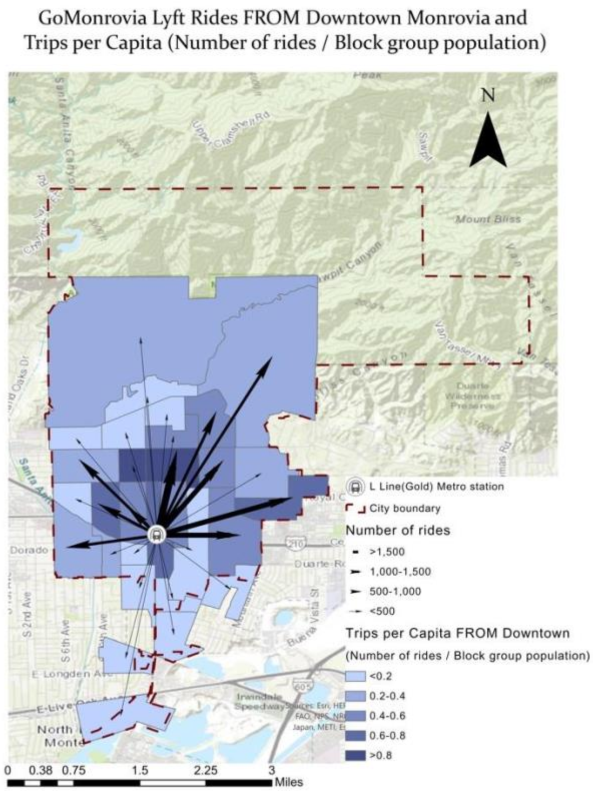


Figure 7: Rides FROM Downtown Monrovia and Trips Per Capita

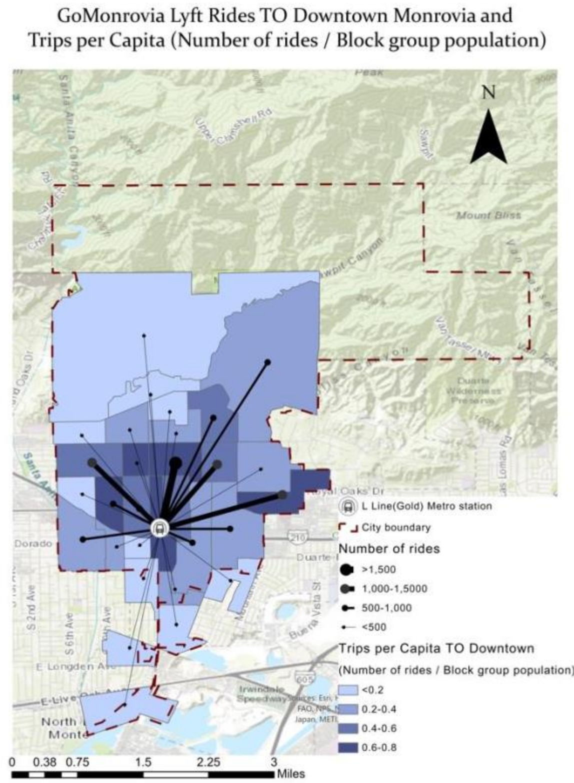


Figure 8: Rides TO Downtown Monrovia and Trips Per Capita

Figures 7 and 8 show that neighborhoods (block groups) just south of foothills use at level disproportionate to their total GoMonrovia trips per capita. We observe substantial spatial variation in where Lyft trips are beginning and ending. The background of these maps shows the number of trips per capita to/from the Downtown block group.

Figures 9 and 10 show the ridership data overlaid on the clusters identified previously in this Chapter. Considering our clusters, we see a particularly strong correlation between: (a) trips to/from the block group containing the Monrovia Metro station, and (b) the cluster group termed "young Latinx families with children" (in blue); but is this correlation significant? This is the question.

Based on the cluster analysis presented above, it appears that sociodemographic factors are most meaningfully associated with GoMonrovia trips to/from the Downtown block groups. These four census block groups that generate most trips fall into the following clusters:

1. Low-income and transit-dependent renters (easternmost block group)
2. Young Latinx families with children (three other block groups)

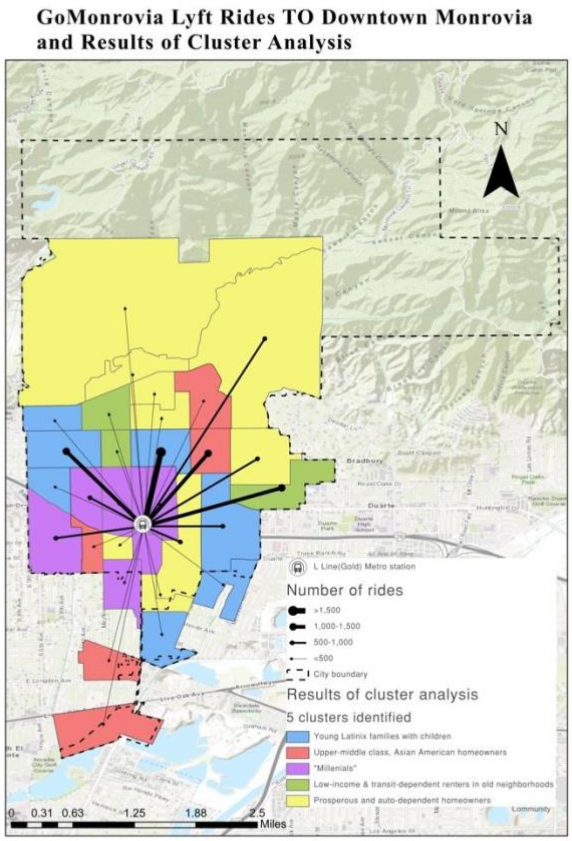


Figure 9: Rides TO Monrovia Metro Station

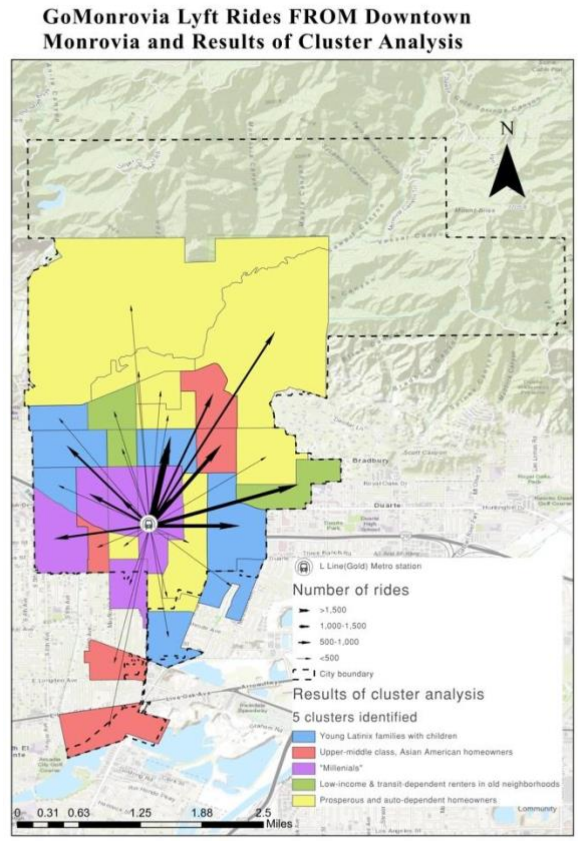


Figure 10: Rides FROM Monrovia Metro Station

Considering our clusters, we see a particularly strong correlation between: (a) trips to/from the block group containing the Monrovia Metro station, and (b) the cluster group termed "young Latinx families with children" (in blue); but is this correlation significant? This is the question that we kept investigating using other statistical methods, including analyses of variance and multivariate regression analyses.

Analysis of Variance

To help understand the expected profile of GoMonrovia users at the neighborhood level, we conducted several analysis of variance (ANOVA) tests. ANOVA tests are nonparametric in nature. They estimate the covariation between two factors, i.e., the extent to which changes in one factor are associated with changes in the other factor. To reiterate, our cluster analysis incorporated various socioeconomic and housing measures for each block group, information that could help develop such an expected profile.

Accordingly, we ran ANOVA tests that compared the covariation between: (a) an “independent variable”, i.e., the cluster category of each block group, and (b) a “dependent variable”, i.e., an individual measure of GoMonrovia ridership for each block group. We considered six individual measures of GoMonrovia ridership across all block groups, and therefore ran six different ANOVA tests, with the identified clusters as independent variables. These individual measures or dependent variables for each block group were:

- Total Lyft (i.e., GoMonrovia) trips recorded as beginning or ending in a block group, per block group resident
- Lyft trips recorded as beginning in a block group, per block group resident
- Lyft trips recorded as ending in a block group, per block group resident
- Share of Lyft trips that began in a block group where the destination was the block group containing Monrovia’s Metro station
- Share of Lyft trips that ended in a block group where the origin was the block group containing Monrovia’s Metro station
- Share of total Lyft trips involving a block group that also involved the block group containing Monrovia’s Metro station

Of the six ANOVA tests we ran, three of those tests indicated significant covariance between block groups’ assigned clusters and an individual Lyft ridership measure (see Tables 4 and 5). All three tests considered GoMonrovia travel related to Monrovia’s Metro station. These results suggest that Monrovia residents with particular socioeconomic and/or housing characteristics especially rely on the service as a first/last mile travel mechanism. Still, they do not identify which characteristics influence that behavior. To further investigate the factors predicting GoMonrovia usage, and more specifically First/Last mile travel via GoMonrovia, using individual survey response data.

Table 4: Median Values for Lyft Ridership Statistics by Identified Clusters

	F Stat for co-variance	*Median statistics by Cluster* Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Total Lyft Trips per Capita (2020-21)	1.98	3.42	3.00	9.22	5.69	1.88
Lyft Trips as Origin per Capita (2020-21)	2.00	1.91	1.52	4.51	2.80	1.05
Lyft Trips as Destination per Capita (2020-21)	1.95	1.53	1.49	4.65	2.97	1.03
Share of Lyft Trips as Origin where Destination = Metro Area (2020-21)	**3.94***	**11%**	**24%**	**10%**	**18%**	**17%**
Share of Lyft Trips as Destination where Origin = Metro Area (2020-21)	**3.08***	**13%**	**17%**	**11%**	**18%**	**17%**
Share of Lyft Trips involving Metro Area (2020-21)	**4.20****	**13%**	**21%**	**11%**	**16%**	**20%**

Table 5: ANOVA Tests of Six Individual Measures of Ridership

	F Stat for co-variance	Prob > F
Total Lyft Trips per Capita (2020-21)	1.98	0.1285
Lyft Trips as Origin per Capita (2020-21)	2.00	0.1252
Lyft Trips as Destination per Capita (2020-21)	1.95	0.1333
Share of Lyft Trips as Origin where Destination = Metro Station Area (2020-21)	**3.94***	**0.0129**
Share of Lyft Trips as Destination where Origin = Metro Station Area (2020-21)	**3.08***	**0.0342**
Share of Lyft Trips involving Metro Station Area (2020-21)	**4.20****	**0.0097**

Note: Independent variable is identified clusters

Estimating Price Elasticity and COVID Effect

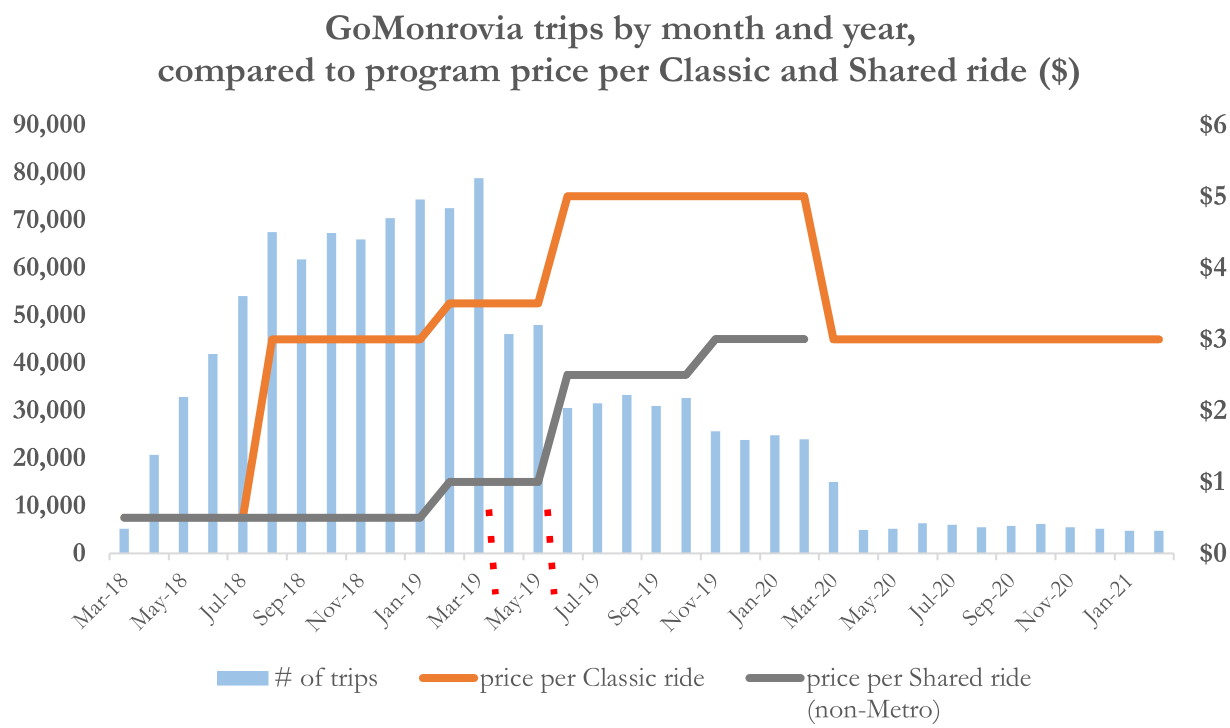
Descriptive Trends

To date, Monrovia has adjusted the price paid by riders five times: in September 2018, February 2019, June 2019, November 2019, and March 2020. These price shifts have been idiosyncratic in nature: in no case have all service tiers experienced a change simultaneously, and price changes have been unpredictable in magnitude.

A price increase for a given tier of service is consistently associated with reduced ridership for that service tier the following month (Table 6). This is most obvious for the third price shift in June 2019, when the cost of a Classic ride increased from $3.50 to $5.00 and the cost of a Shared ride increased from $1.00 to $2.50. Simultaneously, Classic ridership fell by 60.3% month-over-month (from 6,753 rides in May 2019 to 2,679 rides in June 2019) and Shared ridership fell by 61.8% (from 24,819 rides in May 2019 to 9,473 rides in June 2019). Ridership under the Shared Metro/Downtown Area tier, which did not experience a price change at that time, increased over the same period by 14.5% (from 14,645 rides in May 2019 to 16,772 rides in June 2019). Although Monrovia removed the City of Bradbury from its service area in June 2019 also, the opposing changes in ridership for the Classic and Shared tiers versus the Shared Metro/Downtown Area tier are strongly suggestive of a negative response to pricing increases.

At a cursory level, use of the program therefore appears sensitive to pricing changes, but as mentioned above, the price effect is difficult to disentangle from other factors impacting ridership, such as changes in the service area boundaries or the COVID effect. Next, we utilize a time-series regression model to estimate the effects of price changes and the COVID-19 pandemic on GoMonrovia usage (See Table 4). In particular, we measure the extent to which such events predict future ridership levels, in line with the Granger test commonly employed in econometric research (Granger, 1969).

Figure 11: GoMonrovia Trip Volume and Rider Flat Fee Levels by Type of Ride (Service Area Changes Noted via Dotted Red Lines)



Note: Per red dotted lines, LA County removed from service area in April 2019, and City of Bradbury removed in June 2019

Table 6: Trip Frequencies by Price Tier

	Ride Counts by Service Tier						
month	Classic	Shared	Shared Metro / Downtown	Shared OR Shared Metro / Downtown	Unknown	Total	Price Shifts
Mar-18	0	0	0	0	4,535	4,535	
Apr-18	0	0	0	0	19,043	19,043	
May-18	0	0	0	0	30,917	30,917	
Jun-18	0	0	0	0	39,284	39,284	
Jul-18	0	0	0	0	50,891	50,892	
Aug-18	0	0	0	0	63,222	63,222	***Price shift 1***
Sep-18	9,165	0	0	48,194	0	57,359	***Classic ride from $0.50 to $3.00***
Oct-18	10,352	0	0	51,263	0	61,615	
Nov-18	9,605	0	0	50,260	0	59,865	
Dec-18	10,905	0	0	53,487	0	64,392	
Jan-19	9,818	0	0	57,984	0	67,802	***Price shift 2***
Feb-19	8,941	2,711	54,543	0	0	66,195	***Classic ride from $3.00 to $3.50***
Mar-19	10,548	29,142	34,428	0	0	74,118	***Shared ride from $0.50 to $1.00***
Apr-19*	6,263	24,056	13,895	0	0	44,214	
May-19	6,753	24,819	14,645	0	0	46,217	***Price shift 3 (& Removal of City of Bradbury)***
Jun-19*	2,679	9,473	16,772	0	0	28,924	***Classic ride from $3.50 to $5.00***
Jul-19	2,615	8,496	18,849	0	0	29,960	***Shared ride from $1.00 to $2.50***
Aug-19	2,819	8,974	19,925	0	0	31,718	
Sep-19	2,806	8,480	18,167	0	0	29,453	
Oct-19	2,955	8,490	19,467	0	0	30,912	***Price shift 4***
Nov-19	2,684	6,496	15,024	0	0	24,204	***Shared ride from $2.50 to $3.00***
Dec-19	2,828	6,397	13,334	0	0	22,559	***Shared Metro / Downtown ride from $0.50 to $1.00***
Jan-20	2,846	6,426	14,261	0	0	23,533	
Feb-20	2,885	6,258	13,604	0	0	22,747	***Price shift 5 (& COVID-19 pandemic)***
Mar-20	14,155	0	0	0	0	14,155	***Classic ride from $5.00 to $3.00***
Apr-20	4,255	0	0	0	0	4,255	

Ride Counts by Service Tier

May-20	4,618	0	0	0	0	4,618
Jun-20	5,616	0	0	0	0	5,616
Jul-20	5,334	0	0	0	0	5,334
Aug-20	4,925	0	0	0	0	4,925
Sep-20	5,125	0	0	0	0	5,125
Oct-20	5,521	0	0	0	0	5,521
Nov-20	4,848	0	0	0	0	4,848
Dec-20	4,491	0	0	0	0	4,491
Jan-21	4,182	0	0	0	0	4,182
Feb-21	4,339	0	0	0	0	4,339
Total	**174,877**	**150,218**	**266,914**	**261,188**	**207,892**	**1,061,089**

**Note: LA County removed from service area in April 2019, and City of Bradbury removed in June 2019*

Model Specifications

The model's dependent variable is average daily ridership in a given month (e.g., September 2019), where the ridership measure includes only trips that occurred fully within Monrovia (i.e., both the start and end points were associated with census tracts or block groups that are fully or partially inside the City boundary). We isolate those trips to mitigate the confounding effects of service area changes, which have historically occurred at the same time as or proximate to pricing changes. Our specification is as follows:

$$\begin{aligned} AverageDailyRidership_t &= \beta_0 + \beta_1 * AverageDailyRidership_{t-1} + \beta_2 * COVIDstart_{t-1} \\ &+ \beta_3 * PriceShift1_{t-1} + \beta_4 * PriceShift2_{t-1} + \beta_5 * PriceShift3_{t-1} \\ &+ \beta_6 * PriceShift4_{t-1} + \varepsilon_t \end{aligned}$$

where:

- $AverageDailyRidership_t$ represents average daily ridership in month *t* (*e.g.*, September 2019)
- $AverageDailyRidership_{t-1}$ represents average daily ridership in month *t - 1*, relative to the dependent variable's month of measurement *t* (*e.g.*, August 2019)
- $COVIDstart_{t-1}$ is an indicator variable capturing whether the start of the COVID pandemic in the U.S. – considered March 2020 – occurred in the month prior to the dependent variable's month of measurement *t* (*note:* this indicator is equal to "yes" only when the dependent variable's month of measurement is April 2020)
- $PriceShift1_{t-1}$ is an indicator variable capturing whether the third shift in flat fees – in September 2018 – occurred in the month prior to the dependent variable's month of measurement *t* (*note:* this indicator is equal to "yes" only when the dependent variable's month of measurement is October 2018)
- $PriceShift2_{t-1}$ is an indicator variable capturing whether the second shift in flat fees – in February 2019 – occurred in the month prior to the dependent variable's month of measurement *t* (*note:* this indicator is equal to "yes" only when the dependent variable's month of measurement is March 2019)
- $PriceShift3_{t-1}$ is an indicator variable capturing whether the third shift in flat fees – in June 2019 – occurred in the month prior to the dependent variable's month of measurement *t* (*note:* this indicator is equal to "yes" only when the dependent variable's month of measurement is July 2019)

- $PriceShift4_{t-1}$ is an indicator variable capturing whether the fourth shift in flat fees – in November 2019 – occurred in the month prior to the dependent variable's month of measurement t (*note:* this indicator is equal to "yes" only when the dependent variable's month of measurement is December 2019)

We included a one-month lagged measure of our dependent variable as an explanatory factor based on the variable's large and positive autocorrelation and partial autocorrelation apparent over a one-month period. Longer lag periods did not exhibit significant autocorrelation or partial autocorrelation and therefore were excluded. (See Appendix). Similarly, we utilized one-month lagged indicators of the COVID-19 outbreak and the first four price shifts based on their final prediction error (FPE), Akaike's information criterion (AIC), Shwarz's Bayesian information criterion (SBIC), and Hannan and Quinn information criterion (HQIC) values relative to longer lag periods.

