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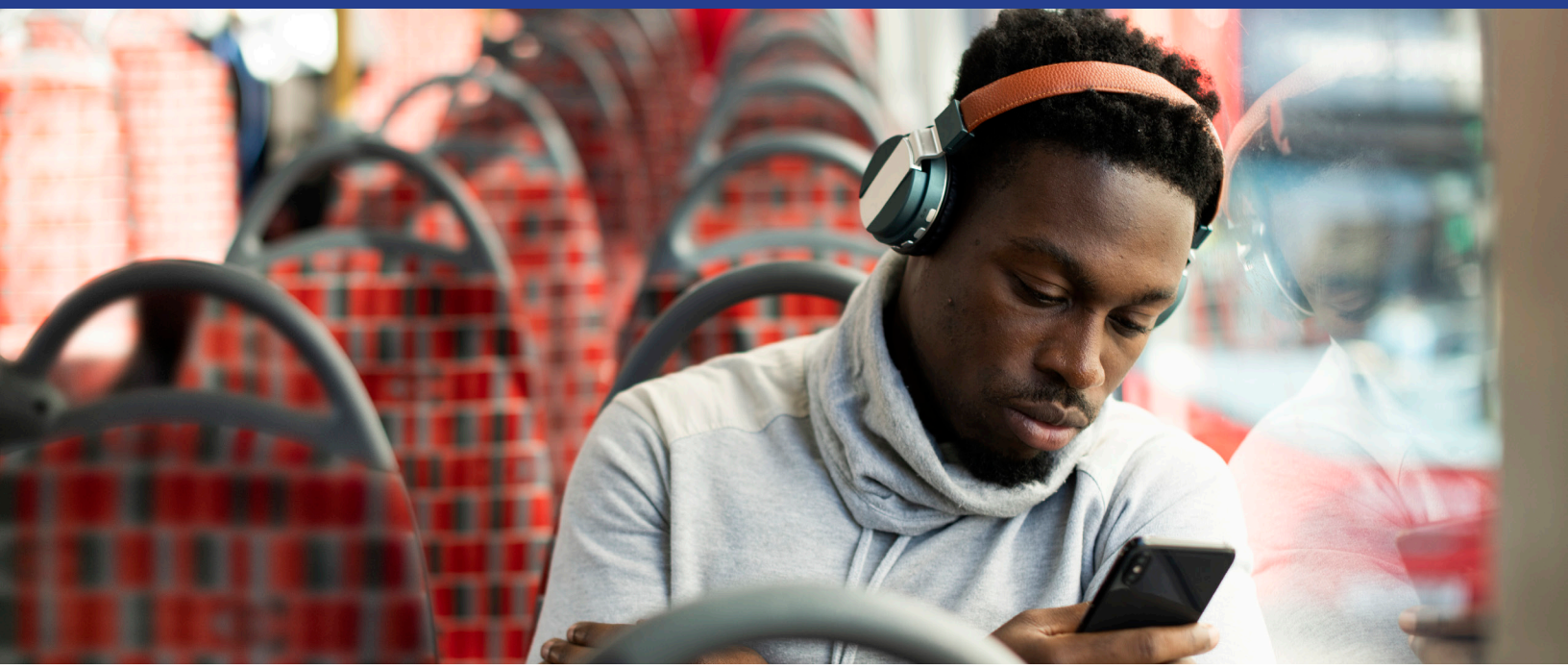

App-based Data Collection to Characterize Latent Transportation Demand within Marginalized and Underserved Populations

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Using a Smartphone App-based Data Collection Method to Characterize Latent Transportation Demand and Impacts on Health and Quality of Life within Marginalized and Underserved Populations

