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Qualitative Evaluation of the Yolobus BeeLine Microtransit Service

Authors

Liu, Matthew
Watkins, Kari
Pike, Susan

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Qualitative Evaluation of the Yolobus BeeLine Microtransit Service

Matthew Liu, University of California, Davis

Kari Watkins, University of California, Davis

Susan Pike, University of California, Davis

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16. Abstract

In response to challenges with providing fixed route transit in rural areas, many transit agencies in the United States and around the world are increasingly looking towards microtransit, a form of flexible route transit service which can be reserved on-demand, to provide transit service in rural areas. However, the immaturity of microtransit relative to conventional fixed route transit means that the benefits and challenges of microtransit in rural areas are still not fully understood. This paper aims to identify these benefits and challenges through the evaluation of a case study microtransit system—the Yolobus BeeLine. The BeeLine is a microtransit service provided by Yolobus, the transit agency operating in Yolo County, California, and is unique in that it operates in both low-density rural and medium-density suburban areas. By conducting ride-along interviews with riders of the BeeLine service, the authors investigate the benefits of the microtransit service for its riders as well as the challenges and shortcomings of the service that these riders face. These interviews found that while the BeeLine provides a useful and inexpensive travel alternative for riders, certain challenges associated with using the service—including its limited service area, limited service span, technology requirements to reserve rides, etc.—impact riders from disadvantaged communities disproportionately. These findings are consistent with existing literature studying other microtransit systems. Thus, both the study and existing literature suggest that addressing the travel needs of individual communities should be a top priority when designing microtransit systems.

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Qualitative Evaluation of the Yolobus BeeLine Microtransit Service

A National Center for Sustainable Transportation Research Report

Matthew Liu, Department of Civil and Environmental Engineering, University of California, Davis

Kari Watkins, Department of Civil and Environmental Engineering, University of California, Davis

Susan Pike, Institute of Transportation Studies, University of California, Davis

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Qualitative Evaluation of the Yolobus BeeLine Microtransit Service

Executive Summary

In response to challenges with providing fixed route transit in rural areas, many transit agencies in the United States and around the world are increasingly looking towards microtransit, a form of flexible route transit service which can be reserved on-demand, to provide transit service in rural areas. However, the immaturity of microtransit relative to conventional fixed route transit means that the benefits and challenges of microtransit in rural areas are still not fully understood. A literature review was conducted to identify the causes of challenges faced by other microtransit services and the ways these other microtransit services can address or exacerbate existing equity challenges within their communities. This study then identifies these benefits and challenges through the qualitative evaluation of a case study microtransit system—the Yolobus BeeLine. The BeeLine is a microtransit service provided by Yolobus, the transit agency operating in Yolo County, California, and is unique in that it operates in both low-density rural and medium-density suburban areas.

Ride-along interviews were conducted with riders of the BeeLine service for this study. With these interviews, we investigated the benefits of the microtransit service for its riders as well as the challenges and shortcomings of the service that these riders face. Interviews were guided by a script with fourteen questions that were within three sections which spanned questions about rider travel behavior, quality of the rider trip experience, and feedback that riders had for the service. While drivers for the BeeLine were not interviewed directly, driver comments about the service were noted and included within this paper.

These interviews found that the BeeLine provides a useful and inexpensive travel alternative for riders. Regardless of the zone the rider uses the BeeLine, the BeeLine brings valuable mobility alternatives to its riders, especially those that are unable to operate personal automobiles for one reason or another. However, these interviews also found that context-sensitive design of microtransit systems is crucial to make the service as effective as possible for riders. BeeLine riders from rural areas and disadvantaged communities, such as those in Knights Landing and Winters, were disproportionately affected by certain flawed service characteristics. Riders from Knights Landing and Winters tended to depend more on the BeeLine for travel overall and thus were affected more by the limited service area and span compared to riders from Woodland who were less likely to be part of disadvantaged communities and less likely to depend on the BeeLine as much. Here, a failure to account for differences in community needs while designing the BeeLine led to a disproportionate distribution of challenges for its riders. As such, it is vitally important to recognize and address the impact of design choices of

microtransit systems on each individual community that will be served by said microtransit system.