Regression Results

Table 7 below shows time-series regression modeling results. The dependent variable is the average daily trips for a given calendar month (e.g., September 2019), including only rides fully within Monrovia. The time period is March 2018 – February 2021.

Our regression model identifies three factors with significant and negative effects on average daily ridership for trips that occurred wholly within Monrovia: (1) the COVID-19 outbreak in March 2020, estimated to have reduced average daily ridership within Monrovia by 334 trips; (2) the third round of adjustments to rider flat fees in June 2019, estimated to have reduced average daily ridership within Monrovia by 108 trips; and (3) the fourth round of adjustments to rider flat fees in November 2019, estimated to have reduced average daily ridership within Monrovia by 222 trips.

It is not surprising that our model identifies the third and fourth price shifts as more impactful on ridership than the first and second shifts. For one, the third shift was responsible for the largest price changes in terms of magnitude, with the cost of both a Classic ride and a Shared ride increased by $1.50. Meanwhile, the fourth shift was the only one that raised the cost of a Shared Metro / Downtown ride. Between the third price shift and the COVID-19 pandemic, Shared Metro / Downtown rides were by far the most popular tier of service. They accounted for 63% of all rides the month before that fourth shift occurred, and they continued to comprise over 50% of all rides up until the pandemic (see Table 6).

Table 7: Time-Series Regression Modeling Results

Explanatory factor	**Estimated coefficient (t-statistic)**
1-month lagged average daily trips	0.665*** (6.90)
1-month lagged COVID-19 start (Mar 2020)	-334.027*** (-5.44)
1-month lagged Price Shift 1	10.397 (0.17)
1-month lagged Price Shift 2	-83.546 (-1.22)
1-month lagged Price Shift 3	-108.060^ (-2.03)
1-month lagged Price Shift 4	-221.955*** (-4.23)
1-month lagged Price Shift 5	omitted (collinearity)
constant	358.667
# of observations	35
F-statistic	121.86
Prob > F	0.0000
Adjusted R-squared	0.9552

Notes: ^ for p < 0.10; * for p>0.05; ** for p<0.01; *** for p<0.001

To reiterate, the estimated coefficients for these price shifts are aggregate in nature. They capture how a change to at least one service tier's pricing – and typically simultaneous changes to multiple tiers' pricing – predicts a change in overall ridership across the three tiers of service. Therefore, they do not represent estimated elasticities of demand for individual service tiers. While the small sample sizes prevent us from conducting such an analysis parametrically, we can estimate elasticities descriptively by comparing the month-over-month percentage change in a tier's ridership fee versus the month-over-month percentage change in its ridership. We present those ordinary estimates in Table 8. As with our regression model (Table 7), these inferred elasticities are calculated using only trips occurring fully within Monrovia, and so they are unaffected by any service area changes.

Table 8: Ordinary Estimates of Service Tiers' Elasticities of Demand

Ridership statistics	Price Shift 1	Price Shift 2	Price Shift 3	Price Shift 4	Price Shift 5
Change in Classic Ridership (gross)	unknown	-877	-4,074	n/a	n/a
Change in Classic Ridership (percentage)	unknown	-8.9%	-60.3%	n/a	n/a
Change in Shared Ridership (gross)	n/a	unknown	-15,346	-1,994	n/a
Change in Shared Ridership (percentage)	n/a	unknown	-61.8%	-23.5%	n/a
Change in Shared Metro / Downtown Ridership (gross)	n/a	n/a	n/a	-4,443	n/a
Change in Shared Metro / Downtown Ridership (percentage)	n/a	n/a	n/a	-22.8%	n/a

Pricing statistics	Price Shift 1	Price Shift 2	Price Shift 3	Price Shift 4	Price Shift 5
Change in Classic Pricing (gross)	$2.50	$0.50	$1.50	n/a	n/a
Change in Classic Pricing (percentage)	600%	16.7%	42.9%	n/a	n/a
Change in Shared Pricing (gross)	n/a	$0.50	$1.50	$0.50	n/a
Change in Shared Pricing (percentage)	n/a	100%	150%	20%	n/a
Change in Shared Metro / Downtown Pricing (gross)	n/a	n/a	n/a	$0.50	n/a
Change in Shared Metro / Downtown Pricing (percentage)	n/a	n/a	n/a	100%	n/a

Elasticity measure*	Price Shift 1	Price Shift 2	Price Shift 3	Price Shift 4	Price Shift 5
Classic Rides	n/a	0.53	1.41	n/a	n/a
Shared Rides	n/a	n/a	0.41	1.17	n/a
Shared Metro / Downtown Rides	n/a	n/a	n/a	0.23	n/a

**Note: Elasticity of demand calculated as: (a) Change in Ridership (percentage), divided by (b) Change in Pricing (percentage)*

Chapter 5 – GoMonrovia and First/Last Mile Mobility: Survey of Residents

This chapter further answers Research Question 1, regarding the sociodemographic profiles of users, while also addressing Research Question 3. Its analysis is grounded in the online survey conducted in May 2021.

Summary of Survey Responses

Data

In total, 203 individuals responded to the on-line GoMonrovia survey across its various distribution channels. Over half of these individuals (130) responded to the survey through the Lyft platform, while another quarter (54) responded to the survey via Facebook, Instagram, or Twitter social media. A small number (19) responded to the survey via the City of Monrovia's newsletter. Again, we note that this is a convenience sample given our short timeframe for collecting survey responses. We recommend that subsequent research incorporates a probability sample to mitigate any potential for bias in summary statistics and estimated coefficients.

Patronage

Regarding both general GoMonrovia travel and travel specifically to/from city's Gold Line Metro station, respondents indicated less frequent use of the program since the start of the COVID-19 pandemic. Whereas only 1% reported never using GoMonrovia prior to the pandemic, just over one-quarter (26%) reported never using the program since March 2020. Similarly, while over one-tenth (11%) of respondents reported using GoMonrovia most days of the week to access the Gold Line station pre-pandemic, only 2% reported such travel behavior during the pandemic. These results are consistent with the "COVID" effect on total ridership volume reported earlier. A full account of respondents' GoMonrovia travel frequencies – in general versus to/from the Gold Line station specifically, and currently versus pre-pandemic – is provided in Table 9.

Sociodemographics

The sociodemographic characteristics of the 203 survey respondents are outlined in Table 10. That table also provides this information for a specific sub-population of interest, namely those respondents who used GoMonrovia at least weekly to travel to/from the Gold Line station in the pre-pandemic period ("frequent Gold Line travelers"). Overall, 82% of respondents have regular access to a personal vehicle, whereas only 70% of frequent Gold Line travelers have such access. About one-quarter (24%) of all respondents live within one mile of the Gold Line station, while fewer than one-tenth (9%) live more than 4 miles away. In comparison, only one-tenth (11%) of frequent Gold Line travelers live within one mile of the station, while 16% live more than 4 miles away.

Additional data on respondents' employment and student statuses, gender, race/ethnicity, age, educational attainment, and income are made available in Table 10. The general population of respondents and frequent Gold Line travelers are similar across most of these other metrics, with the exception being respondents whose household earn $100,000 or more. Those respondents are more represented in the general population (43% of all respondents) than the frequent Gold Line user sub-population (32% of those respondents).

Regression analysis

Regression Models

As articulated in our research questions, we are particularly interested in GoMonrovia as a first/last mile transit mechanism for users of Monrovia's Gold Line Metro station. Although the above statistics help describe the general GoMonrovia user population versus the sub-population of frequent Gold Line travelers, they cannot identify the precise sociodemographic and geographic characteristics that predict whether a respondent uses GoMonrovia as a first/last mile transit mechanism. They also do not indicate the extent to which respondents are substituting GoMonrovia use for personal vehicle use, which represents another of our research questions.

Accordingly, we designed three regression models that collectively assess: (a) the relationships between respondents' individual sociodemographic and geographic characteristics and their usage intensity of GoMonrovia as a first/last mile mechanism (Models 1 and 2); and (b) the relationship between GoMonrovia usage intensity and personal vehicle usage intensity, controlling for a near-identical set of sociodemographic and geographic characteristics (Model 3). We focus on travel behavior reported prior to the pandemic, given its anomalous impact on individuals' preferences for public transit versus personal vehicle usage.

In developing these models, we utilized the ordered probit functional form as shown below. This form is appropriate given that the dependent variables in these models are discrete and hierarchical survey responses (*e.g.*, "never" using GoMonrovia to/from the Metro station versus doing so "most of the week"). We employed relatively parsimonious specifications given the low number of survey responses available for analysis.

Model 1:

Our first model's specification is as follows:

$$firstLastMileUsageIntensity_i^* = \beta_1 * personalVehicleAccess_i + \beta_2 * resDistToMetroLess1Mile_i + \beta_3 * fullTimeTradJob_i + \beta_4 * genderFemale_i + \beta_5 * whiteNonLatinx_i + \beta_6 * age25to64years_i + \beta_7 * age65orOlder_i + \beta_8 * atLeastBA_i + \beta_9 * householdIncAtLeast\$100K_i + \varepsilon_i$$

Where:

- firstLastMileUsageIntensity$_i$* is the latent, unobserved measure that indicates individual *i*'s usage intensity of GoMonrovia as a first/last mile transit mechanism (pre-pandemic) on a continuous scale. It is measured via the categorical variable firstLastMileUsageIntensity$_i$, which is constructed as follows:
  - A value of 0 for a respondent *i* who indicated they never used GoMonrovia to travel to/from the Gold Line station pre-pandemic
  - A value of 1 for a respondent *i* who indicated they used GoMonrovia to travel to/from the Gold Line station either a few times a year or a few times a month pre-pandemic
  - A value of 2 for a respondent *i* who indicated they used GoMonrovia to travel to/from the Gold Lines station either at least once a week or most of the week pre-pandemic

So that:

$$firstLastMileUsageIntensity_i = \begin{cases} 0 \; if \; firstLastMileUsageIntensity_i^* \leq cut_1 \\ 1 \; if \; cut_1 < firstLastMileUsageIntensity_i^* \leq cut_2 \\ 2 \; if \; cut_2 < firstLastMileUsageIntensity_i^* \end{cases}$$

And where:

- personalVehicleAccess$_i$ is an indicator for whether individual *i* reported having regular access to a personal vehicle
- resDistToMetroLess1Mile$_i$ is an indicator for whether individual *i* reported living less than 1 mile away from the Monrovia Gold Line Metro station

- $fullTimeTradJob_i$ is an indicator for whether individual *i* reported having a traditional full-time job
- $genderFemale_i$ is an indicator for whether individual *i* reported identifying as female
- $whiteNonLatinx_i$ is an indicator for whether individual *i* reported identifying as White alone, non-Latinx
- $age25to64years_i$ is an indicator for whether individual *i* reported being between 25 and 64 years old in early 2020 (pre-pandemic)
- $age65orOlder_i$ is an indicator for whether individual *i* reported being at least 65 years old in early 2020 (pre-pandemic)
- $atLeastBA_i$ is an indicator for whether individual *i* reported having attained at least a Bachelor's degree in terms of their education
- $householdIncAtLeast\$100K_i$ is an indicator for whether individual *i* reported living in a household with an annual pre-tax income of at least $100,000

We modified the above specification in two ways to develop our other two regression models.

Model 2:

For the second model, we considered an alternative measure for usage intensity of GoMonrovia as a first/last mile transit mechanism. More specifically, we also measured $firstLastMileUsageIntensity_i$ as a share measure instead of a frequency measure as follows:

- A value of <u>0</u> for a respondent *i* who indicated that <u>0%</u> of their GoMonrovia travel was to/from the Gold Line station pre-pandemic
- A value of <u>1</u> for a respondent *i* who indicated that <u>1-50%</u> of their GoMonrovia travel was to/from the Gold Line station pre-pandemic
- A value of <u>2</u> for a respondent *i* who indicated that <u>51-100%</u> of their GoMonrovia travel was to/from the Gold Line station pre-pandemic

Model 3:

For the third model, we leveraged the specification above to explore whether respondents were substituting GoMonrovia usage for personal vehicle usage pre-pandemic. To do so, we first constructed a new dependent variable named personalVehicleUsageIntensity as follows:

- A value of <u>0</u> for a respondent *i* who indicated they <u>never</u> used a personal vehicle pre-pandemic

- A value of 1 for a respondent *i* who indicated they used a personal vehicle either a few times a year or a few times a month pre-pandemic
- A value of 2 for a respondent *i* who indicated they used a personal vehicle either at least once a week or most of the week pre-pandemic

Next, we constructed a new independent variable, $useGoMonroviaWeekly_i$, which indicates whether respondent *i* reported using GoMonrovia at least weekly pre-pandemic. Finally, we omitted the independent variable $personalVehicleAccess_i$, as it was unsurprisingly an almost perfect predictor for usage intensity of a personal vehicle.

For all of the above, we note a consistent limitation. In particular, respondents indicated their sociodemographic and geographic characteristics as they are presently, which we used to predict their travel behavior prior to the pandemic. Nonetheless, it is likely that some respondents' characteristics shifted over the last year and a half. While we adjusted respondents' reported ages to reflect that approximately year-long gap, we could not make informed adjustments to other characteristics (*e.g.*, employment status). Conducting additional survey work after the pandemic subsides would eliminate this limitation.

Regression Results

The results of the three model specifications outlined above are provided in Table 11. Because estimated coefficients of ordered probit models are not intuitive in their interpretation, we focus on the signs and levels of significance for the model estimates. In Models 1 and 2, we find consistent evidence that those with personal vehicle access were significantly less likely to use GoMonrovia to access the city's Metro station pre-pandemic. A consistently significant and negative relationship is also evident for those respondents residing less than 1 mile from the station, as well as those 65 years and older (relative to those younger than 25).

Looking at Model 2 alone, which measures the usage intensity of GoMonrovia to/from the station on a share basis, we find evidence for other significant factors as well. For one, those identifying as female were significantly less likely to use GoMonrovia as a last/mile mechanism (on a share basis) pre-pandemic. The same holds true for those aged 25-64 years old as well (again, relative to those younger than 25). In addition, Model 2 indicates that respondents with at least a Bachelor's degree were significantly more likely to use GoMonrovia as a last/mile mechanism on that share basis. Admittedly, the significance of that explanatory factor is at the $p<0.10$ level.

Finally, we found no predictive power for three factors in terms of respondents' usage intensity of GoMonrovia to/from the Gold Line station. That is, three factors were consistently insignificant predictors across Models 1 and 2. Those three were: possessing a traditional full-time job; identifying as White alone, non-Latinx (relative to other racial/ethnic identities); and having a household annual income of $100,000 or above (relative to earnings below that threshold).

Unlike Models 1 and 2, Model 3 predicts a respondent's usage intensity of a personal vehicle pre-pandemic. As described above, the explanatory factors included are virtually identical to those contained within Models 1 and 2, with one notable adjustment. In some tension with the literature (Boarnet et al., 2020; Guerra, Cervero, & Tischler, 2012), we find that respondents living within one mile of Monrovia's Gold Line station used a personal vehicle significantly more frequently pre-pandemic than those beyond one mile. Unlike the literature, however, we are measuring vehicle use frequency rather than vehicle miles traveled (VMT). We also find that respondents with a traditional full-time job used a personal vehicle significantly more frequently pre-pandemic, as did those identifying as White alone, non-Latinx and those in households earning above $100,000. The significance of income is likely attributable to the fact that higher-income households can afford a personal vehicle to a greater degree than other households.

More vitally, in terms of our research question of interest – are Monrovia households substituting GoMonrovia use for personal vehicle use? – we fail to find substantial evidence of that relationship. The estimated coefficient for our explanatory factor of interest ("Use GoMonrovia at least weekly") is insignificant. Still, the coefficient's estimated sign is negative, and its z-score is close to the 10% significance threshold ($p=0.119$). Therefore, it is quite possible that an expanded survey post-pandemic would reveal a significant substitution effect.