Final Report

NITC-RR-1397

by

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16. Abstract

Our interdisciplinary team refined an app prototype, *MyAmble*, to gather data related to quantity of transportation disadvantage and latent demand, and to identify psycho-social-economic corollaries. *MyAmble* utilizes a traditional travel diary format but expands the type of trips measured to include 1) completed trips, 2) missed trips, and 3) latent travel demand. The app also measures the real-time perceived impact of transportation behaviors (realized and latent) on participants' physical health, mental health, social engagement, and employment/academics. Finally, the app has a text-messaging feature, Travel Buddy, that is used to increase participant engagement and retention over longitudinal data collection. The project had several phases including focus groups to help inform app refinement. We deployed the *MyAmble* prototype through community-engaged research strategies in Dallas, TX, Tucson, AZ, and Knoxville, TN. Recruiting through community partners and snowball sampling resulted in a sample of 77 participants. The majority of participants were female (74.7%) and the average age of participants was 38.41 (*SD* 13.61) years old. In terms of race and ethnicity, the majority of participants were white (45.5 %) followed by Black/African American (28.6%), Hispanic or Latinx (10.4 %), and American Indian or Alaska Native (5.2%). The prototype testing shows promise in capturing latent travel demand data among typically underserved populations. The study generated critical feedback for continued improvements to *MyAmble*. Participants expressed positive feedback about *MyAmble* in the usability survey and offered recommendations for improving the app during the follow-up focus group. Transportation professionals offered recommendations for implementation planning and future studies using *MyAmble.*

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DISCLAIMER

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TABLE OF CONTENTS

[FNL1]

APPENDICES

LIST OF TABLES

EXECUTIVE SUMMARY

Travel diaries are effective at capturing people's planned and completed travel activities; however, they fail to capture transportation disadvantage (TD) in the form of essential trips that people plan to take, but are unable to complete due to transportation barriers (e.g., car/bus breaks down, ride does not show up, or no gas money). Moreover, travel diaries fail to capture latent travel demand, defined as travel that people would plan to complete had they the transportation resources to do so, but that they do not plan due to transportation barriers or perceived and actual safety concerns. Unsuccessful travel and latent demand are particularly relevant for underserved populations or those who experience transportation disadvantage, disproportionately persons who are minority race, lower income, or who have a disability. We proposed a novel solution to the lack of high-quality, holistic data about transportation disadvantaged populations through the application of low-cost mobile technologies. Our interdisciplinary team custom designed and refined an app prototype, *MyAmble*, to gather data related to quantity of TD and latent demand, and to identify psycho-social-economic corollaries using dual frameworks of social exclusion and Maslow's Hierarchy of Needs (HON). *MyAmble* utilizes a traditional travel diary format but expands the type of trips measured to include 1) completed trips, 2) missed trips, and 3) latent travel demand. *MyAmble* captures reasons - including being in a high-risk COVID-19 category - for missed travel and latent travel demand. The app also measures the real-time perceived impact of transportation behaviors (realized and latent) on participants' physical health, mental health, social engagement, and employment/academics according to the frameworks above. Finally, the app has a text-messaging feature, Travel Buddy, that is used to increase participant engagement and retention over longitudinal data collection. Travel Buddy also allows for gathering qualitative, longitudinal, ethnographic-type data. We deployed the *MyAmble* mobile prototype through community-engaged research strategies in Dallas, TX, Knoxville, TN, and Tucson, AZ, to test the app's feasibility among predominantly TD populations. Qualitative and quantitative data were analyzed to understand the role of transportation in social inclusion, or exclusion, and how daily trips correlate with HON, from basic needs up through higher-order self-actualization. Finally, users were asked about the app's usability post-field testing.

1.0 BACKGROUND

1.1.1 INTRODUCTION

The United States' demographics are changing as the population grows more diverse and older, while income and resource inequality intensify. These changes raise concerns about how U.S. transportation systems respond to and address the needs of marginalized and underserved populations. Transportation access is linked to employment and economic mobility, health care, food security, and even psycho-social well-being. The interaction among land use patterns, transport systems, and individual circumstances produces systemic transportation disadvantages (TD) (Curie & Delbosc, 2011). Groups at an elevated risk for TD in the U.S. include, women, elders, single parents, minorities, youth, persons who are disabled, and persons who are un/under-employed (*1*).

In the context of increasing inequities, data documenting transportation behaviors and needs among TD populations is critical if we hope to design smart and inclusive cities with transportation systems that promote rather than segregate access to opportunities. In general, while we know that the mismatch between the spatial distribution of resources and transportation systems produces disparate access to opportunities, we mostly understand these relationships at a cross-sectional, descriptive level. We continue to lack data showing how access to opportunities may co-vary with missed and latent transportation demand, and how marginalized and underserved populations perceive the impact of chronic TD on their economic security and physical and psycho-social well-being. Traditional travel diary data-collection methods, which are designed to measure completed trips, such as the U.S. National Household Travel Survey (NHTS), may fail to capture holistic aspects of the transportation needs among individuals who desire but miss travel opportunities due to TD, including how levels of health and well-being may be associated with different travel patterns.