The findings of this study largely support the findings of existing literature, particularly in the challenges faced by riders and providers of microtransit services. Both existing literature and this study observed challenges associated with service area, service span, and visibility of the microtransit service. These shared challenges suggest that agencies looking to provide microtransit services should make careful considerations in these three areas when designing their microtransit systems. Failures in any of these three areas can dampen demand for the service and prevent it from reaching its potential maximum ridership. Only by carefully addressing these three areas can a microtransit system reach its highest possible ridership and service levels. Similarly, the findings of this study support the findings of existing literature regarding the interactions between microtransit services and existing equity challenges. Both existing literature and this study observed how microtransit can help address the travel needs of low-income and disadvantaged communities, how microtransit can provide service to rural areas, and how it is necessary to provide multiple methods for reserving rides to prevent technological barriers from excluding riders from the service.

Introduction

Microtransit is an emerging form of public transit where public transit agencies provide flexible route service which can be reserved on-demand. This is in direct contrast to conventional fixed route transit, where vehicles operate on predetermined routes and schedules/headways. As such, microtransit is sometimes also referred to as on-demand transit. Microtransit services are similar to ride-hailing services, such as those provided by Uber and Lyft, in that they are both on-demand transportation services enabled through real-time vehicle tracking and routing software. However, microtransit services still differ from ride-hailing services through the use of shared rides, different fare structures, and by adhering to a limited service area and service span. Other comparisons can also be drawn between microtransit and paratransit, but microtransit differs through its ability to be called by riders on-demand and by not exclusively serving those with difficulties using existing fixed route transit. The characteristics of microtransit services often vary from service to service as well—some microtransit services offer door-to-door service, where the service vehicles take riders from any pick-up to drop-off location, while other services require pick-up and drop-off locations be set at some predetermined location, such as existing bus stops.

Microtransit services are typically used to provide public transit access to areas that are unsuitable for conventional fixed route transit (Ghimire et al., 2024). This includes areas of low population density which often see low ridership on fixed route transit. Microtransit is also increasingly seen as an option to provide better transit service to low-income or disadvantaged populations that often have mobility challenges due to a lack of personal automobiles or the lack of frequent and reliable fixed route transit service (Volinski, 2019). However, these benefits of microtransit—and challenges as well—are still not well understood. This paper aims to identify these benefits and challenges through the evaluation of a case study—the Yolobus BeeLine, a service that operates in both low-density and medium-density areas—to draw conclusions and identify best practices for microtransit services.

Yolobus BeeLine

The BeeLine is a microtransit service provided by Yolobus, the transit agency operating in Yolo County, California. Yolo County has a unique land development pattern, where communities ranging from small rural towns to large suburban cities are separated by much larger plots of farmland. Many of the small rural towns within Yolo County have low-income and disadvantaged populations that depend on transit to travel to and from nearby larger cities. However, due to low ridership, Yolobus could not support sufficiently frequent fixed route transit service for these smaller rural towns. In response, Yolobus created the microtransit service Yolobus Urban/Rural (YOUR) Ride in 2019, which was originally designed to specifically serve areas of low population density and areas with low-income and disadvantaged populations within Yolo County. This was implemented by

limiting YOUR Ride service to two zones within Yolo County, those being the towns of Knights Landing and Winters. Knights Landing and Winters are small rural towns with a population of 987 and 7,540 in 2022 respectively (Data Commons, n.d.). The population in Knights Landing has a significantly lower median income, higher rates of poverty, and a higher proportion of Hispanic/Latino residents than those of adjacent townships. While Winters is larger and has a higher median income and lower rates of poverty, there are communities within Winters—such as El Rio Villa, operated by the Yolo County Housing Authority—that are lower-income and are located within transit deserts. Despite the approximately 20-minute drive to the cities closest to Knights Landing and Winters, the existing fixed route transit in both towns was completely replaced by YOUR Ride, meaning that the most prominent options to travel within the towns and to nearby cities was through YOUR Ride or through a personal automobile. In September 2023, YOUR Ride was rebranded to BeeLine, and a third zone in the suburban city of Woodland was added to the service area. In contrast to the small population of the previous two townships, Woodland had a much larger population of 61,462 in 2022 (Data Commons, n.d.).