TABLE 9: Summary of GoMonrovia Use Reported By Survey Respondents

	Frequency of use, overall		Frequency of use, to/from Gold Line Metro station only	
	2021	Pre-COVID	2021	Pre-COVID
TOTAL				
Never	26%	1%	61%	23%
Few times throughout year	52%	30%	28%	34%
Few times a month	11%	21%	5%	21%
At least once a week	7%	23%	3%	11%
Most days of the week	4%	25%	2%	11%
	100%	100%	100%	100%
Lyft				
Never	18%	1%	60%	20%
Few times throughout year	56%	35%	28%	35%
Few times a month	13%	19%	5%	21%
At least once a week	7%	21%	4%	13%
Most days of the week	6%	25%	3%	11%
	100%	100%	100%	100%
Facebook, Instagram, Twitter				
Never	35%	0%	56%	28%
Few times throughout year	48%	17%	33%	30%
Few times a month	7%	29%	9%	22%
At least once a week	7%	26%	2%	7%
Most days of the week	2%	29%	0%	13%
	100%	100%	100%	100%
Newsletter				
Never	53%	0%	84%	32%
Few times throughout year	37%	22%	11%	37%
Few times a month	5%	22%	0%	21%
At least once a week	5%	44%	5%	5%
Most days of the week	0%	11%	0%	5%
	100%	100%	100%	100%

TABLE 10: Summary of Sociodemographic and Geographic Characteristics, All Respondents Versus Those Respondents Who Used GoMonrovia to/from Gold Line At Least Weekly Pre-pandemic

Share of respondents	All respondents				Respondents who used GoMonrovia to/from Gold Line at least weekly, Pre-COVID			
	Lyft	Facebook, Instagram, Twitter	Newsletter	Total	Lyft	Facebook, Instagram, Twitter	Newsletter	Total
…with personal vehicle access	78%	85%	100%	82%	65%	82%	100%	70%
… living < 1 mile from Monrovia Metro	25%	19%	32%	24%	13%	9%	0%	11%
… living 1 - 4 miles from Monrovia Metro	62%	80%	68%	67%	65%	91%	100%	73%
… living > 4 miles from Monrovia Metro	14%	7%	0%	9%	23%	0%	0%	16%
… with a traditional full-time job	48%	63%	58%	53%	39%	73%	100%	50%
… learning as part- or full-time student	12%	13%	0%	11%	16%	9%	0%	14%
… identifying as female	58%	47%	79%	57%	62%	45%	100%	60%
… identifying as Latinx and single race	35%	39%	16%	34%	37%	36%	50%	37%
… identifying as Black American, non-Latinx	5%	0%	11%	4%	10%	0%	0%	7%
… identifying as Asian American/Pacific Islander, non-Latinx	14%	15%	0%	13%	13%	18%	0%	14%
… identifying as White, non-Latinx	46%	46%	74%	49%	40%	45%	50%	42%
… younger than 25 years old	6%	11%	0%	7%	7%	0%	0%	5%
… between 25 & 44 years old	39%	55%	32%	42%	37%	91%	50%	51%

	All respondents				Respondents who used GoMonrovia to/from Gold Line at least weekly, Pre-COVID			
… between 45 & 64 years old	39%	28%	47%	37%	40%	9%	50%	33%
… 65 years old or older	16%	6%	21%	14%	17%	0%	0%	12%
… with at least a Bachelor's degree	62%	67%	74%	64%	53%	73%	50%	58%
… with annual income < $25,000	17%	7%	5%	13%	19%	0%	0%	14%
… with annual income $25,000 - $49,999	19%	6%	11%	15%	23%	18%	0%	20%
… with annual income $50,000 - $99,999	28%	30%	26%	29%	39%	27%	0%	34%
… with annual income $100,000 or above	35%	57%	58%	43%	19%	55%	100%	32%

TABLE 11: Summary of Ordered Probit Regression Results for Three Model Specifications

T-statistics shown in parentheses below coefficient estimates

^ for p<0.10; * for p<0.05; ** for p<0.01; *** for p<0.001

	(1) Go Monrovia to Gold Line Frequency (Pre-COVID)	(2) Go Monrovia to Gold Line Share (Pre-COVID)	(3) Personal Vehicle Use Frequency: Pre-COVID
Personal vehicle access	-0.56* (-2.18)	-0.49^ (-1.79)	
Use Go Monrovia at least weekly			-0.35 (-1.56)
Distance from home to Monrovia Metro: less than 1 mile	-0.41* (-2.23)	-0.59** (-3.16)	0.71** (2.64)
Traditional full-time job	0.27 (1.41)	0.18 (1.00)	0.50* (2.01)
Female	-0.26 (-1.57)	-0.37* (-2.10)	-0.03 (-0.13)
White alone, non-Latinx	0.00 (0.01)	0.24 (1.33)	0.71** (2.78)
Age 25 - 64 years (Reference: younger than 25 years old)	-0.29 (-1.02)	-0.83** (-2.83)	0.36 (0.90)
Age 65 or older (Reference: younger than 25 years old)	-0.76^ (-1.92)	-1.13** (-2.91)	0.35 (0.68)
Educational attainment of at least a Bachelor's degree	0.13 (0.66)	0.31^ (1.72)	-0.05 (-0.19)
Household annual income $100,000 or above	-0.15 (-0.79)	-0.002 (-0.01)	0.83*** (3.35)
cut1	-1.63	-1.83	0.20
cut2	-0.03	-0.79	0.78
# of observations	195	195	146
Wald χ2	20.26	36.87	42.42
Prob > χ2	0.0164	0.0000	0.0000

Chapter 6 – Conclusion and Discussion

Research Contribution and Limitations

We conducted an in-depth case study of the GoMonrovia program, a PPP between the TNC Lyft and the City of Monrovia, to investigate whether such a partnership can help enhance transit accessibility for low-income and/or transit-dependent populations in a suburban context. Our focus was the first/last mile issue, as we looked in particular at the segment of GoMonrovia users who use the program to travel to and from the Downtown Monrovia Metro station. The first/last mile issue is known to significantly impede transit adoption (UTA, 2015), a major challenge in car-dependent suburban communities that have recently been connected to rail transit, and also to limit transit access to opportunities in ways that disproportionately affect disadvantaged populations (Boarnet et al., 2017). This study therefore adds to recent scholarship interested in exploring the socioeconomic inequities in using TNCs as a first/last mile solution (Reck & Axhausen, 2020).

A major challenge for case study research lies in generalizability. Yet we believe that lessons learned from the GoMonrovia case are informative for other suburban communities, especially of the Southwest, that have recently become accessible via rail transit. Incorporated in 1887, the City of Monrovia is one of the oldest suburban communities of the Los Angeles area. Interestingly, its sociodemographic characteristics align quite well with that of the State of California, with a median age of 39, a median annual income just over $71,000, and a relatively diverse population (41% Hispanic, 35% non-Hispanic White, 14% Asia, and 5% non-Hispanic Black). Furthermore, the sprawled urban form is typical of most suburban communities, characterized by a predominance of single-family homes (66%) and very high car dependence as a result (77% of the Monrovia population commutes by car; only 6% of the households do not own a car). Finally, the City of Monrovia has experienced two major transportation trends that have unfolded nationwide in recent years: the rise of on-demand ride-hailing services provided by TNCs, especially Lyft and Uber, and 2) massive investments in transit systems extensions branching out farther out from dense urban cores – the City of Monrovia was connected to the LA Metro system in 2016.

In sum, the fact that the City of Monrovia launched in 2018 a partnership with Lyft to provide residents with subsidized on-demand rides, especially to the downtown area where the Metro station is located, made the City a relevant case to explore whether such a PPP can address the first/last mile issue. Recent research has posited TNCs as a potential solution to address the first/last mile issue (Clewlow et al., 2017; Kaufman et al., 2015; Schaller, 2019). Yet, to the best of our knowledge, only a couple of studies (Curtis et al., 2019; Sather, 2018) had focused on the suburban context in particular, where the challenge of retrofitting the unsustainable car-dependent travel behaviors and resulting urban form is particularly high. Meanwhile, the challenges and the promises of TNCs for enhancing equitable access to opportunities have recently started to garner scholarly interest (e.g., Agrawal et al., 2020; Deakin et al., 2020; Lazarus et al., 2021); our contribution is built on this recent scholarship by focusing on the promises of TNCs as a first/last mile solution, that is to say, of TNCs + transit, in regard to equitable access to opportunities.

Our empirical analyses drew on two complementary datasets: 1) 2018-2021 trip data provided by Lyft and 2) individual users data collected from a survey by the research team in May 2021. While the trip data was silent on the background characteristics of the users, it provided a complete overview of ridership trends since the beginning of the program. Conversely, the self-collected survey data provided insight on the user characteristics but suffered from three major limitations: 1) a relatively small sample size (N = 203); 2) a convenience sample, that is not representative of the population of GoMonrovia users or users in general; 3) responses were collected in the midst of the COVID-19 pandemic; the program operated in reduced capacity, people's circumstances were most likely impacted by the lock-down crisis and its after-effects, and responses about pre-pandemic travel behaviors were based on more-than-one-year-old memories. To overcome these limitations, we have recommended collecting new data from a post-pandemic probability sample for future studies.

Our first research question was about the sociodemographic profile of the GoMonrovia users, especially those who use the program as a first/last mile option. First of all, one striking fact about the GoMonrovia program is its overwhelming success and ubiquitous use from the inception, as illustrated by the fact that there have been nearly as many beneficiaries of the GoMonrovia promo code (i.e., people downloading it in the Lyft app) as there are residents in the City of Monrovia. This finding alone indicates that heavily subsidized ride-hailing rides potentially attract users from across the board, and not only young educated millennials who live in dense and mixed-used urban cores, which previous literature had described as the primary TNC users (e.g., Circella et al., 2018; Clewlow et al., 2017; Grahn et al., 2020a). We found, furthermore, as expected that those who use GoMonrovia as first/last mile solution are relatively more likely to be carless; to live beyond one mile from the station; and to be in prime working age (25 -44 years old). These findings support the idea that subsidized on-demand rides hold promise to enhance equitable access to opportunities (especially jobs) in car-dependent suburban contexts.

Nevertheless, partly due to data-related limitations mentioned above, we could only provide partial answers to our second research question, about the extent to which the GoMonrovia program meets the first/last mile mobility needs of Monrovia residents, especially those of low-income and/or transit dependent residents. A cluster analysis of Monrovia's census block groups, drawing on ACS data, coupled with our mapping of the trip data, indicated that areas with a predominance of "young Latinx families with children" seem to generate more trips to/from the downtown area where the station is located. Yet, we have no certainty that these trips qualify as first/last mile trips. As for the analyses based on the survey data, for example, there were too few observations in the lower income brackets to include them as meaningful categories in regression analyses. The results showed that households whose annual income is less than $100,000 are indeed more likely to use the GoMonrovia program; this cut-off point is too high to consider households below it as low-income.

Our regression analyses showed that women were significantly less likely to use GoMonrovia as a first/last mile solution. While gender inequities were not the focus of this research, this finding calls for further investigations about gender and TNCs.

Our third research question was about the impacts of the GoMonrovia program on transit ridership and its potential to reduce automobile dependence, thus speaking to the unresolved debate on the complementarity of substitution effects between TNCs and more conventional transportation modes (e.g., Baber & Burtch, 2020; Dialo et al., 2021; Erhardt et al., 2019; Graehler et al. 2019; Malalgoda & Lim, 2019). Our study brought attention to the suburban context, which is especially relevant to these debates, considering the sizable challenge of retrofitting the urban form through sustainable travel behaviors. Nevertheless, further studies will be needed to reach firm conclusions. At best, our findings suggested but could not confirm that the GoMonrovia program may render transit more attractive. Most our survey respondents seemed to suggest that indeed the access to Downtown Monrovia metro station had become more convenient (62%). However, half of them indicated that their overall travel time using public transit had remained the same, or even increased, and that their wait times had not improved either – See Appendix U. Unfortunately, we were not able to access on-boarding and off-boarding data at the Downtown Monrovia Metro station (unfortunately LA Metro does not collect such data), so we could not assess whether the GoMonrovia program starting in 2018 was associated with an increase in rail transit ridership compared to the previous two-year period, after the Metro station opened in 2016. Finally, we failed to find significant evidence that Monrovia residents substituted GoMonrovia rides for individual trips using their private vehicles.

Finally, our fourth and last research question was about the lessons learned from the GoMonrovia program, and whether and how this model should be replicated in other suburban communities to promote equitable and sustainable mobility. The remainder of this conclusion chapter will focus on answering this question.

Lessons Learned for Replication

Considered collectively, what does our research indicate about the feasibility and replicability of GoMonrovia in other suburban communities? One answer is that such a program seems extremely successful when prices are kept very low but patronage seems quite sensitive to price increases. The GoMonrovia program was losing users even before the pandemic, with sudden drops in ridership associated with price increases used to defray the program's impact on the City's financial standing. Between June 2019 and February 2020, monthly ridership decreased from 28,924 to 22,747 – equivalent to a 21% loss – without any commensurate change in service area. In fact, during that same period, Monrovia only marginally increased the cost of a shared ride (from $2.50 to $3.00) and the cost of a shared ride to/from the Metro/Downtown area (from $0.50 to $1.00).

That latter change in cost, for first/last mile-oriented travel, is particularly salient to this report. While our findings suggest some households are significantly more likely to use GoMonrovia as a first/last mile mechanism, household income is not one of our models' notable predictors. Moreover, of the 203 households that responded to our survey, 85 (*i.e.*, 42%) said they would ride the Gold Line at least weekly if GoMonrovia shared rides to/from the Metro were free. In comparison, only 22% of respondents said they used GoMonrovia to access the Gold Line station at least weekly prior to the pandemic. For the same pre-pandemic time period, only 32% of respondents said they rode the Gold Line at least weekly.

In general, GoMonrovia's cost to consumers appears to be a direct determinant of its viability going forward. Additional comments provided by survey respondents corroborate this conclusion, with multiple users noting that the program was too expensive. Yet this consideration of cost applies to GoMonrovia's feasibility as a first/last mile mechanism too. If GoMonrovia is to become an extension of the city's Metro station, and if it is to improve the transit capabilities of low-income households especially, then keeping the cost of trips to/from the Metro station low is unquestionably key. This means that the City may need to rethink how the program is situated within its general financial plan. Additional public support may be necessary for GoMonrovia to expand access in an equitable way.

That said, the attractiveness of Los Angeles County's Metro system is a distinct and crucial determinant of GoMonrovia's feasibility as a first/last mile mechanism. Multiple survey respondents indicated either stopping their use of GoMonrovia or using it less frequently due to safety concerns about riding Metro or issues with the Metro's connectivity to jobs. Mitigating these issues is beyond the City of Monrovia's influence, but they have clear implications for the replicability of GoMonrovia in other parts of LA County and Southern California overall. In addition, the City of Monrovia has no control over Metro system pricing or hours of service, both variables that further drive the attractiveness of GoMonrovia as a first/last mile travel mechanism.

On top of the Metro system's characteristics, it is worth considering the role that the region's Metrolink commuter rail system plays too. The El Monte Metrolink station is located only 2 miles south of Monrovia's southernmost portion, and it is less than 5 miles from the Monrovia Metro station. The typical travel time via Metrolink from El Monte to downtown Los Angeles' Union Station is 22 minutes.[4] The typical travel time via Metro from Monrovia to Union Station is 38 minutes.[5] Given that disparity in commute time, along with potential differences in perceived safety, it is possible that many Monrovia residents who commute to downtown Los Angeles for work do so via Metrolink rather than Metro. The San Bernardino Metrolink line, which includes the El Monte station,

[4] https://metrolinktrains.com/schedules/?type=line&lineName=San+Bernardino+Line

[5] https://media.metro.net/documents/9a582fb5-68f7-44e4-903b-b170294abd7e.pdf

also accesses an array of communities and employment centers that the LA Metro Gold Line does not.

With these additional considerations and our findings in mind, we conclude this report with a few concrete policy recommendations. These recommendations are oriented around improving GoMonrovia's potential as a popular and equitable first/last mile travel mechanism. In addition to the recommendations discussed below, we stress the value of an augmented survey post-pandemic – ideally, one that collects information from Monrovia residents regardless of their GoMonrovia usage.

Policy Recommendations

Policy Recommendation #1: Fully subsidize GoMonrovia trips to/from the Monrovia Metro station. Our analysis indicates that the City's subsidies have been effective at promoting GoMonrovia usage, with several large month-over-month declines in ridership associated with reductions in subsidy amounts (*see* Tables 6 and 7). At the same time, we generate no evidence that low-income households are more likely to use GoMonrovia, including to access the Gold Line Metro station. Based on our results, deeply subsidizing GoMonrovia trips to/from the Metro station would: (1) boost overall GoMonrovia usage, (2) boost usage of the program as a first/last mile mechanism, and (3) make the program more accessible to low-income households and therefore more equitable in nature.

In addition, we recommend that the City and other authorities conceptualize GoMonrovia travel as one component of the "chained" trips that many households make. As Reck and Axhausen (2020) argue, providing GoMonrovia riders with discounts on LA Metro, Foothill Transit, and/or Metrolink travel could expand usage of GoMonrovia as a first/last mile mechanism and spur greater usage of the region's overall public transit infrastructure.

Policy Recommendation #2: Partner with LA Metro to identify synergies between the GoMonrovia program and Metro initiatives. GoMonrovia's success as a first/last mile mechanism hinges on residents' willingness to ride the LA Metro system. As a result, we believe the City of Monrovia should engage Metro officials in further configuring the program. Such a relationship could provide an array of benefits. For one, our survey results could spur Metro to enhance the perceived safety of its system, which in turn could encourage greater usage of the GoMonrovia program. Second, Metro may be able to share information on the first/last mile strategies employed by other jurisdictions; a salient example is the City of Los Angeles, which has emphasized first/last mile connectivity for its Metro rail stations.[6] Third, discussions with Metro may help disseminate information on GoMonrovia to other communities, therefore encouraging the program's replication throughout Southern California.

Policy Recommendation #3: Expand GoMonrovia's service area to include the El Monte Metrolink station. According to the most recent public data available (from 2019), average weekday ridership for the Metrolink San Bernardino line, which includes the El Monte station, was approximately 10,000 individuals boarding across 14 stations. Those figures are equivalent to about 700 riders per station.[7] For comparative purposes, average 2019 weekday ridership for the LA Metro Gold Line, which includes the Monrovia station, was approximately 47,500 individuals[8] boarding across 27 stations. That is equivalent to about 1,750 riders per station.

Based on those figures, we believe the City of Monrovia could markedly improve first/last mile connectivity for its residents by expanding its service area to include the El Monte Metrolink station.

[6] https://www.metro.net/projects/first-last/

[7] https://metrolinktrains.com/globalassets/about/agency/facts-and-numbers/quarterly-fact-sheet-q3-fact-sheet-2018-2019.pdf

[8] https://isotp.metro.net/MetroRidership/IndexRail.aspx

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Data Management Plan

Products of Research

The research team collected data from multiple public and private sources and supplemented it with a survey.

- We used 2018 American Community Survey (ACS) 5-year data from the Census Bureau.
- The City of Monrovia provided Lyft's monthly ridership data and associated trip characteristics for a period of three years from March 2018 to February 2021.
- We surveyed GoMonrovia users over a two-week period, May 14 to 28, 2021 through multiple channels including outreach to Lyft's rider database (15,000 riders), and City's newsletter and social media (Facebook, Instagram, and Twitter).

Data Format and Content

The format and content of each file type is as follows:

- 2018 ACS: Excel; Demographic, Socio-economic, Transportation, and Housing Data
- Lyft's Monthly Ridership Data (March 2018 to February 2021): Excel; Passenger ID, Transaction ID, Month/Year, Day of Travel, Dispatch Method, Origin and Destination (Census Tract/Block), Trip Time Period, Trip Length, Trip Duration, Trip Cost, and Trip Subsidy
- Survey of GoMonrovia Users: Excel; Information from 203 survey respondents on their GoMonrovia Experience, Travel Habits, and Personal Background

Data Access and Sharing

The general public can access data by getting requisite permissions from Lyft and the City of Monrovia. ACS Census data is available in the public domain.

Reuse and Redistribution

GoMonrovia monthly ridership data is available for reuse and redistribution contingent on the applicant obtaining a written permission from Lyft, Inc. and the City of Monrovia. Survey data collected by USC is also available contingent on the applicant obtaining a written permission from Lyft, the City of Monrovia, and USC.