While mobile technology use for travel data collection has not yet surpassed traditional approaches, the smartphone may reduce respondent burden while improving travel data quality, as well as quantity (*2*). For example, the use of mobile device apps may increase participation rates and offer a cost-effective way to collect high-fidelity data (*3*). Secondly, utilizing these technologies may mitigate challenges to participant accessibility among hard-to-reach populations, which is becoming an increasing concern in traditional data collection methodologies (*4*). An additional key feature of contemporary data collection methods includes a GPS feature to monitor and track travel behavior through passive methods that reduce participant burden. Taken together, the fusion of an innovative travel diary mobile device app with the GPS logger presents an ideal solution to gather transportation-related data (*5*). Additionally, utilizing innovative methods in data collection through smartphone technologies may increase

the accuracy and quality of data (*2*). Finally, research suggests that individuals who are lower income may use cell phones with greater frequency due to lower computer access (*6*), implying that smartphones may offer an ideal means for collecting real-time transportation data with marginalized populations.

Unfortunately, while emerging smartphone apps effectively track observed trips and facilitate user interface, they may fail to adequately capture data for older and lower-income populations (*7*). Additionally, travel diary methods, both paper-based and digital, miss latent and underserved travel demand (*2*). Overall, current and even emerging data collection strategies and techniques make identifying TD individuals and their corresponding underserved travel demand extremely difficult. New methods could replicate the strategies described in the existing data collection methods; however, they must also capture unserved transportation demand.

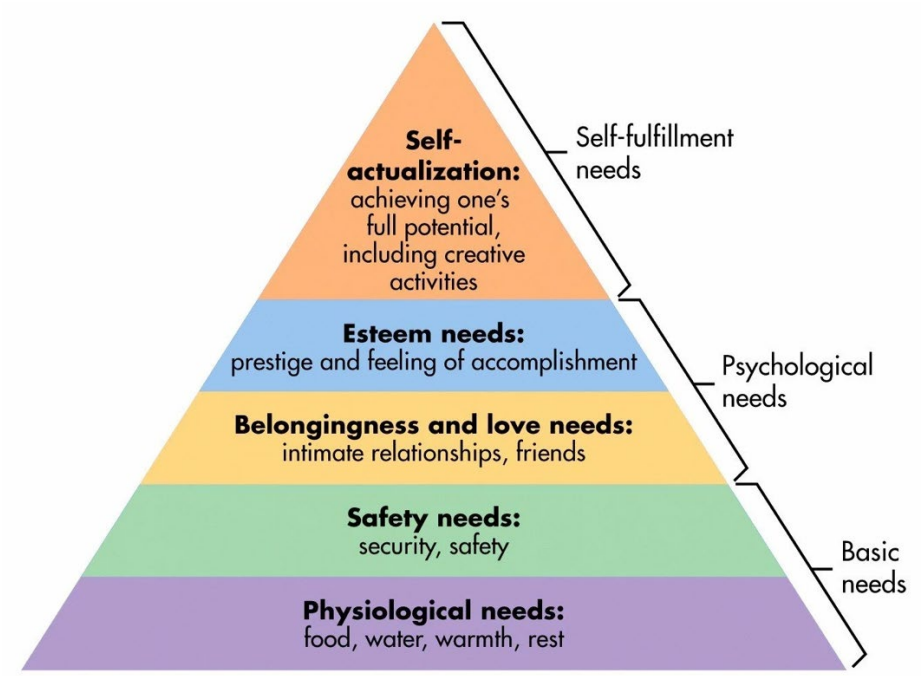
Traditional travel diary methods may lead to biased data about travel patterns and travel needs for individuals who experience TD. While travel diaries are effective at capturing an individuals planned and completed travel activities, they fail to capture essential trips that individuals plan to take but fail to complete due to transportation barriers (e.g., car/bus breaks down, ride does not show up, or no gas money). Moreover, travel diaries fail to capture latent travel demand, defined as travel that people would plan to complete had they the transportation resources to do so, but that they do not plan due to transportation barriers or perceived and actual harassment and/or over-policing in public spaces. This latent travel demand will likely disproportionately increase for TD individuals considered high risk during the COVID-19 pandemic due to higher underlying risk for a severe case due to age and/or pre-existing chronic disease/s highly correlated with race and low-income status.