BeeLine was not designed to be a door-to-door service and instead has designated pick-up and drop-off locations. The service span varies by zone—the weekday service hours for Woodland typically go from 7:00AM to 7:00PM, but the weekday service hours only go from 8:30AM to 5:30PM for Knights Landing and 8:30AM to 4:30PM for Winters. In addition, the level of service differs between zones—Woodland, the zone with the highest population and highest demand, is serviced by up to four vehicles. In contrast, Knights Landing and Winters are serviced by one vehicle each. Riders are able to reserve a ride through a mobile app or through a phone call. The fare to ride the service ranges from two to three dollars depending on zone, and discounts are available for riders who are senior, disabled, or youth. The fare can be paid through various media, including cash, Yolobus monthly passes, cash value tickets, Connect Cards (smart card available in the region), credit cards through the ZipPass mobile app, and credit cards through the BeeLine app.

Literature Review

This literature review looks at existing literature to illustrate the causes of challenges faced by microtransit services and the ways microtransit services can address or exacerbate existing equity challenges within communities. These findings can then be used to compare the benefits and challenges of the BeeLine microtransit service with that of other existing microtransit services. This comparison will allow conclusions from existing literature to either be further substantiated or refuted by observations made on the BeeLine service. The findings of this literature review are below in the following sections.

Service Challenges

One challenge seen in many microtransit systems is the availability of the service. The causes of this lack of service availability include a lack of vehicle availability, slow operator response time, and limited hours of service. Vehicle availability is an issue faced by many services due to the nature of a microtransit service. Unexpected demand surges can push demand past available service capacity, resulting in longer than acceptable customer wait times and unreliable service. Pilot programs are often constrained financially when determining microtransit fleet size, and so few services are able to quickly scale up their service in response to demand. This causes some services to need to reposition vehicles between zones, leaving others with less-than-optimal coverage (Steiner et al., 2021; Van Hentenryck et al., 2023). Additional challenges occur when vehicle drivers are non-responsive.

Another consideration when it comes to microtransit service availability is service span, or the hours of operation in which the microtransit system is in service. Several services designed around first-mile/last-mile service patterns are not active at times other than peak hours, limiting their utility for intrazonal trips without connections on one end (Van Hentenryck et al., 2023). Some studies showed that on-demand transit service can serve as a great promoter of public transit use during non-peak hours, especially overnight, potentially allowing agencies to eliminate inefficient nighttime fixed route service (Zhang et al., 2022).

Another characteristic which created challenges for microtransit services is the design of customer service zones. Most microtransit services operate on a zone-based system, where users can take a ride to a destination as long as it is within the same zone as their origin. Therefore, zone design is a critical piece of service design, as it essentially restricts the range and mobility benefits of a microtransit service. In some cases, service zones are designed with a very specific user base in mind, such as a zone based on an industrial area for workers, or a zone centered around a medical complex for patients. These types of zones are typically designed to provide riders with first-mile/last-mile transportation to other connecting forms of transportation (Mavrouli, 2020; Van Hentenryck et al., 2023). Other zones are designed to serve as a first-mile/last-mile connection to neighborhoods

and residences. It is also important to include equity considerations in zone design so that disadvantaged users are provided sufficient service and that their needs are not ignored (D. Wang et al., 2024).

Additionally, several agencies highlighted challenges they had with promoting and marketing the service. Awareness is a key driver of ridership, and many survey results suggest that many people simply do not know microtransit services exist (Weckström et al., 2018). Many studies also suggest that services should increase their marketing effort, especially targeting those who are likely to be willing to use the service (Cordahi et al., 2018; Steiner et al., 2021).

Equity

Many sources found that microtransit service improves the socio-economic and public health metrics of users (Maleki & Smith-Colin, 2023; C. Wang et al., 2014). This is especially true in systems that focus on providing intrazonal services as opposed to focusing on first-mile/last-mile service, as riders are able to use the service to fulfill trips such as running errands or attending medical appointments (Zuniga-Garcia et al., 2022). Microtransit can also be used to address service challenges in rural areas. Rural regions in both Europe and the US have had success with microtransit and other shared mobility systems (Khattak, 2024; C. Wang et al., 2014). Fixed route transit faces challenges in rural areas due to low population densities and large distances, which results in an inefficient service delivery. Microtransit is seen as a possible solution due to its demand responsive nature and direct service. Microtransit can also provide better service to those with accessibility needs compared to fixed route services. This is implemented through the potential for door-to-door service, reducing the distance those with mobility devices must navigate to get to their nearest bus stop (Calabrò et al., 2022; Goralzik et al., 2022; Niles & Pogodzinski, 2021; Rodman, 2022). Smaller vehicles can also serve as a more comfortable and personal option for those with mobility devices.