Appendices

Appendix A: Lyft Trip Data

Table A1: Summary of Lyft Trip Data Provided – Raw Counts by Year and Month

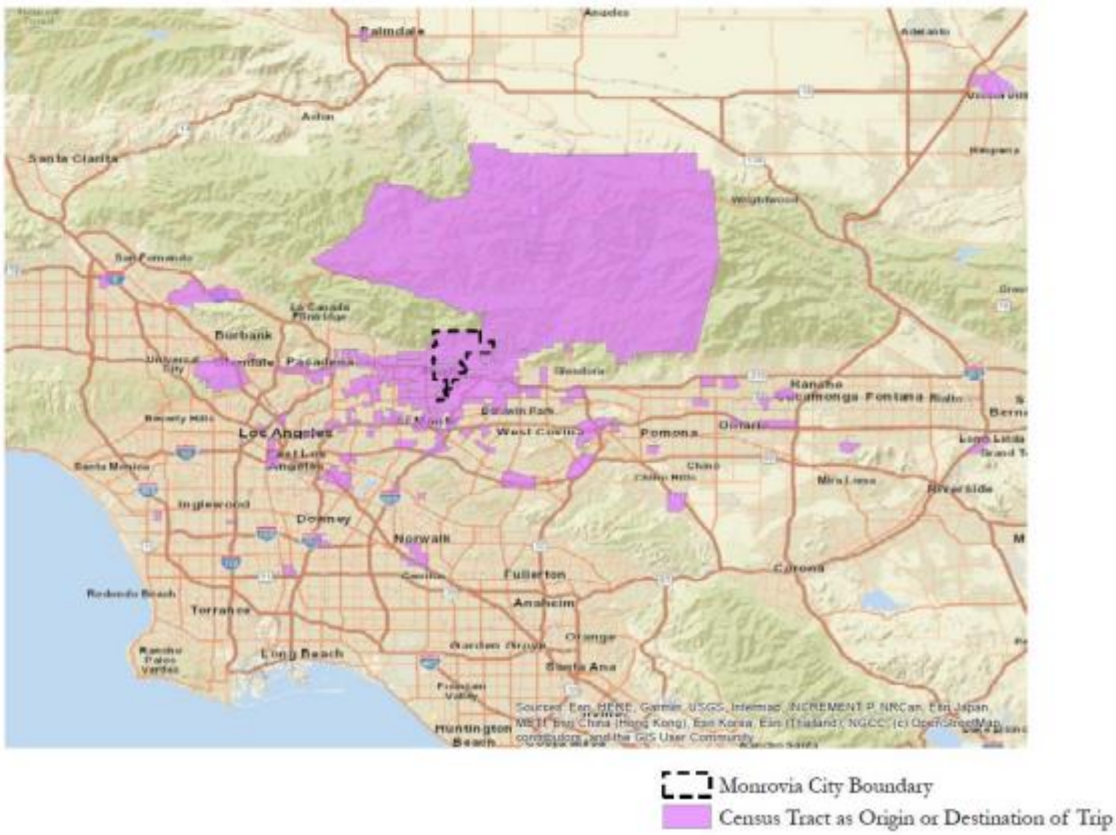
All Trips (Concierge + Coupon)					
	Year				
Month	**2018**	**2019**	**2020**	**2021**	**Total**
1	*n/a*	74,396	24,861	4,753	**104,010**
2	*n/a*	72,481	23,979	4,837	**101,297**
3	5,140	78,819	15,062	*n/a*	**99,021**
4	20,706	46,043	4,867	*n/a*	**71,616**
5	32,969	47,952	5,268	*n/a*	**86,189**
6	41,874	30,517	6,309	*n/a*	**78,700**
7	54,094	31,578	6,038	*n/a*	**91,710**
8	67,402	33,354	5,495	*n/a*	**106,251**
9	61,734	31,003	5,765	*n/a*	**98,502**
10	67,388	32,614	6,174	*n/a*	**106,176**
11	65,864	25,680	5,470	*n/a*	**97,014**
12	70,409	23,818	5,147	*n/a*	**99,374**
Total	487,580	528,255	114,435	9,590	**1,139,860**

Table A2: Summary of Lyft Trip Data by Dispatch Method

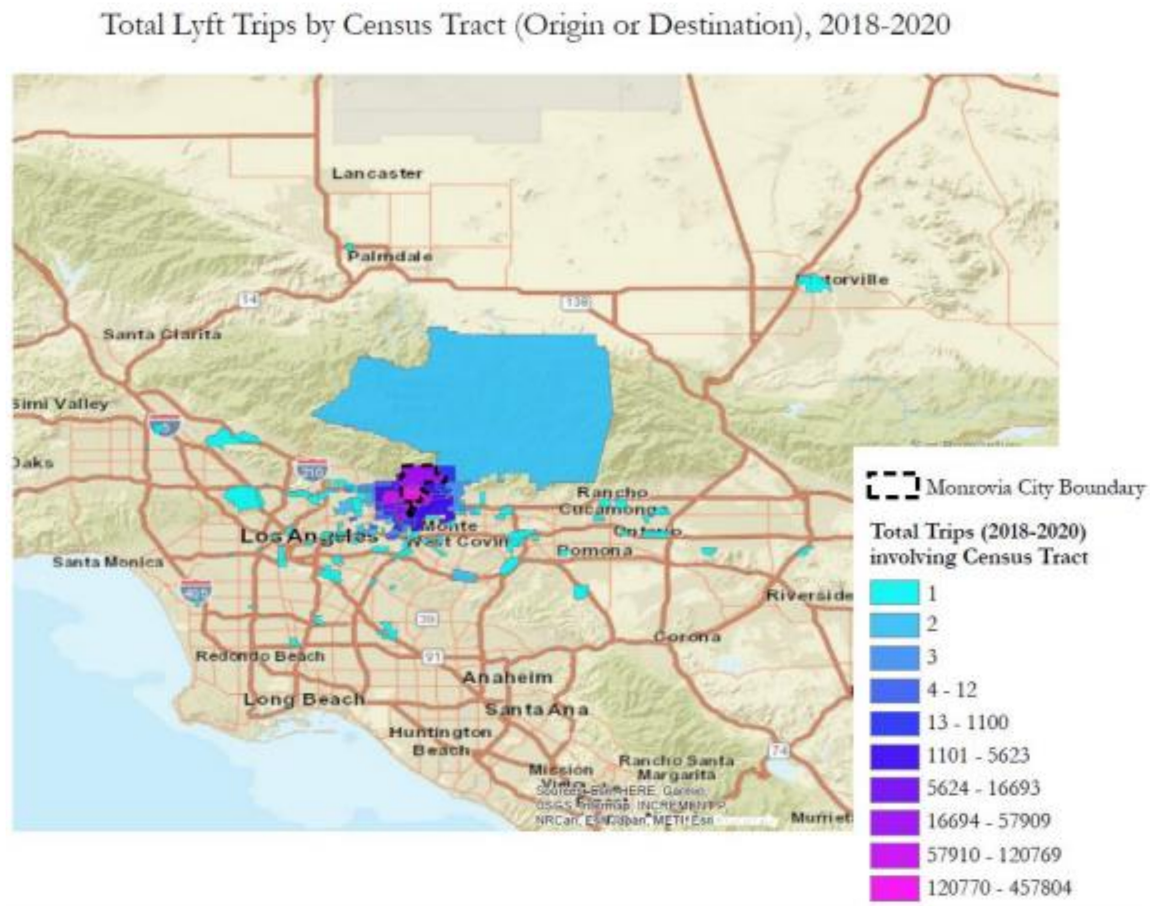
	Dispatch Method		
Trip Type	**Concierge**	**Coupon**	**Total**
Monrovia Metro or Downtown	8,335	108,279	**116,614**
Otherwise within Monrovia	66,782	864,202	**930,984**
Outside Monrovia	1,008	91,413	**92,421**
Total	76,125	1,063,894	**1,140,019**

Appendix B: Spatial Location of All GoMonrovia Lyft Trips, 2018 – 2020

All Lyft Trips, Origin and Destination Tracts Highlighted

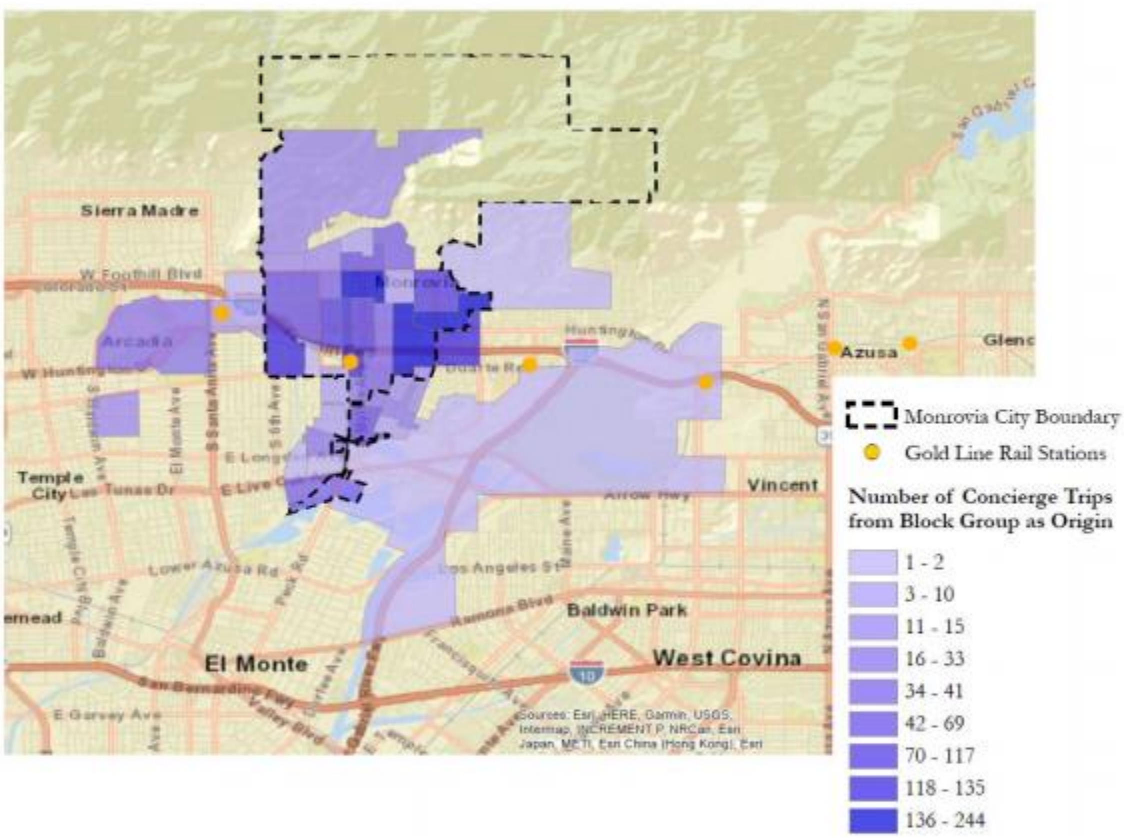


Appendix C: Heat Map of All Lyft Trips, 2018 – 2020



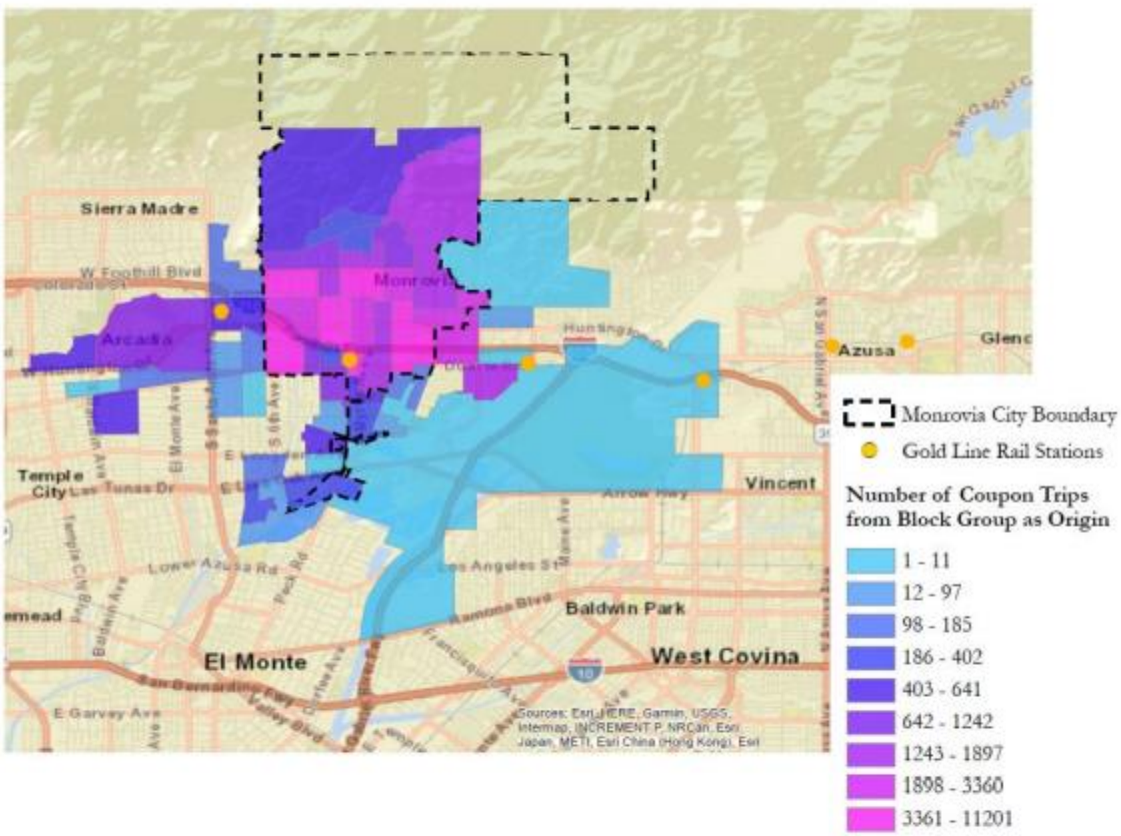
Appendix D: Heat Map of Concierge Trips by Block Group Origin, 2020

Concierge Lyft Trips in 2020, Origin Block Groups Shaded by Frequency



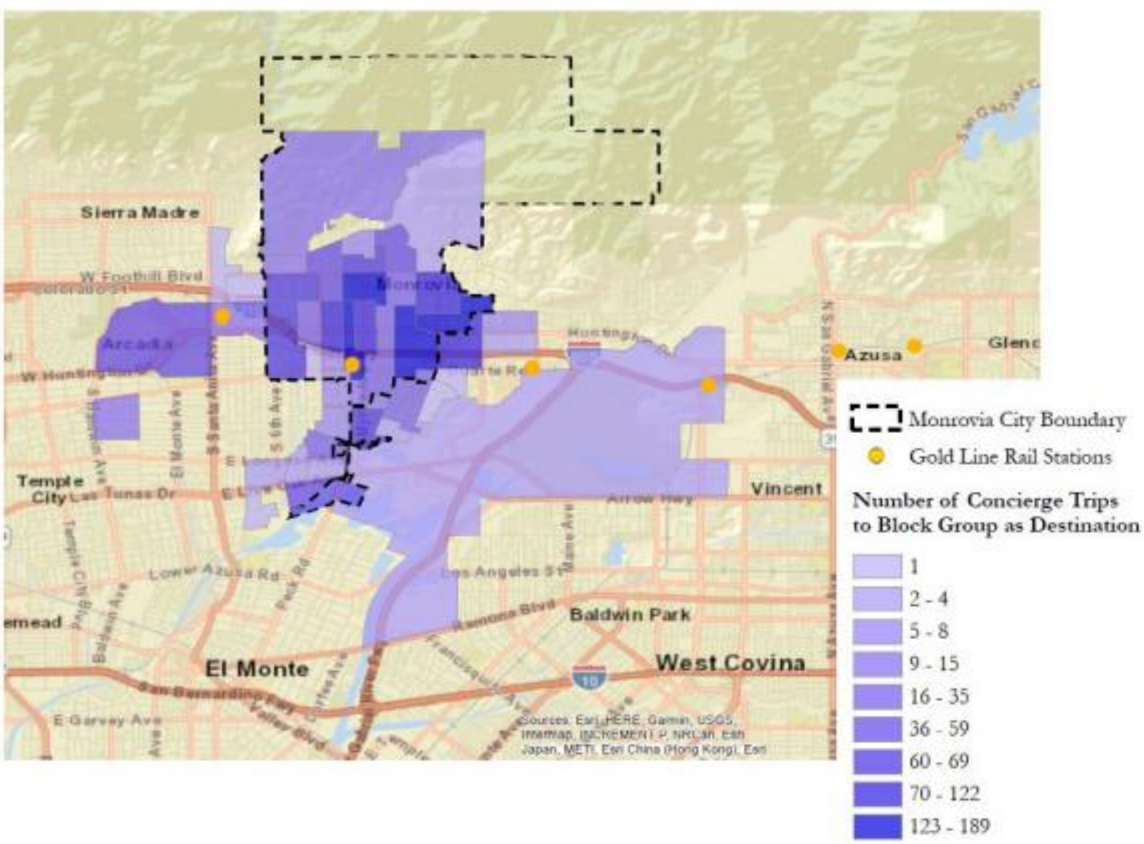
Appendix E: Heat Map of Coupon Trips by Block Group Origin, 2020

Coupon Lyft Trips in 2020, Origin Block Groups Shaded by Frequency

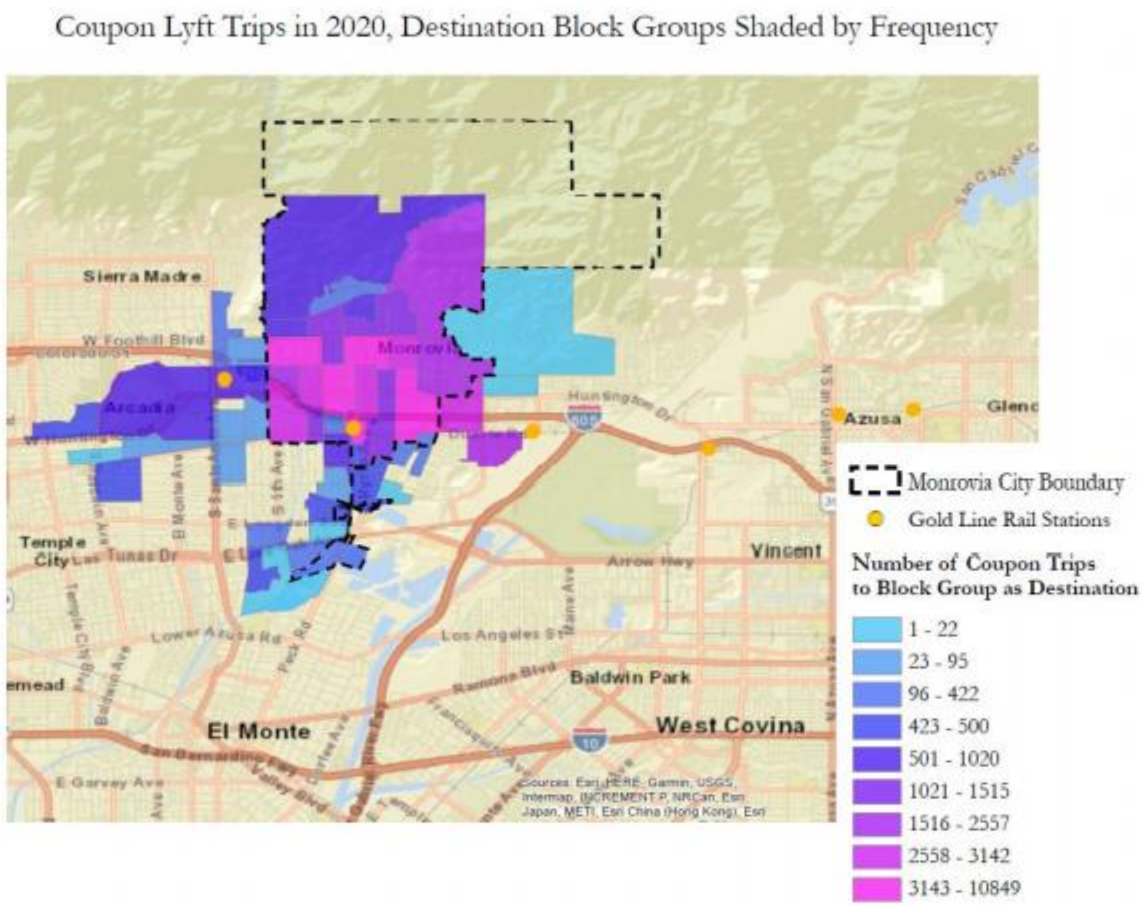


Appendix F: Heat Map of Concierge Trips by Block Groups Destination, 2020

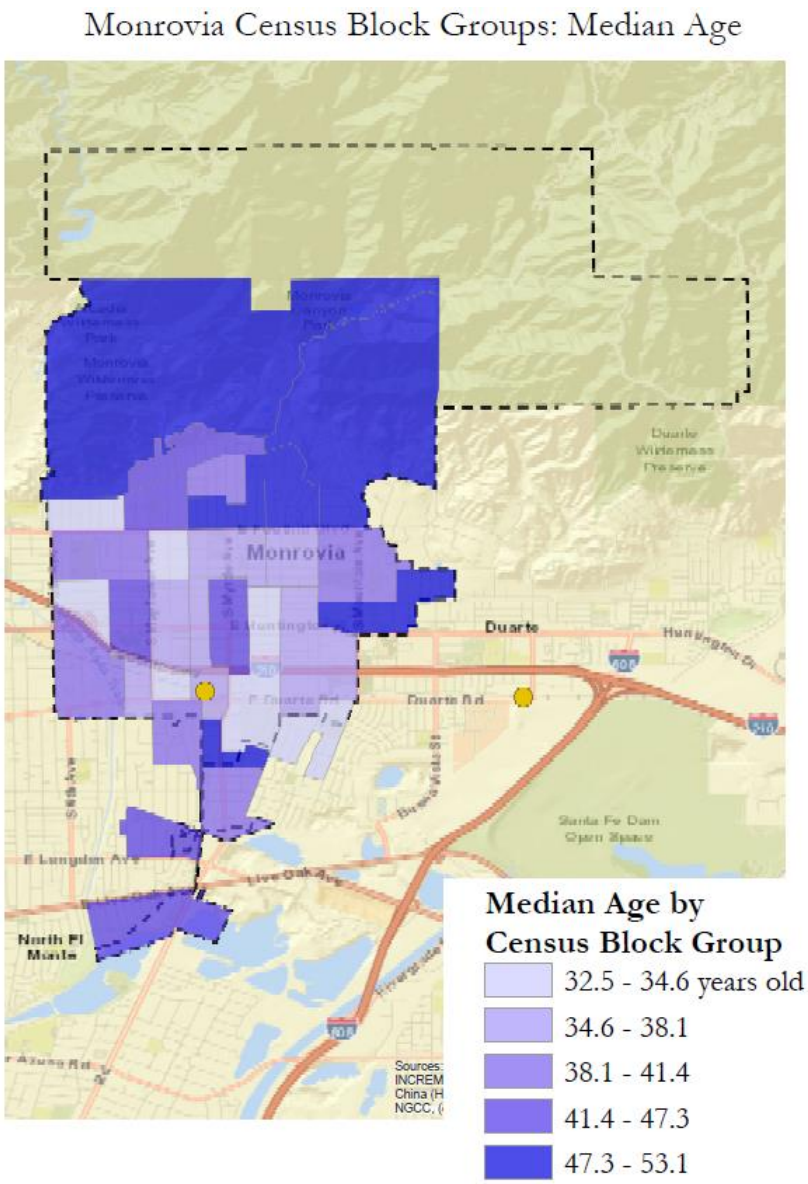
Concierge Lyft Trips in 2020, Destination Block Groups Shaded by Frequency