Transportation and mobility are related to equitable access to various opportunities, such as education, employment, and health care. Taken jointly, these opportunities can be mapped along the domains of social in/exclusion (*8*), a critical but underutilized theory in mobility research to understand the link between transportation and society-level disparities, including academic, health, economic, and psycho-social. Social exclusion posits four domains across which individuals are unable to equitably participate in society - access to basic resources, participation in broader society, and quality of life (*8*). Underserved populations may be particularly vulnerable to both transportation disadvantage and social exclusion, but we lack data showing how access to opportunities may co-vary with types of trips described above - *planned and completed*, *planned but not completed*, and *latent transportation demand*. We mostly understand the relationships among transportation and access to opportunities in terms of spatial distribution of resources and cross-sectional survey and interview self-report at a descriptive level. Rarely do we collect intentional concurrent data on types of trips and their correlations with social, economic, and health disparities in real time and longitudinally.

Furthermore, Maslow's Hierarchy of Needs (HON; *9*) offers an additional theoretical framework for classifying the access to opportunities that transportation provides. HON

is a five-tier model of human needs. Level 1 is physical survival needs, which include water, food, sleep, and shelter. Level 2 is about the need for safety and security, which includes physical safety, economic safety, employment, resources, health, and property. Level 3 is social needs-belonging, which includes acceptance, group membership, friendship, love, and affection, Level 4 is about the need for self-esteem, which includes important projects recognition of strength-intelligence, status, recognition, freedom, and prestige. Level 5 is about the need for self-actualization, which includes challenging projects, opportunities for innovation and creativity. Transportation planners often consider Level 1 and 2 needs when they are considering equity plans, but rarely do they seek to provide infrastructure that achieves Level 3 access for all community members equitably. See Figure 1.

Figure 1. Maslow's Hierarchy of Needs (*9*) [FNL2]



1.1.2 SCOPING REVIEW

In advance of this research, the team beginning its primary data collection, a scoping review was conducted to examine the literature concerning state-of-the-art smartphone data collection in relation to transportation and travel behaviors with respect to underserved populations. The scoping review used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards (*10*) and Covidence (*11*) to ensure rigor and thoroughness.

The PRISMA standards require that researchers follow a detailed checklist (*10*) when reviewing articles that includes: eligibility criteria for including/excluding articles, bibliographic databases searched, search strategy for each database, number of reviewers, data collection tools (e.g. Covidence software), and a flow diagram that

includes the number of studies identified/screened/excluded and number of studies included in the review. Covidence is an online tool that assists researchers with conducting scoping reviews by allowing researchers to import citations, screen title/abstract/full text of articles, extract and export data (*11*). Covidence allows multiple researchers to collaborate on screening/reviewing articles.

A second search was conducted at the conclusion of the project, using the same search terms, in spring 2023 to capture any studies that were published in the interim. Peer-reviewed articles published from 2010 to 2023 in English and including transportation data collected with smartphone data collection apps were used. The starting year was selected based on the Pew Research Center's survey on smartphone ownership (*12*). Searched databases included the following: Engineering Village, SciTech Premium Collection, ASCE Research Library, Civil Engineering Database, Transportation Research Board Publications, Web of Science, Race Relations Abstracts, Social Work Abstracts, Anthropology Plus, CINAHL, Psychology and Behavioral Sciences, National Transportation Library, IEEE Explore, and Google Scholar.

In total, the scoping review yielded 27 articles, which identified 21 individual apps that were tested and studied. Results showed that five publications reported on the *Future Mobility Sensing (FMS)* (*13,14,15,16,17*). The second most frequent publications, three in total, investigated *MyAmble* (*18,19,20*). Two publications reported on the apps, *Daily Mobile Survey, sbNavi,* and *sbNavi game-based*. The *Daily Mobile Survey* articles shared the same lead author (*21,22*). The *sbNavi* app and its gamified version were investigated together in two separate articles by different lead authors (*23,24*), though both articles shared three researchers. Berger and Platzer (*25*) reported on the *SmartMo* app, which is an adaptation of a paper-based travel diary. Lu and Shankari (*26)* report on a U.S. Department of Energy-sponsored open-source app, *OpenPath*, that is novel in that it collects travel diary details through passive methods. Three studies did not mention the name of the app, but given the distinctiveness of the target population, methodology, and no shared authors, the team treated each study as if it were examining a unique app. The three unnamed apps and the remainder of the apps (n = 11) were featured in only one article.