One equity concern mentioned in the literature is the potential for technological barriers when accessing microtransit services. Many sources discovered that microtransit riders skewed younger, and a common hypothesis among these sources was that certain populations may not have access to a smartphone or a mobile bank account (Beale et al., 2023; Bonner & Miller-Hooks, 2023; Hernandez, n.d.; Maleki & Smith-Colin, 2023; Zuniga-Garcia et al., 2022). A common solution used in pilot projects is the addition of a phone call option for booking a ride without the use of a dedicated mobile app. Despite the majority of bookings across all studies being made through an app, some agencies had a large number of bookings made via phone call, suggesting that a phone-call reservation system is a viable alternative for those without access to a smartphone (Steiner et al., 2021).

Methods

With permission from Yolobus, rider interviews were conducted as ride-along interviews, where the interviewer would ride on the BeeLine vehicle as it operated and conduct interviews with riders as they boarded. Ride-along interviews were conducted over multiple two-hour periods until several interviews were conducted for each zone. The zones of Woodland and Knights Landing had two ride-along interview periods each while the zone of Winters only had one ride-along interview period. In total, fifteen riders agreed to participate in interviews, of which seven were female and eight were male. Eight of the riders were interviewed in the Woodland zone, six of the riders were interviewed in Winters zone, and only one of the riders was interviewed in the Knights Landing zone. Interview participants were limited to those who were 18 years or older in age. While participant ages were not collected as part of the interview, the participant ages generally seemed to range between early 20s up to late 60s. All interviews were conducted between late March and early April 2024.

Interviews were guided by a script with fourteen questions that were within three sections. The first section of questions investigated rider travel behavior, particularly how travel behavior was impacted because of the introduction of the BeeLine microtransit service to the rider. The second section of questions evaluated the quality of the rider trip experience, such as how satisfied riders were with the BeeLine microtransit service in general, the service area, the service span, etc. The last section of questions simply asked for feedback that riders had for the service. While drivers for the BeeLine were not interviewed directly, driver comments about the service were noted and included within this paper.

Results

Interviewees shared information about their travel behavior, the benefits of the BeeLine, and the challenges they faced while using the BeeLine. Drivers also shared their insights on how the BeeLine's design affects both the rider experience and the operator experience for the service. These findings are explained in detail in the following sections below.

Travel Behavior

There were a variety of trip purposes observed on the BeeLine. All three zones had riders that would use the BeeLine for work or school commutes and grocery trips. The Winters and Woodland zones also had riders that would use the BeeLine for medical appointments and social/recreational trips. To be sure, this is not an indication that Knights Landing riders are limited in their trip purposes. The lack of interviews conducted in the Knights Landing zone simply mean that Knights Landing riders using the BeeLine for other trip purposes might not have been interviewed in this study. Some riders in the Woodland and Winters zones even connected to existing fixed route transit using the BeeLine. Because of these various trip purposes, there was also a wide range of frequency of use of the BeeLine by riders—some riders using the BeeLine solely for grocery trips and medical appointments would use the service around once a week or so while riders using the BeeLine for commutes would use the service at least once a day.

The BeeLine seemed to primarily substitute personal automobile trips and—in the case of the Woodland zone—ride-hailing trips. This, however, does not indicate a complete substitution of these modes. For instance, some trips made with the BeeLine in one direction were not necessarily made with the BeeLine on the return trip—many riders often had family or friends with personal automobiles that could fill that role instead, regardless of zone. Riders also did not necessarily ride the BeeLine alone. It was common for riders to ride the BeeLine with other friends or family members under a single reservation.

One of the rider behaviors that would differ between zones was the method used to reserve rides on the BeeLine. Riders from Knights Landing and Winters would both call and use the mobile app to reserve rides. In contrast, riders from Woodland would primarily use the app to reserve rides. This possibly suggests that providing a calling option for reserving rides is a necessity for riders coming from lower-income and disadvantaged communities, such as those from Knights Landing and Winters, as they might not have access to smartphones that can support the app. Interestingly, however, a few riders from Woodland did mention that they would call to reserve rides when they first started using the BeeLine service, but would transition to using the mobile app to reserve rides as they became more comfortable utilizing the app. There was no prominent pattern in the method of fare payment between the three zones. While paying with cash and paying by credit card through the BeeLine app were the most prominent methods, all the available fare payment methods were used by at least one rider, and thus there was no other distinct trend.