Appendix G: Heat Map of Coupon Trips by Block Group Destination, 2020

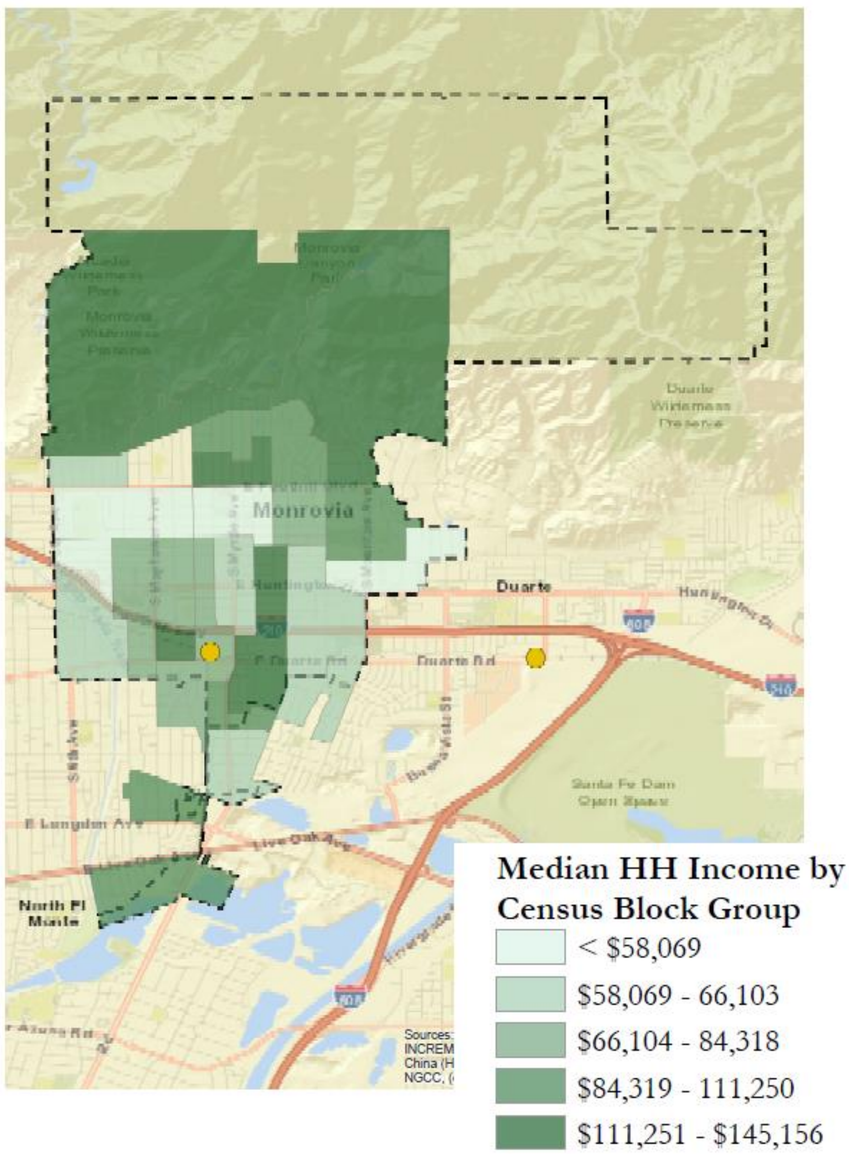


Appendix H: Median Age by Block Group, 5-Year 2018 ACS



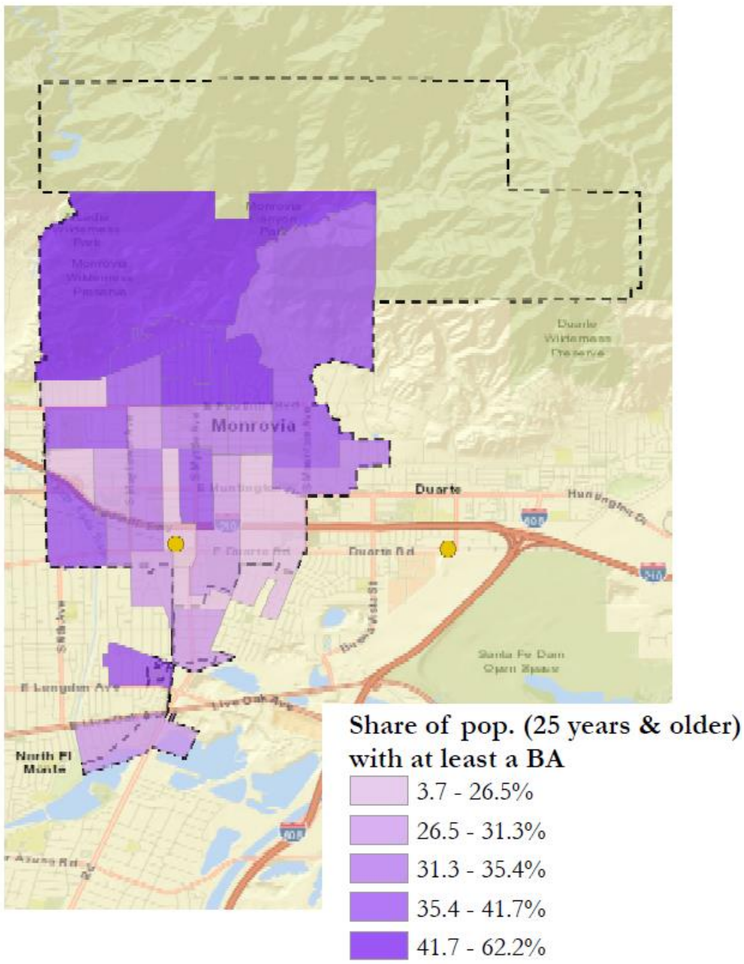
Appendix I: Median Household Income by Block Groups, 5-Year 2018 ACS

Monrovia Census Block Groups: Median Household Income



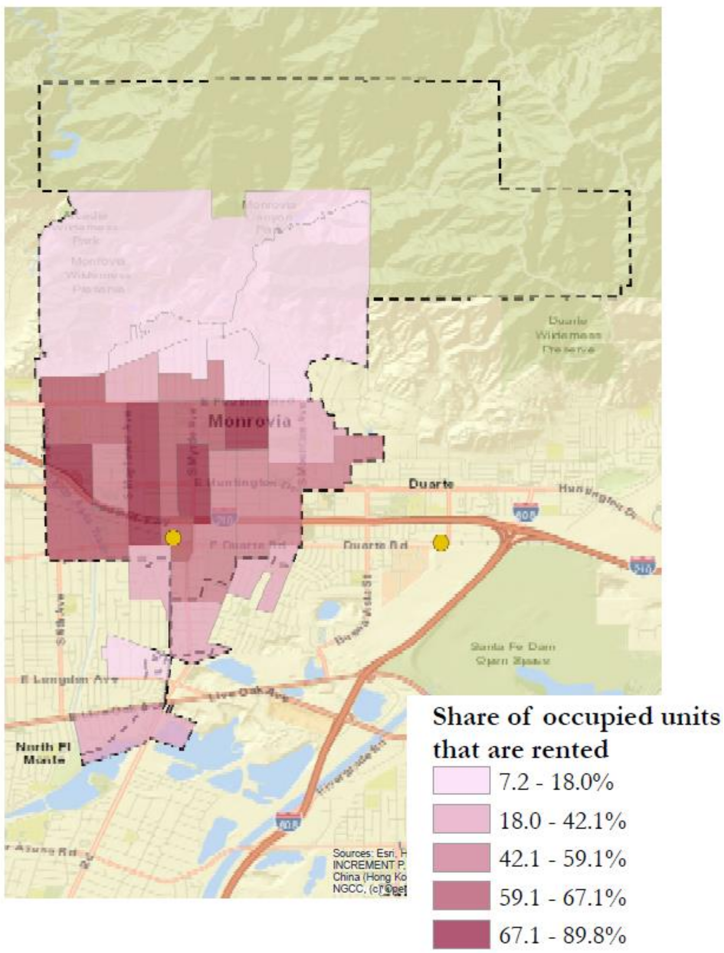
Appendix J: Share of Population (25 Years and Older) with at least a Bachelor's Degree, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: Population with at least BA



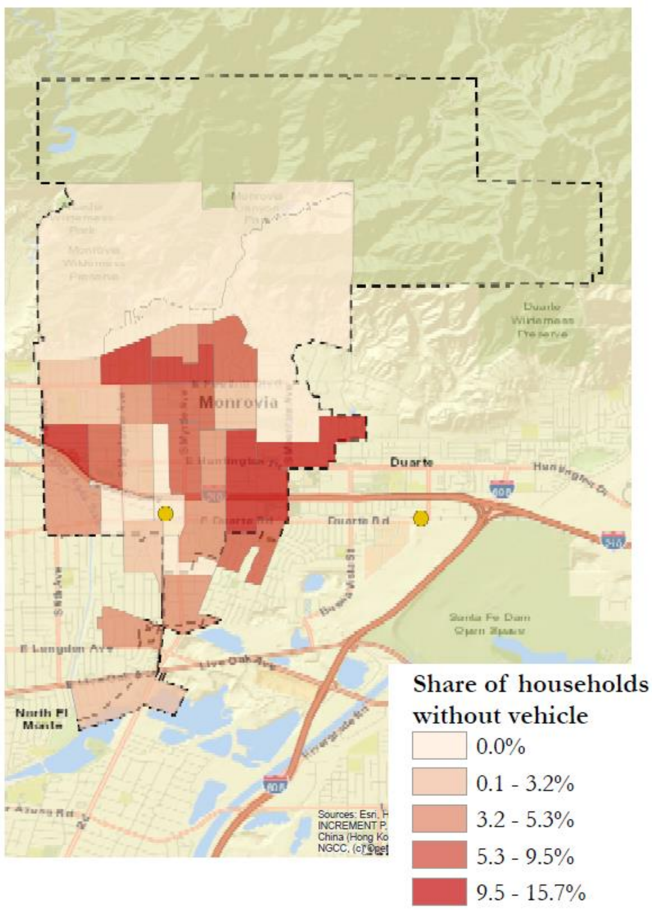
Appendix K: Share of Occupied Units that are Rented, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: % of Occupied Units Rented



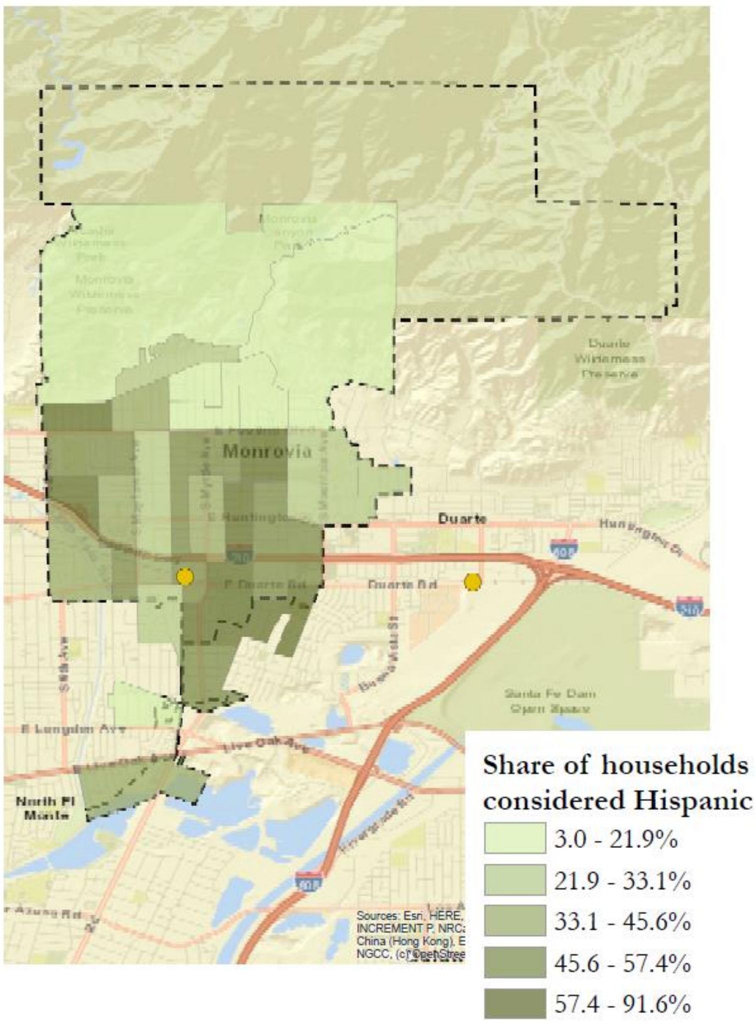
Appendix L: Share of Households Without a Personal Vehicle, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: % of Households w/o Vehicle



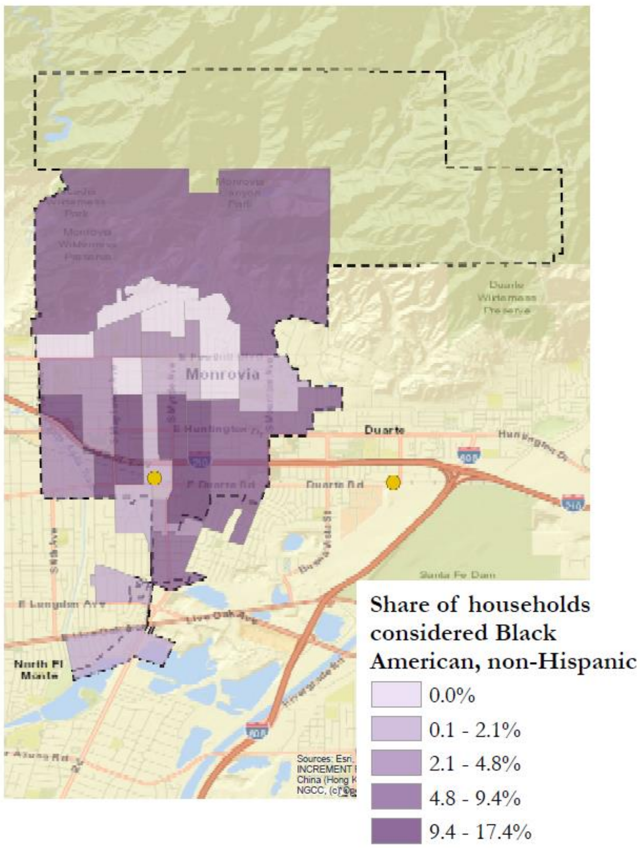
Appendix M: Share of Households Reported as Hispanic, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: Hispanic Share

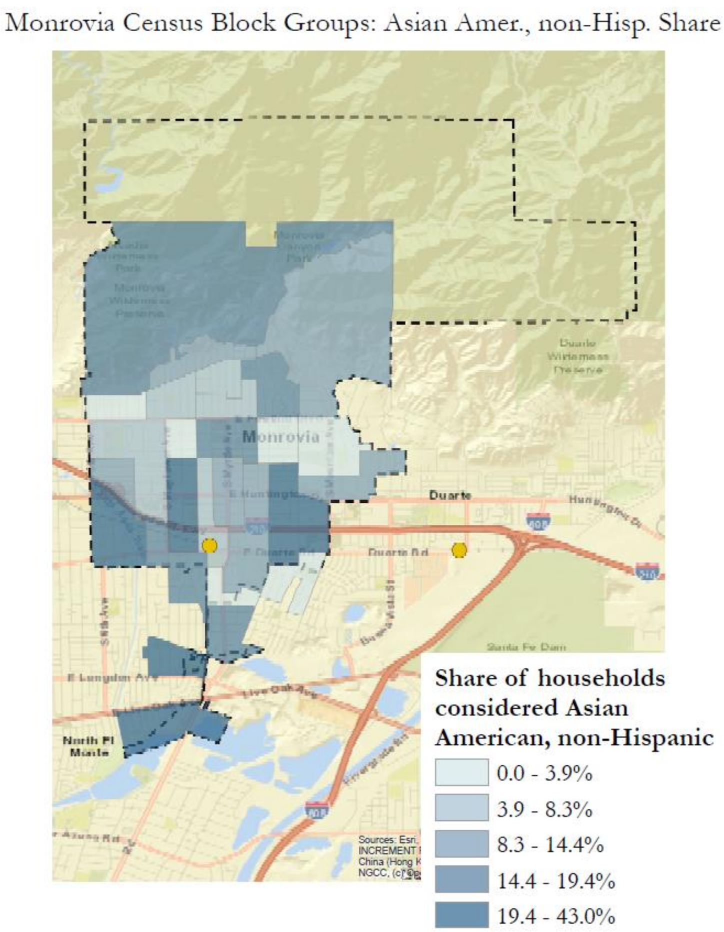


Appendix N: Share of Households Reported as Black, Non-Hispanic, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: Black Amer., non-Hisp. Share