Apps tended to focus either on individual users' personal transportation habits across all modes of transportation or collected data on how and the frequency with which individuals utilized public transportation. Over half (n = 17) of the apps focused on individual travel needs and habits. About a third (n = 6) of the apps focused on public transportation.

Each app was unique in the transportation data that it collected and the mechanisms it utilized to collect that data. Eighteen of the apps used a phone sensor, such as an accelerometer or a global positioning system to collect real-time, passive travel data, such as mode of transportation or location. All but one of the apps were concerned with modes of transportation, but few (n = 7) apps inquired about participants' subjective experiences of trips. Most of the apps (n = 18) incorporated a travel plan or diary into the app. More than two-thirds (n = 13) collected data about transportation barriers and

difficulties. Just over half (*n* = 12) inquired about the purposes of participants' trips. Fewer than a quarter of the apps collected data about the social component of travel (*n* = 4), and just one, *MyAmble*, collected data on latent travel and personal travel history.

Transportation data collection apps are being tested globally, with studies being conducted in every continent except for Africa and Antarctica. Eight of the 21 apps were being tested in Europe, and 10 were tested in North America. The remaining apps were being tested in Asia (*n* = 2) South America, (*n* = 1) and Oceania (*n* = 1). The *FMS* was being tested in the widest geographic range: Singapore, the U.S., and Israel.

Apps were utilized by transportation researchers to investigate different populations. Nearly half of the apps (*n* = 11) targeted the general population, whereas others (*n* = 7) collected data from specific populations that were not expressly environmental-justice populations. *MyAmble* specifically targeted a sample of the environmental justice population (*19,20,27*). Three apps collected information from general populations and recorded information about vulnerable individuals within that population (*28,29*). These studies identified vulnerable groups as older adults, those from lower socio-economic strata, disabled individuals, etc. (*29*). Study samples identified as environmental justice populations included lower-income older adults and single parents experiencing homelessness. Non-environmental justice population samples included university communities (*30,31*), professionals, and transit riders (*14,21,22,32,33,34*).

In sum, the scoping review indicated that a multitude of apps have been developed to simulate and improve upon paper-based travel diaries through more real-time and passive data collection methods. Very few, though, have expressly focused on underserved populations or on collecting data related to transportation disadvantage or latent travel demand. It appears that apps are becoming more common sources for collecting transportation data for the purposes of transportation infrastructure planning. Designing and testing apps to serve the transportation needs and experiences of persons at risk of transportation disadvantage is crucial in order to ensure representative data and transportation modeling.

1.1.3 STUDY OVERVIEW

We proposed a novel solution to the lack of high-quality, holistic data, described above through the dual lens of social exclusion and HON, through the application of low-cost mobile technologies. Our interdisciplinary team has custom designed an app prototype, *MyAmble*, to gather data related to quantity of TD and latent demand, and to identify psycho-social-economic corollaries. Results from a beta test (N = 15) using *MyAmble* on tablets were promising (*18, 20, 27*). Following the U.S. Department of Transportation's Technical Readiness Level Guidebook, we intended to test the degree to which the prototype app is transferable to diverse, relevant and operational environments. We deployed the prototype among: 1) primarily African-American and highly segregated and low-income neighborhoods in Dallas, TX; 2) low-income and disproportionately Latinx populations in the border city of Tucson; and 3) very low-income and disproportionately white and rural populations in Appalachia.

MyAmble utilizes a traditional travel diary format but expands the type of trips measured to include 1) completed trips, 2) missed trips, and 3) latent travel demand. *MyAmble* also captures reasons - including being in a high-risk COVID-19 category - for missed travel and latent travel demand. The app also measures the real-time perceived impact of transportation behaviors (realized and latent) on participants' physical health, mental health, social engagement, and employment/academics. Finally, the app has a text-messaging feature, Travel Buddy, that is used to increase participant engagement and retention over longitudinal data collection. Travel Buddy also allows for gathering qualitative, longitudinal, ethnographic-type data.

In our study, we answered four research questions: 1) What is the transferability of *MyAmble* among lower-income and marginalized individuals in three states (N=90) to collect data related to longitudinal, daily transportation activities, trip patterns, and health and well-being?; 2) What is the efficacy of *MyAmble* in a smartphone mode of delivery?; 3) What are the key components necessary for general adoption and use of *MyAmble* (e.g., user training, digital interface)?; and 4) What is the quality and usability of data showing how types of trips (completed, missed, and latent) associate with physical health, mental health, psycho-social wellbeing, and economic opportunities for underserved and marginalized populations?