Service Benefits

Generally, most riders expressed that the BeeLine provides a crucial alternative to travel within the BeeLine service area regardless of which zone they were riding in. Many of the riders interviewed had circumstances that prevented the use of a personal automobile, which included old age, disabilities affecting mobility, a lack of a personal automobile, a lack of a driver's license, and even personal automobiles that were inoperable or under repair. Several riders even noted that they were dependent on the BeeLine service to make essential trips, such as commutes, grocery trips, and medical appointments. Without the BeeLine service, there would simply be no other feasible alternatives to make these trips. Even for riders that were not dependent on the service, the low fare for the service relative to competing ride-hailing fares through Uber and Lyft allowed for significant cost savings on day-to-day travel. For example, one rider from Woodland noted that he was previously "spending $200 a week on Ubers" in order to send his son to school and to recreational activities. This rider now nearly exclusively uses the BeeLine for travel within Woodland and noted that the service "is saving [him] so much money."

Challenges of the BeeLine

Common challenges that riders faced included the limited service area and service span. While the limited service area is a necessity from the agency perspective of Yolobus, riders often desired direct connections to popular destinations outside of the existing zones, such as Sacramento. The limited service span, particularly in the zones of Knights Landing and Winters, posed challenges for those using the BeeLine for their work or school commute. Some riders would be able to take the BeeLine to work or school but would often finish work or school after the BeeLine service hours had ended, forcing them to find other alternatives to commute back home. For the rider interviewed in Knights Landing, the early ending of service hours at 5:30PM on weekdays was a challenge: "I'm hoping to like, get a job soon, but [the service hours are] not going to work for my schedule [...] I'm trying to work around the time period, but it is a struggle." Riders also noted that the on-time performance of BeeLine vehicles was often inconsistent. The early, late, or even complete lack of arrival of BeeLine vehicles could and would often disrupt riders' travel plans. Some riders even reported that these delays would cause them to miss medical appointments or miss transfers to fixed route transit.

Another complaint from riders was the inconveniences associated with having designated pick-up and drop-off locations, especially for riders with disabilities that make it difficult to get to and from the pick-up and drop-off locations. One rider noted that they missed or nearly missed medical appointments in the past due to drop-off locations that were too far from their medical appointment. Another rider noted that the accepted forms of fare payment were unclear. Other complaints included the desire to be able to reserve rides on a desktop. One rider from Winters particularly noted their high sensitivity to fare increases. This was due to how the fare for YOUR Ride, BeeLines' predecessor, had once been

increased from two dollars to four dollars, which heavily discouraged the use of YOUR Ride for that rider. Lastly, some riders mentioned the importance of visibility for the service, noting how they were unaware of the service even after the BeeLine had been in operation for months. Despite how the BeeLine was easily the best travel option financially for these riders, their lack of awareness of the BeeLine prevented their use of the service. After learning about the service, riders would then use it—and in some cases, use it often. As one rider in Woodland described, "I just saw it drive by. I forgot about it—I didn't even consider it until I saw the BeeLine [van] and I was like 'ah! I should be using that'". Furthermore, there was one instance observed of a previously unaware Woodland resident approaching a BeeLine vehicle during an interview period to ask questions about the service, indicating that some Woodland residents are still unaware of the BeeLine service.

What is important to note is that unlike the benefits of the service, many of these challenges with the BeeLine are more impactful to certain riders than others. For example, the limited service area and service span disproportionately impact riders that are from carless households, who have fewer available alternatives for travel. The lack of a desktop option to reserve rides excludes riders who do not have access to a phone or a smartphone, which disproportionately impacts riders from disadvantaged communities. The disproportionate impact of these challenges raises important equity concerns with the BeeLine service.