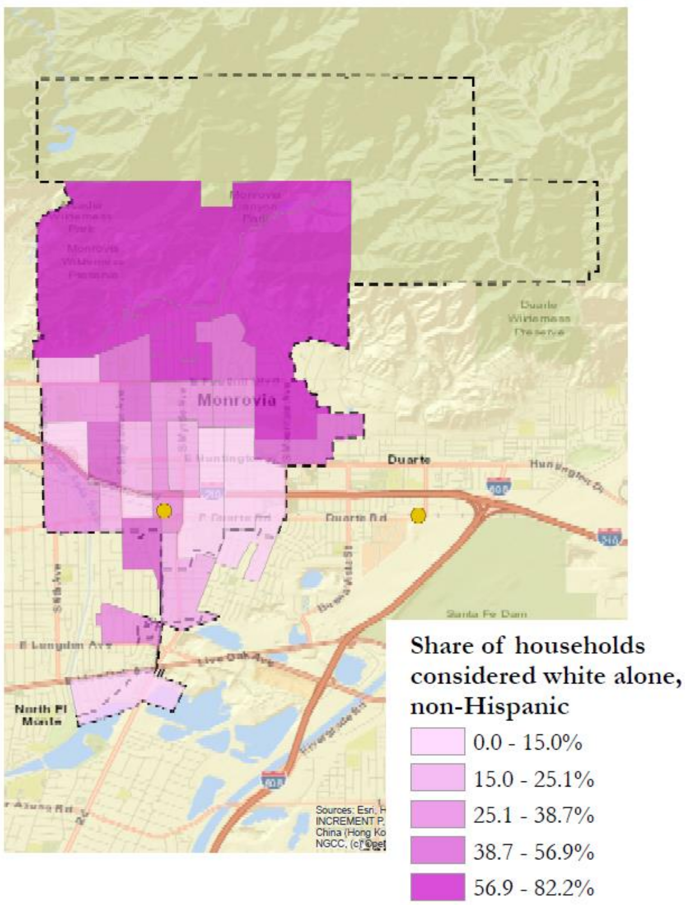


Appendix O: Share of Households Reported as Asian American, Non-Hispanic, by Block Group, 5-Year 2018 ACS



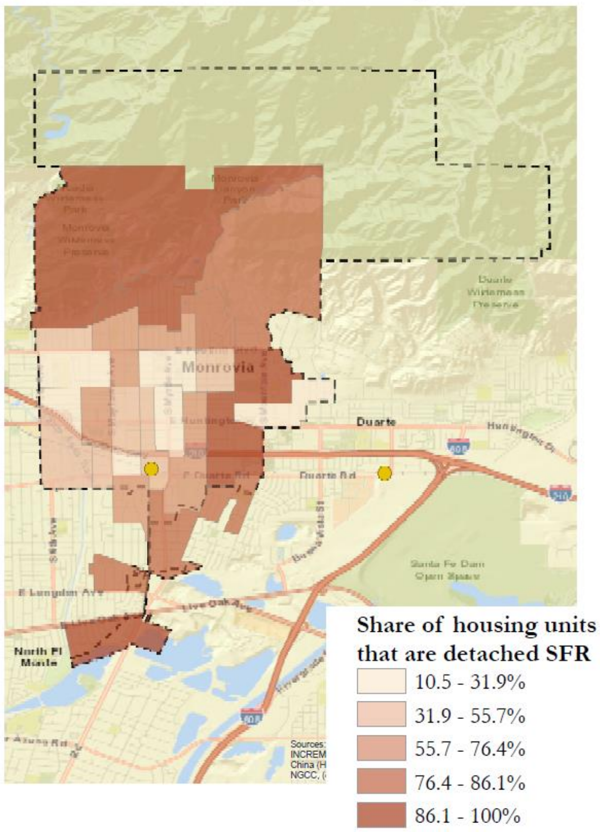
Appendix P: Share of Households Considered White Alone, Non-Hispanic, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: White alone, non-Hisp. Share

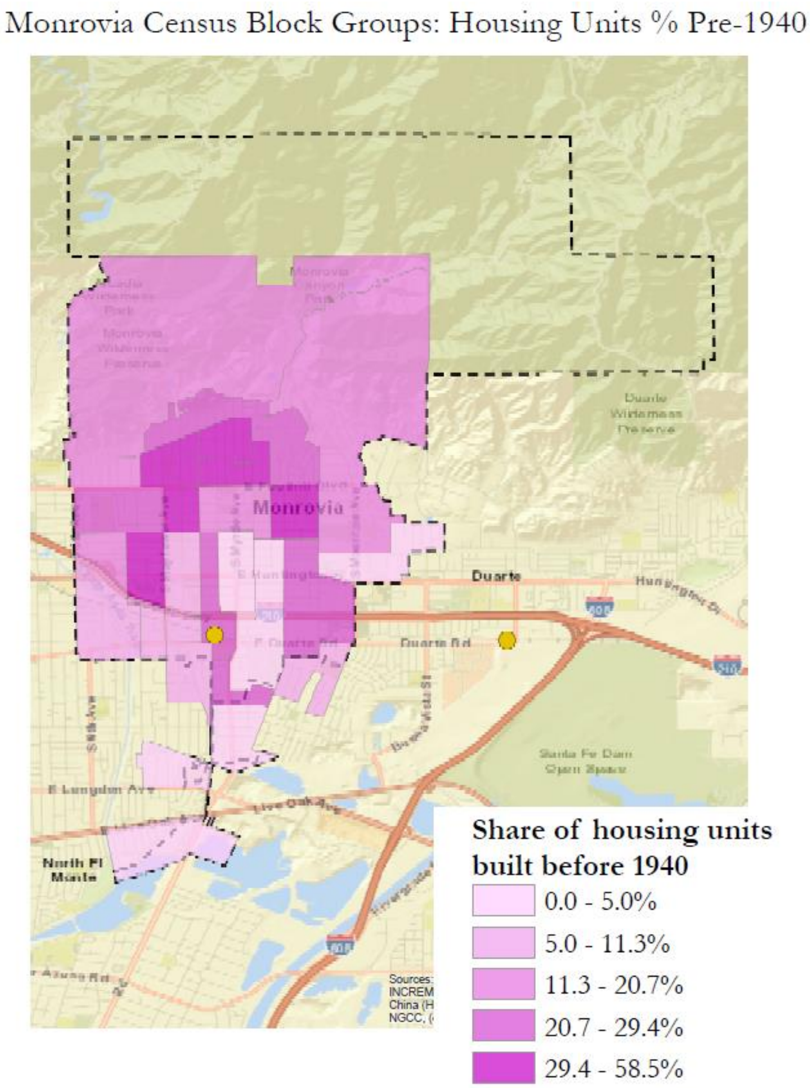


Appendix Q: Share of Housing Units that are Detached Single-Family Residential, by Block Group, 5-Year 2018 ACS

Monrovia Census Block Groups: Housing Units % Det. SFR

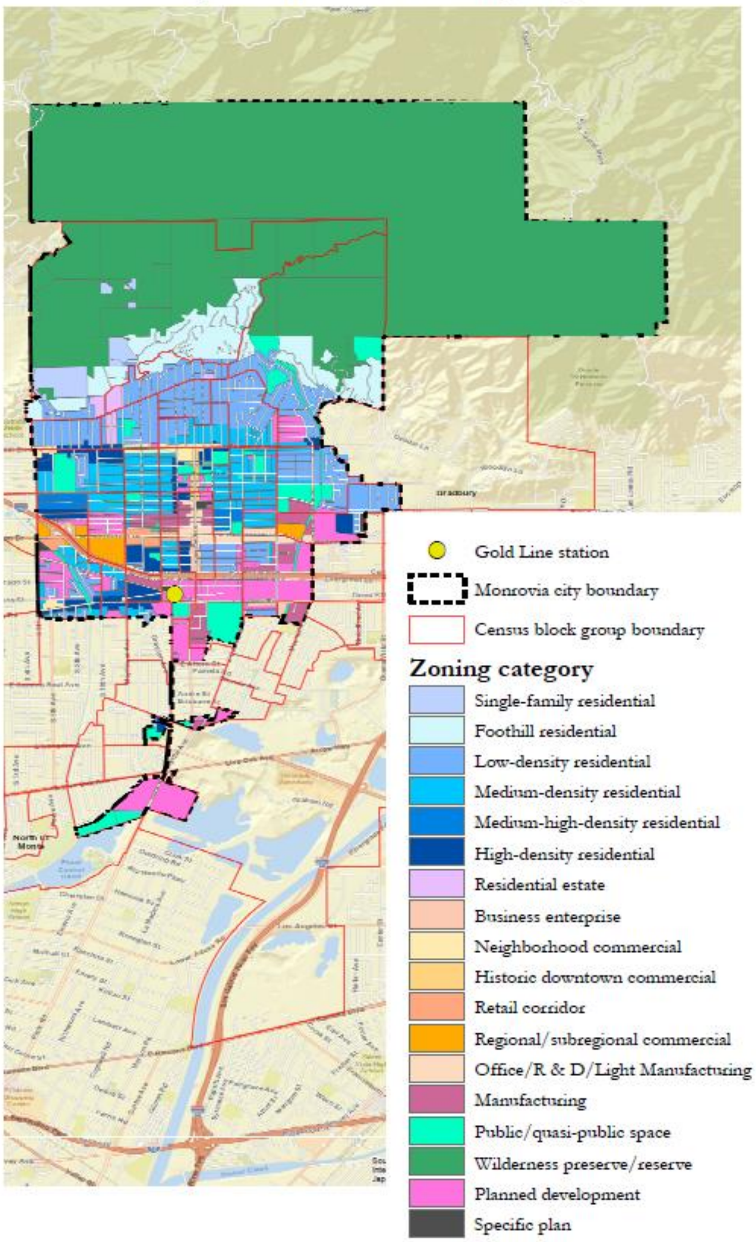


Appendix R: Share of Housing Units that were Constructed Pre-1940, by Block Group, 5-Year 2018 ACS



Appendix S: General Monrovia Zoning

City of Monrovia Zoning Map



Appendix T: GoMonrovia Lyft Rides To and From Monrovia Metro Station

Figure T1: GoMonrovia Lyft Rides to Monrovia Metro Station

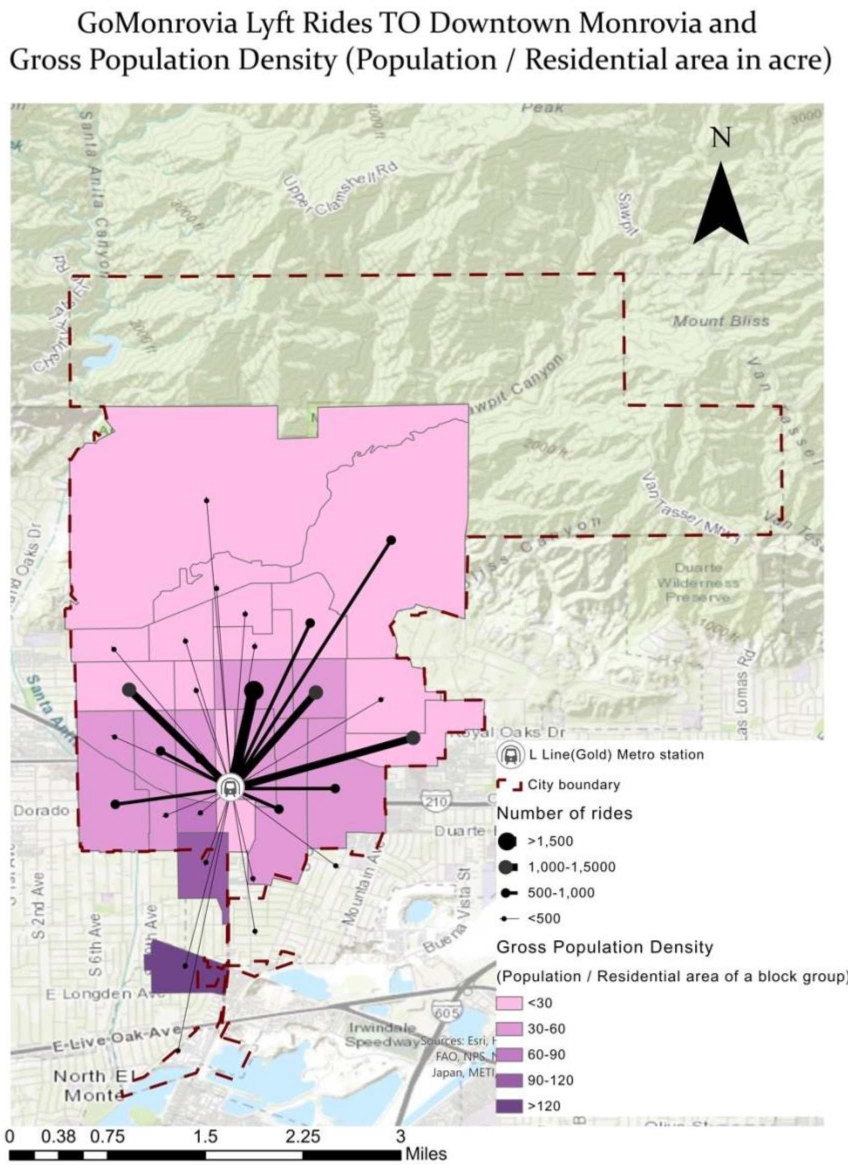
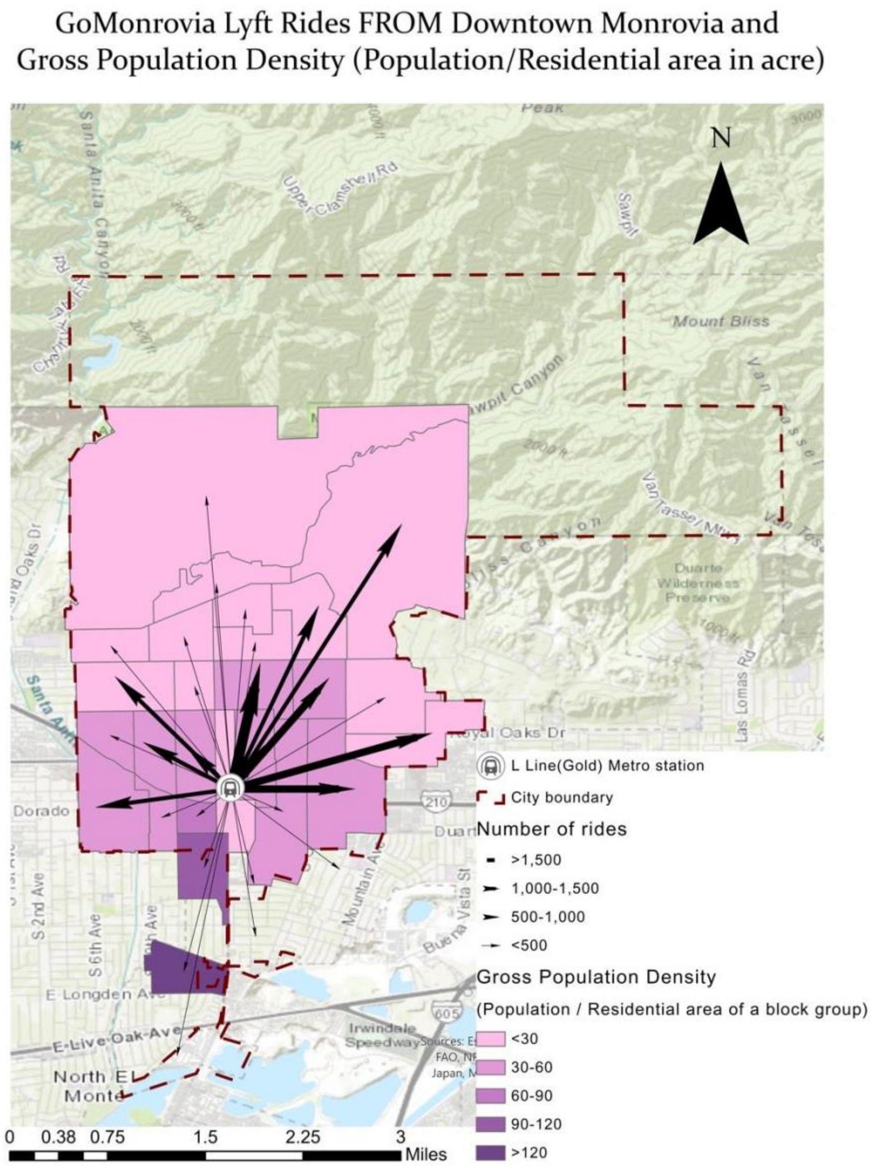


Figure T2: GoMonrovia Lyft Rides From Monrovia Metro Station

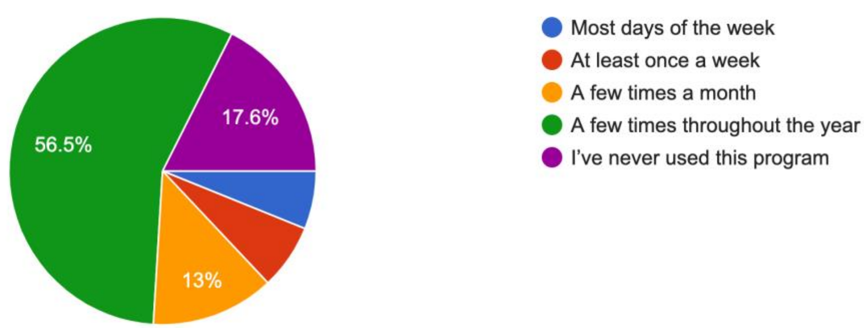


Note. Figures T1 and T2 are similar to Figures 10 and 11, respectively. However, the background here shows gross density (in persons per acres - entire block group) whereas previous map showed net density (in persons per acre of residential area).

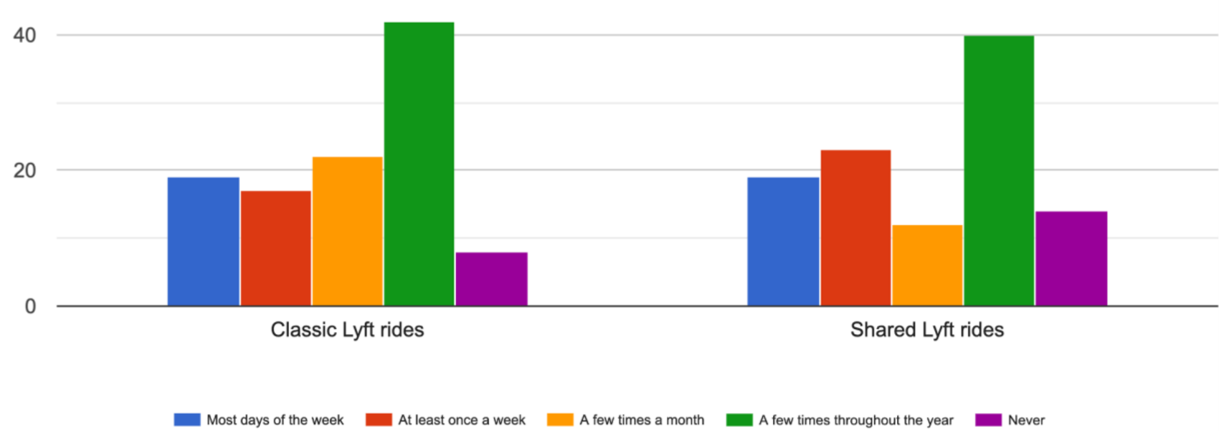
Appendix U: Summary of Survey Responses (Lyft Sample: N=136 as of July 1st, 2021)

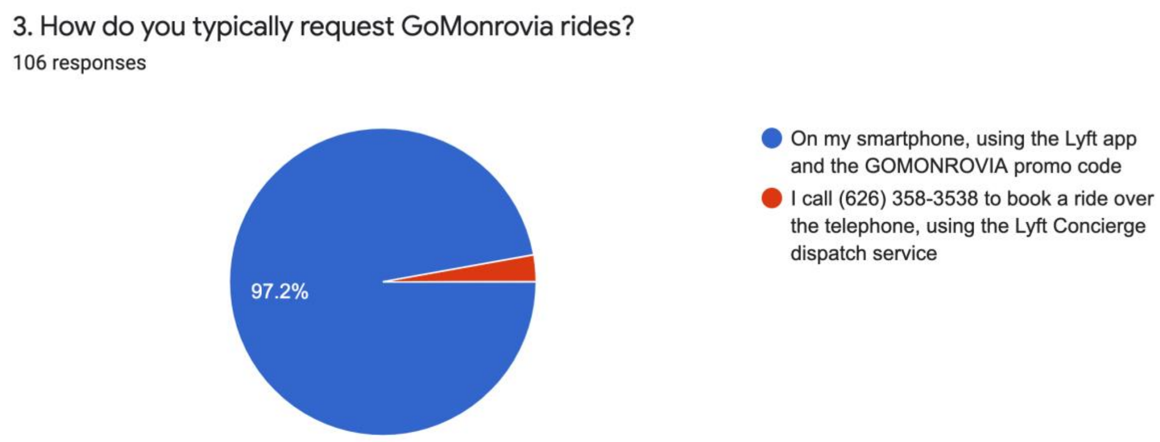
1. How frequently do you use GoMonrovia Lyft rides today, in 2021?

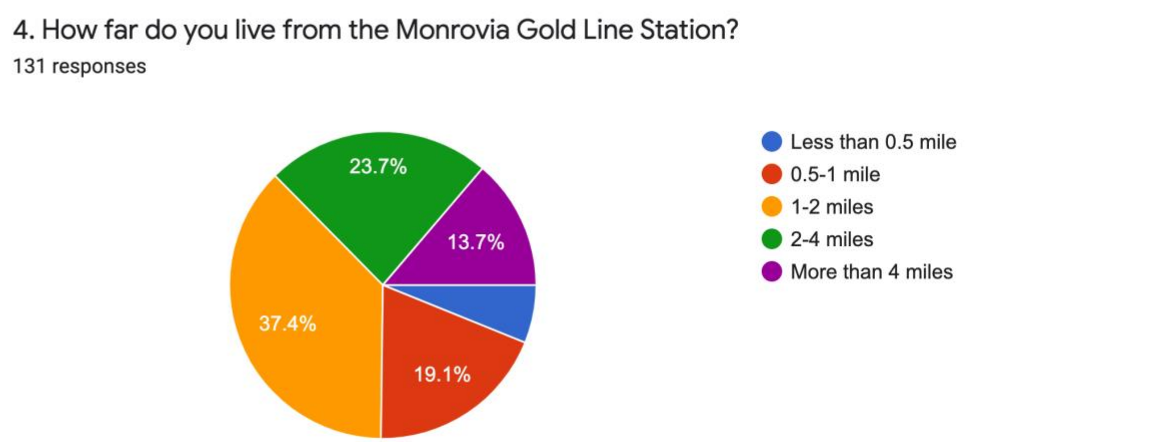
131 responses

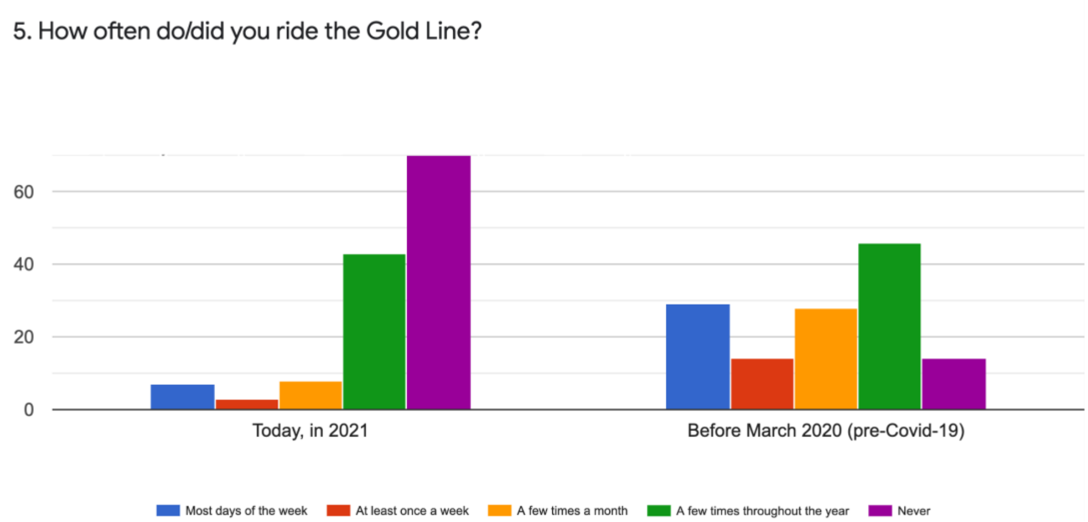


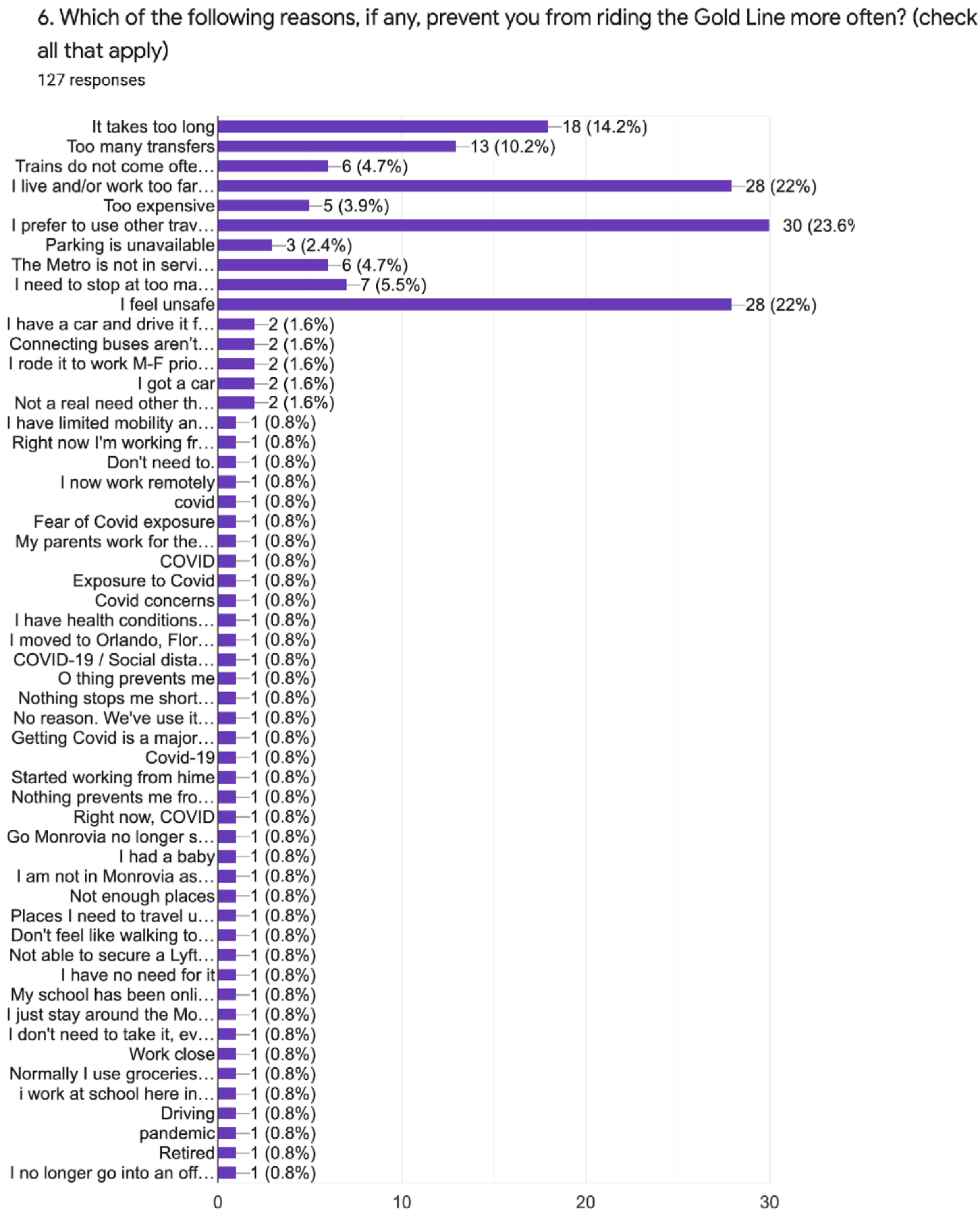
2. How frequently did you use GoMonrovia before March 1, 2020 (pre-Covid-19)?




3. How do you typically request GoMonrovia rides?
106 responses
97.2%
On my smartphone, using the Lyft app and the GOMONROVIA promo code
I call (626) 358-3538 to book a ride over the telephone, using the Lyft Concierge dispatch service

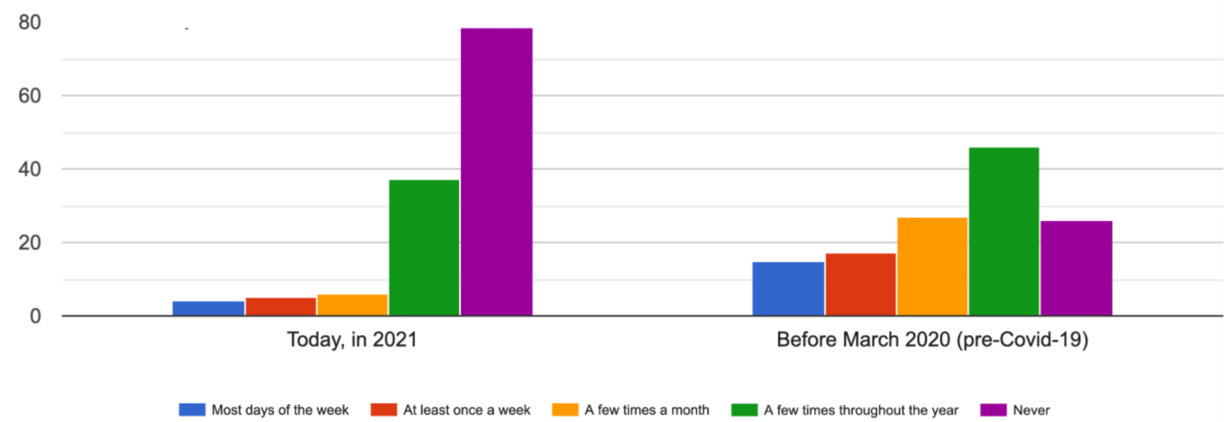

4. How far do you live from the Monrovia Gold Line Station?
131 responses
23.7%
13.7%
37.4%
19.1%
Less than 0.5 mile
0.5-1 mile
1-2 miles
2-4 miles
More than 4 miles


5. How often do/did you ride the Gold Line?
60
40
20
0
Today, in 2021
Before March 2020 (pre-Covid-19)
Most days of the week
At least once a week
A few times a month
A few times throughout the year
Never

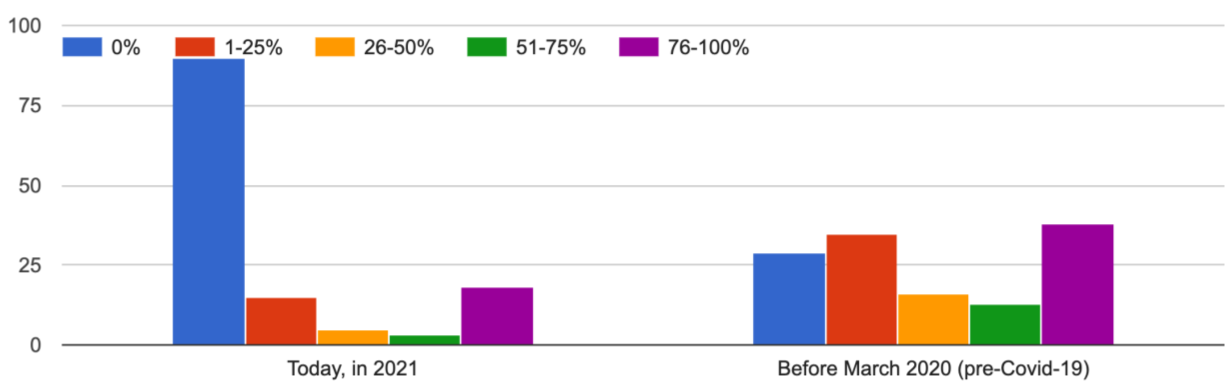

6. Which of the following reasons, if any, prevent you from riding the Gold Line more often? (check all that apply)
127 responses
It takes too long
18 (14.2%)
Too many transfers
13 (10.2%)
Trains do not come ofte…
6 (4.7%)
I live and/or work too far…
28 (22%)
Too expensive
5 (3.9%)
I prefer to use other trav…
30 (23.6%
Parking is unavailable
3 (2.4%)
The Metro is not in servi…
6 (4.7%)
I need to stop at too ma…
7 (5.5%)
I feel unsafe
28 (22%)
I have a car and drive it f…
2 (1.6%)
Connecting buses aren't…
2 (1.6%)
I rode it to work M-F prio…
2 (1.6%)
I got a car
2 (1.6%)
Not a real need other th…
2 (1.6%)
I have limited mobility an…
1 (0.8%)
Right now I'm working fr…
1 (0.8%)
Don't need to.
1 (0.8%)
I now work remotely
1 (0.8%)
covid
1 (0.8%)
Fear of Covid exposure
1 (0.8%)
My parents work for the…
1 (0.8%)
COVID
1 (0.8%)
Exposure to Covid
1 (0.8%)
Covid concerns
1 (0.8%)
I have health conditions…
1 (0.8%)
I moved to Orlando, Flor…
1 (0.8%)
COVID-19 / Social dista…
1 (0.8%)
O thing prevents me
1 (0.8%)
Nothing stops me short…
1 (0.8%)
No reason. We've use it…
1 (0.8%)
Getting Covid is a major…
1 (0.8%)
Covid-19
1 (0.8%)
Started working from hime
1 (0.8%)
Nothing prevents me fro…
1 (0.8%)
Right now, COVID
1 (0.8%)
Go Monrovia no longer s…
1 (0.8%)
I had a baby
1 (0.8%)
I am not in Monrovia as…
1 (0.8%)
Not enough places
1 (0.8%)
Places I need to travel u…
1 (0.8%)
Don't feel like walking to…
1 (0.8%)
Not able to secure a Lyft…
1 (0.8%)
I have no need for it
1 (0.8%)
My school has been onli…
1 (0.8%)
I just stay around the Mo…
1 (0.8%)
I don't need to take it, ev…
1 (0.8%)
Work close
1 (0.8%)
Normally I use groceries…
1 (0.8%)
i work at school here in…
1 (0.8%)
Driving
1 (0.8%)
pandemic
1 (0.8%)
Retired
1 (0.8%)
I no longer go into an off…
1 (0.8%)
0
10
20
30

A New Model of Suburban Mobility: City Partnerships With TNCs, City of Monrovia, February 2019 (PowerPoint Presentation)

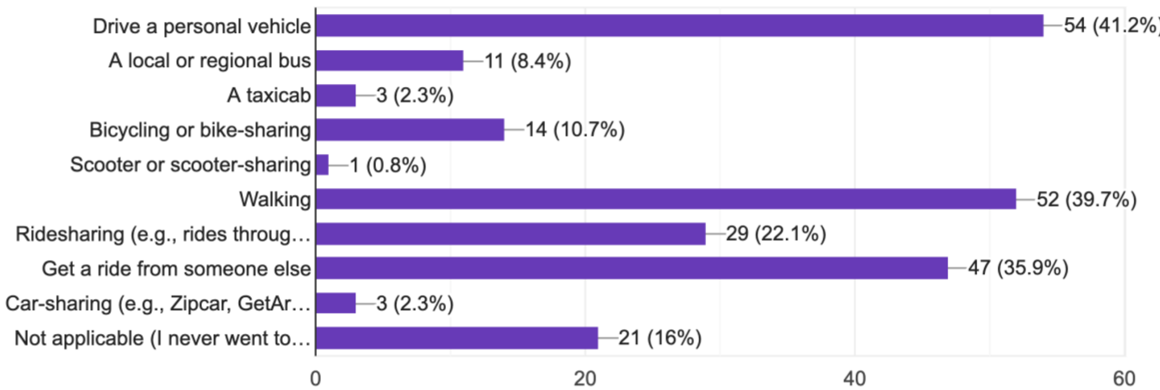
7. How often do/did you use the GoMonrovia program to go to/from the Monrovia Gold Line Station?



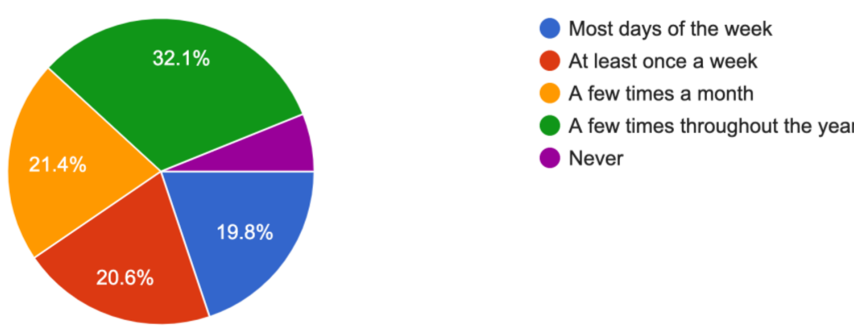
8. What percent of your GoMonrovia trips either start(ed) or end(ed) at the Monrovia Gold Line Metro Station?



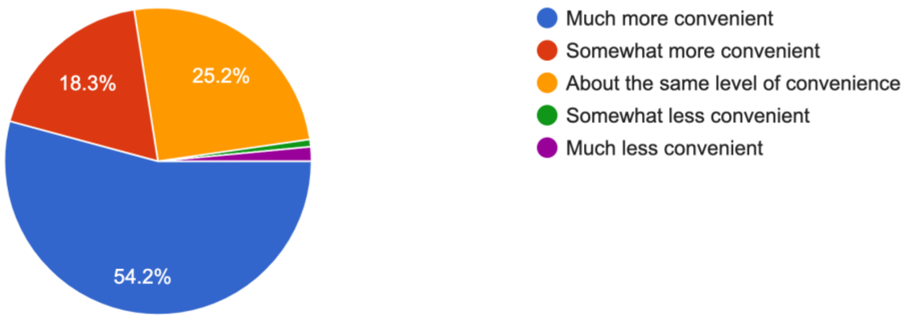
9. Before GoMonrovia (before 2018), what way did you use to reach the Monrovia Gold Line Metro Station? (check all that apply)
131 responses



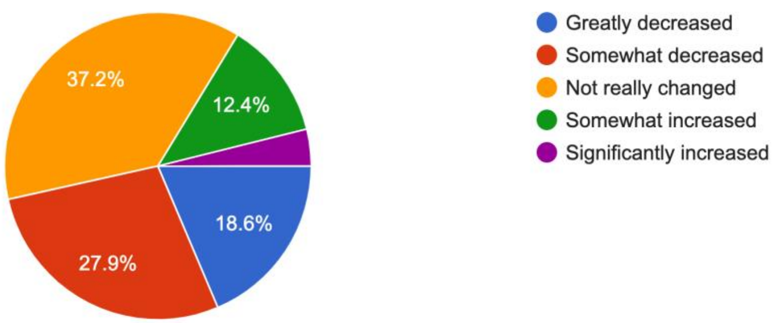
10. IF GoMonrovia rides to/from the Monrovia Gold Line Metro Station were FREE, how often would you ride the Gold Line?
131 responses



11. As a result of using GoMonrovia, my ACCESS to and from the Monrovia Gold Line Station has become:
131 responses

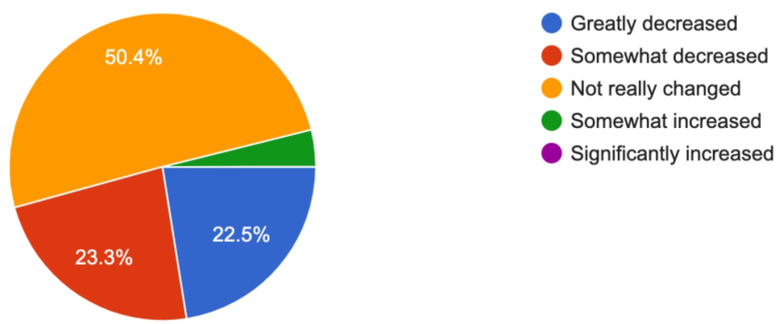


12. As a result of using GoMonrovia, my overall TRAVEL TIMES using public transit have:
129 responses



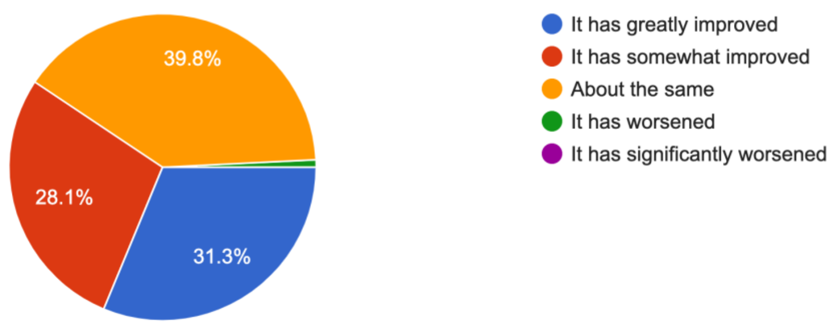
13. As a result of using GoMonrovia, my overall WAIT TIMES using public transit have:

129 responses

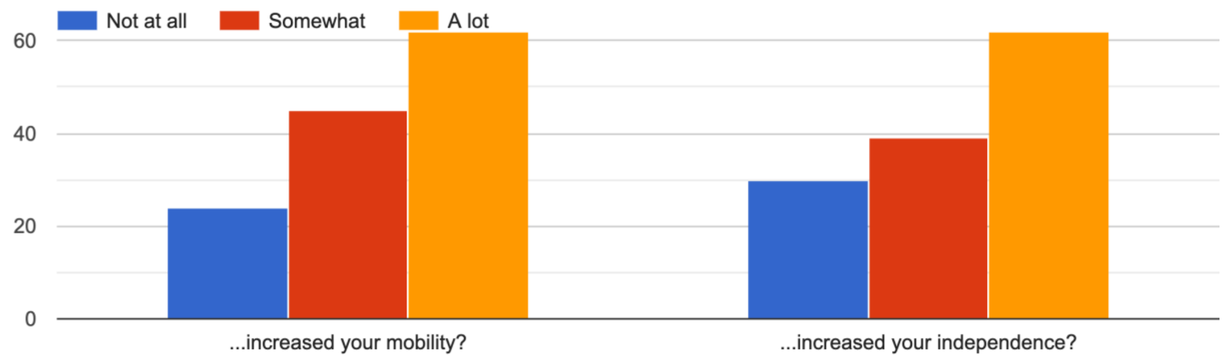


14. How has your ability to get to your daily activities (work, errands, social activities, etc.) using the Gold Line changed as a result of GoMonrovia?