Operator Perspective

Drivers for the BeeLine have noted that no-shows are very common for the service, especially in the Woodland zone where ridership is highest. These no-shows often impact the on-time performance of later pick-ups. In addition, drivers have noted that the job of driving for the BeeLine generally is challenging due to growing demand for the service. For example, drivers servicing the Woodland and Winters zones, which tend to see high ridership, are often unable to take breaks without affecting the on-time performance of the BeeLine. On the other hand, drivers servicing the Knights Landing zone have noted that sometimes there could be no rider demand for hours, even during peak commute hours. Some drivers have also noted that driver recruitment for the BeeLine is very difficult due to how BeeLine drivers are often existing Yolobus bus drivers that simply took additional training. Unfortunately, because there is no extra pay associated with becoming a BeeLine driver, it is challenging to find willing drivers for the BeeLine.

Discussion

The evaluation of the BeeLine in its three different zones highlights how regardless of the location characteristics of the service area, microtransit services bring valuable mobility alternatives to its riders, especially those that are unable to operate personal automobiles for one reason or another. Even for riders that do not depend on the BeeLine to travel within Yolo County, the service provides a cost-effective alternative. This supports the findings from previous literature pertaining to microtransit services' ability to address the transportation challenges of rural areas and low-income or disadvantaged communities.

However, context-sensitive design of microtransit systems is crucial to make the service as effective as possible for riders. As seen from the study, riders from rural areas and disadvantaged communities, such as those in Knights Landing and Winters, were disproportionately affected by certain flawed service characteristics. Riders from Knights Landing and Winters tended to depend more on the BeeLine for travel overall and thus were affected more by the limited service area and span compared to riders from Woodland who were less likely to be part of disadvantaged communities and less likely to depend on the BeeLine as much. Here, a failure to account for differences in community needs while designing the BeeLine led to a disproportionate distribution of challenges for its riders. As such, it is vitally important to recognize and address the impact of design choices of microtransit systems on each individual community that will be served by said microtransit system.

The findings of this study largely support the findings of existing literature, particularly in the challenges faced by riders and providers of microtransit services. Both existing literature and this study observed challenges associated with service area, service span, and visibility of the microtransit service. These shared challenges suggest that agencies looking to provide microtransit services should make careful considerations in these three areas when designing their microtransit systems. Failures in any of these three areas can dampen demand for the service and prevent it from reaching its potential maximum ridership. Only by carefully addressing these three areas can a microtransit system reach its highest possible ridership and service levels. Similarly, the findings of this study support the findings of existing literature regarding the interactions between microtransit services and existing equity challenges. Both existing literature and this study observed how microtransit can help address the travel needs of low-income and disadvantaged communities, how microtransit can provide service to rural areas, and how it is necessary to provide multiple methods for reserving rides to prevent technological barriers from excluding riders from the service.

Conclusion

This paper uses the case study of the BeeLine microtransit system to identify the different benefits and challenges for riders that microtransit services can create for their riders. This was done by conducting ride-along interviews with riders of the BeeLine service. These interviews found that while the BeeLine benefits riders from all zones, the challenges with the service, such as its limited service area and service span, impacted riders from disadvantaged communities—like Knights Landing and Winters—disproportionately. These findings suggest that addressing the equity concerns of individual communities should be a top priority when designing microtransit systems. This is increasingly important as microtransit is seen more and more as an option to provide better transit service to low-income or disadvantaged populations.

The following limitations of this study should be recognized: there were an insufficient number of interviews conducted in Knights Landing, largely in part due to language barriers between interviewers and the primarily Hispanic/Latino community in Knights Landing. In addition, the Yolobus BeeLine system has since been expanded to a fourth zone in Yolo, California. Yolo is a rural community with a population even lower than that of Knights Landing, and thus interviews conducted in Yolo would provide further valuable insight into the interactions between microtransit services and isolated rural communities. We also hope to use the findings from the rider interviews to inform future surveys for BeeLine riders. Surveys place less burden on both respondents and interviewers, and thus would help increase the number of respondents. Furthermore, this study does not include any quantitative analysis of the benefits of the BeeLine and how they weigh against the costs that Yolobus incurs in order to provide the service. Most transit services must balance the conflicting goals of providing the benefits of transit service while also keeping the service cost effective, and thus implementing future quantitative analysis would add a valuable agency perspective to our study.

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Data Summary

Products of Research

Interview recordings were collected for this study. Other data used for this study include data from Data Commons (n.d.).

Data Format and Content

Interview recordings are stored as MPEG-4 files.

Data Access and Sharing

Those interested in the interview recordings can contact the authors.

Reuse and Redistribution

There are no restrictions on how the data can be reused and redistributed by the general public.