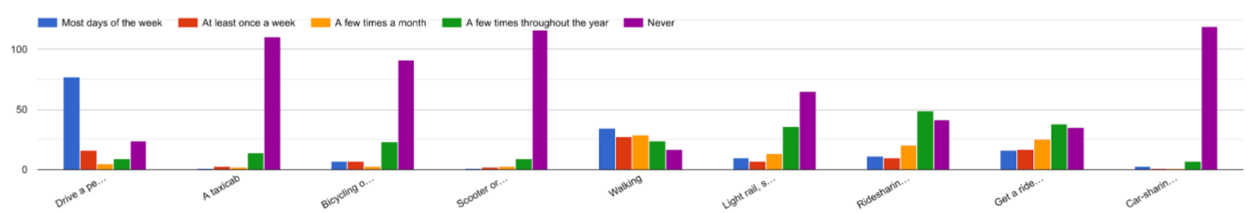
128 responses



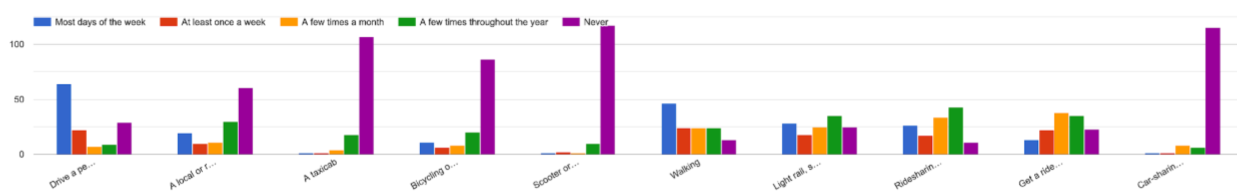
15. To what extent has GoMonrovia...



16. How frequently do you use the following to get where you need to go today, in 2021?

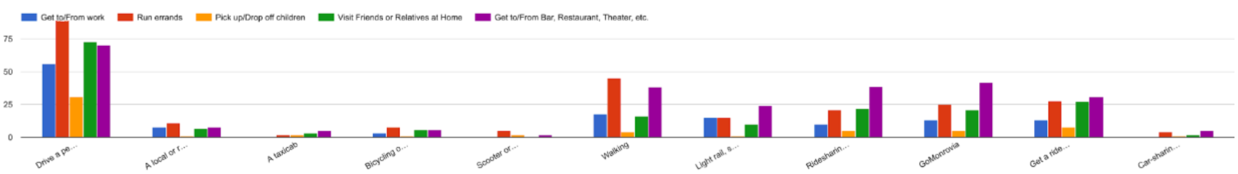


17. How frequently did you use the following to get where you needed to go before March 1, 2020 (pre-Covid-19)?

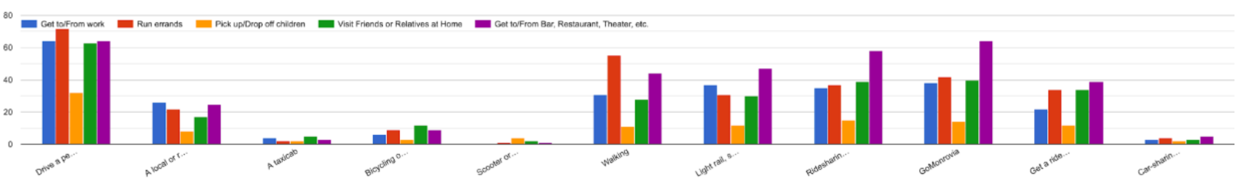


18. Which of the following best describes your access to a vehicle?
131 responses

21. How do you typically do the following things today, in 2021? (check all that apply)



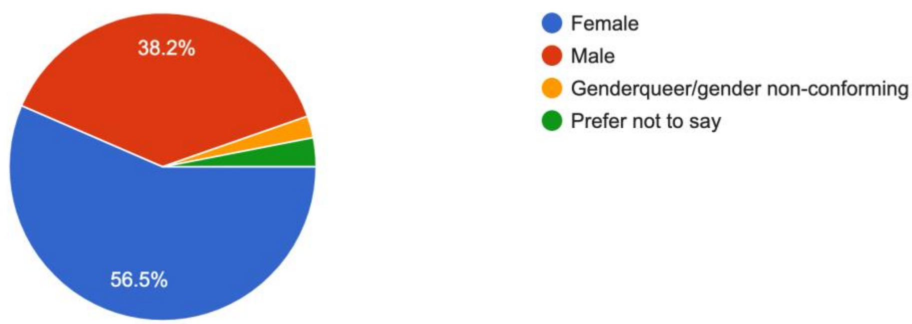
22. How did you typically do the following things before March 2020 (pre-Covid-19)? Select all that apply.



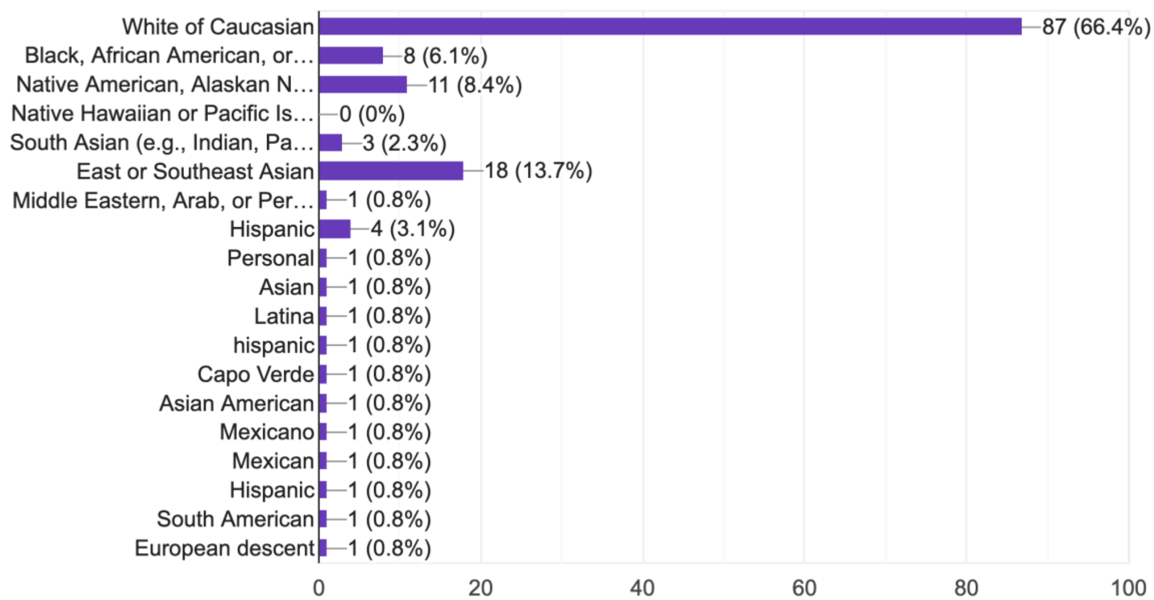
23. How old are you?

Mean answer = 46.4 years old

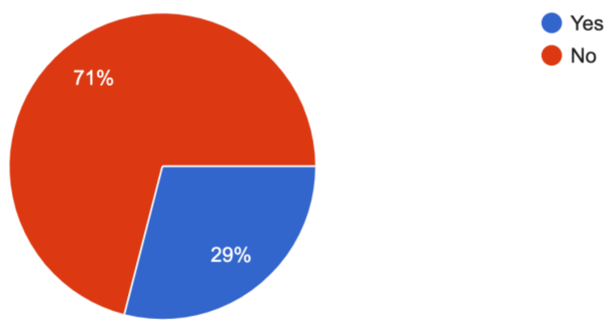
24. Which gender do you most identify as?
131 responses



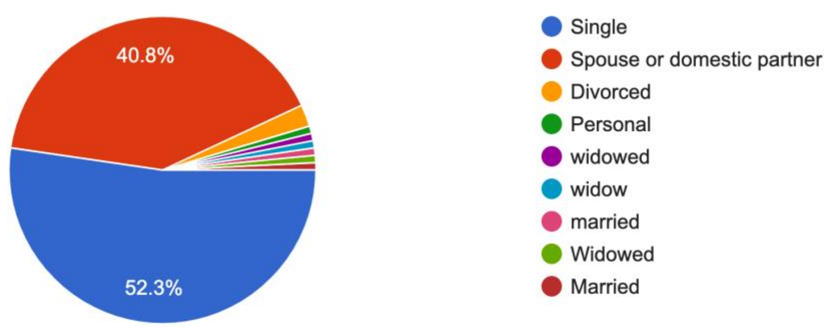
25. Which of the following describes you? If you are biracial or multiracial, please select all that apply.
131 responses



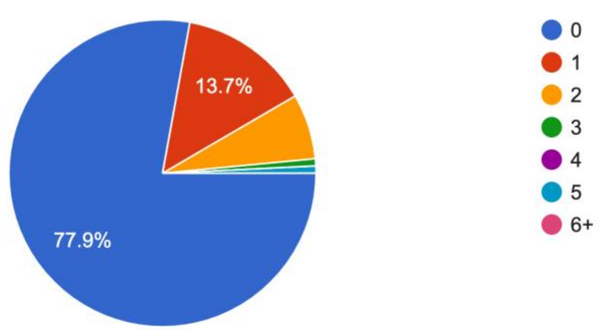
26. And do you consider yourself to be of Hispanic or Latin American descent?
131 responses



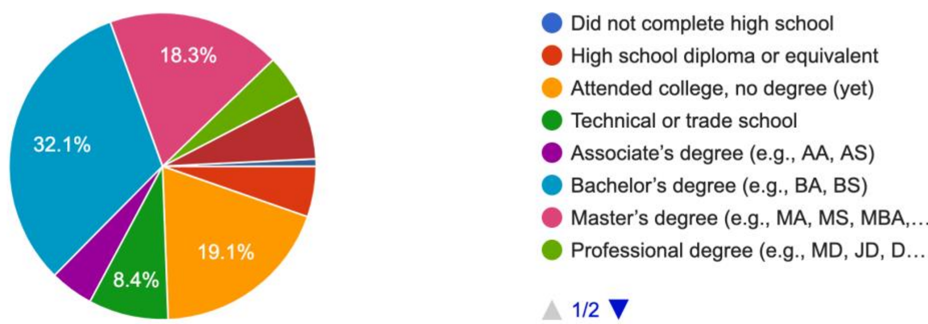
27. What is your marital status?
130 responses



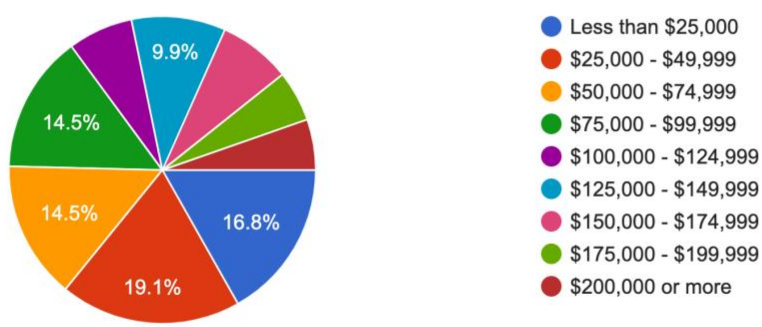
28. How many children under 16 years old are in your household?
131 responses

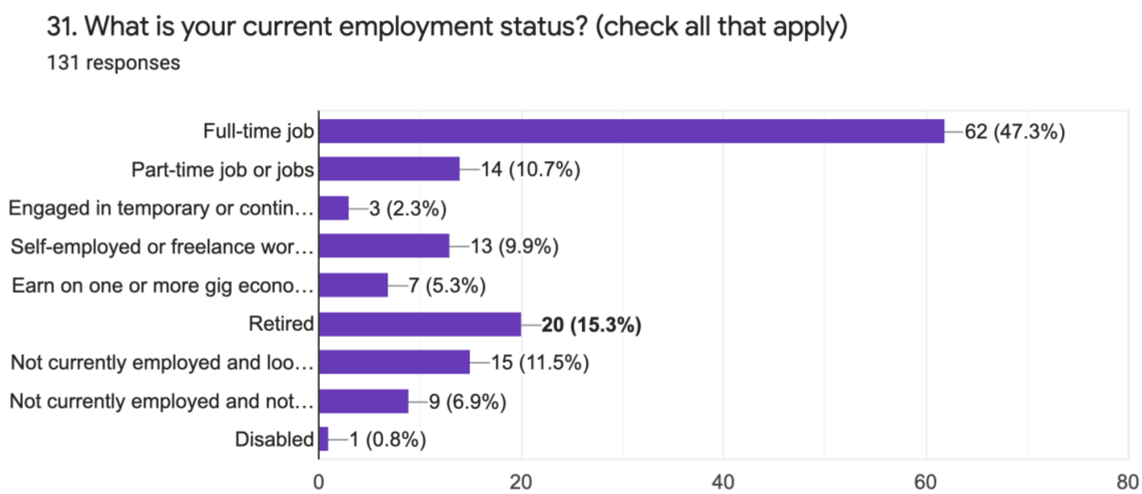


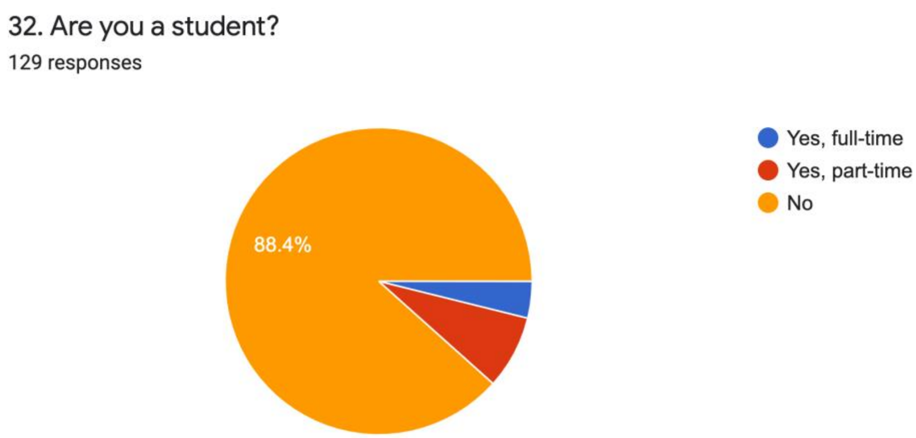
29. What is the highest level of education that you have completed?
131 responses



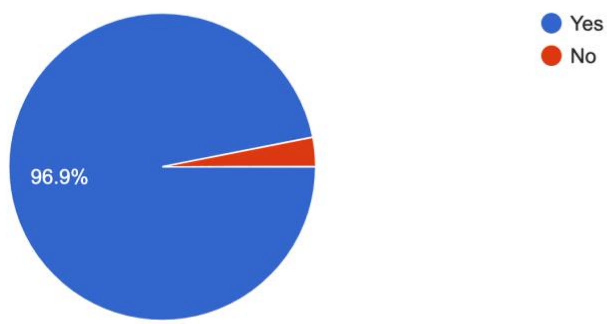
30. What is your approximate annual household income before taxes?
131 responses



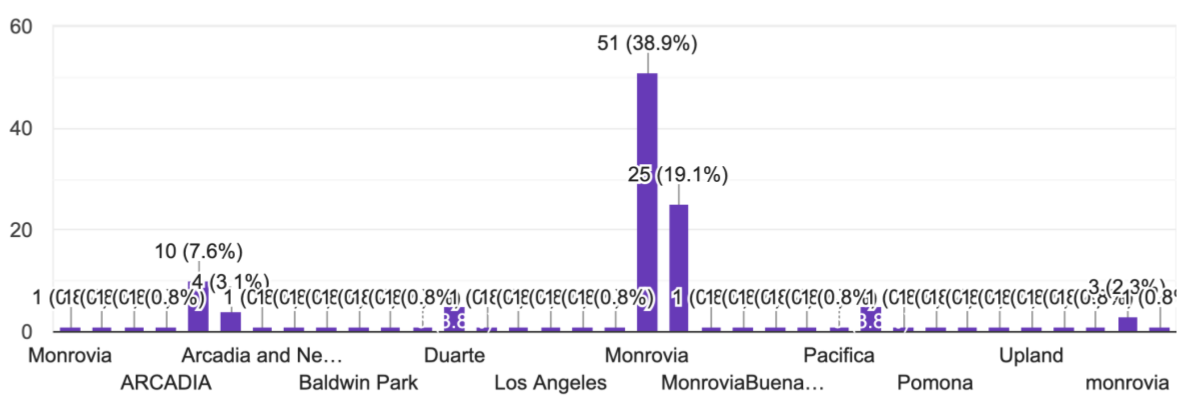

31. What is your current employment status? (check all that apply)
131 responses
Full-time job
Part-time job or jobs
Engaged in temporary or contin…
Self-employed or freelance wor…
Earn on one or more gig econo…
Retired
Not currently employed and loo…
Not currently employed and not…
Disabled
62 (47.3%)
14 (10.7%)
3 (2.3%)
13 (9.9%)
7 (5.3%)
20 (15.3%)
15 (11.5%)
9 (6.9%)
1 (0.8%)
0
20
40
60
80


32. Are you a student?
129 responses
88.4%
Yes, full-time
Yes, part-time
No

33. Do you have a cellphone with internet access?
129 responses



34. What city do you live in?
131 responses



36. If you have a disability, which of the following best describes it? (check all that apply)
131 responses