2.0 METHODOLOGY

2.1.1 METHODS

The study employed a mixed-methods design (*35*) with focus group data, text-messaging interview data, daily diary trip data, photos/videos, travel stories, and pre- and post-survey data. Prior to any data collection, the study was approved by the University of Texas at Arlington Institutional Review Board (See Appendix A-1).

The study occurred in three sites: Dallas, TX, Tucson, AZ, and Knoxville, TN.

In 2020, the population of Dallas was 1.34 million people. The median age was 32.9 and median household income was $54,747. The poverty rate was 20.8%. The largest ethnic groups in Dallas included: white (Non-Hispanic) (43.3%); white (Hispanic) (26%); Other (Hispanic) (10.2%); Two+ (Hispanic) (5.92%); and Black or African American (Non-Hispanic) (4.55%). Most workers in Dallas drove to work and the average commute time was 26.9 minutes (*36*).

In 2020, the population of Tucson was 545,000 people. The median age was 34 and median household income was $45,227. The poverty rate was 20.8%. The largest ethnic groups in Tucson included: white (Non-Hispanic) (43.3%); white (Hispanic) (26%); Other (Hispanic) (10.2%); Two+ (Hispanic) (5.92%); and Black or African American (Non-Hispanic) (16.9%) (Data USA, n.d.). Most workers in Tucson drove to work and the average commute time was 22.4 minutes (*37*).

In 2020, the population of Knoxville was 187,000 people. The median age was 32.9 and median household income was $41,598. The poverty rate was 22.5%. The largest ethnic groups in Knoxville included: white (Non-Hispanic) (72.4%); Black or African American (Non-Hispanic) (16.9%); white (Hispanic) (3.25%); Two+ (Non-Hispanic) (3.07%); and Asian (Non-Hispanic) (1.67%) (Data USA, n.d.). Most workers in Knoxville drove to work and the average commute time was 20.6 minutes (*38)*.

2.1.2 FOCUS GROUPS

Prior to refining *MyAmble*, a focus group with experts from the North Central Texas Council of Governments (NCTCOG) and other MPOs was conducted to ensure that data relevant to transportation policy and planning was captured in the app (See Appendix A-2). Recruitment strategies included purposive, convenience and snowball sampling methods.

Next, one focus group was conducted with potential ends users of *MyAmble* at each site (See Appendix A-3). The purpose was to elicit feedback on *MyAmble*'s graphical interface, ease of use, and logic. The potential end users focus group participants were recruited using snowballing sampling relying on contacts from community partners including: The Senior Source, Inc. (Dallas); The State Fair of Texas/Big Tex (Dallas); Community Action Committee (CAC) (Knoxville); Knox Area Transit (KAT) (Knoxville; and The Living Street Alliance (Tucson). Recruitment in Texas focused on individuals from South Dallas. Recruitment in Tennessee focused on individuals in Appalachia who were lower income and transportation disadvantaged. Recruitment in Arizona was more likely to be younger and Latinx due to the area's demographics. End user participants were offered an incentive ($10 gift card) for their participation in the focus groups.

Before participating in the focus groups, all participants completed an informed consent form and brief demographic survey (See Appendices A-2 and A-3). All of the focus groups used semi-structured focus group guides that included open-ended questions and a visual PowerPoint presentation of the current state of *MyAmble* and how to use the app. Due to continued COVID-19 restrictions, all of the focus groups occurred on Zoom and were audio recorded and transcribed with the permission of participants. The groups lasted for approximately one hour with no less than two members of the researcher team conducting the meeting.

A directed content analysis (*39*) approach was utilized when seeking themes within the transcribed focus group audio. Next, the graduate student research team members created a survey for the faculty to review that included all of the themed

recommendations from the focus groups. Three faculty independently ranked each recommendation and then met to prioritize the refinements based on what could be accomplished within the time and resource constraints of the project.

Results from the professionals' focus group (n = 14): The majority of participants in the professional focus group were female (85.7%), white (71.4%), and half had a master's degree. The average age of participants was 37.1 years old. The majority of participants were currently working in the field transportation (57.1%) followed by social work (21.4%).

Themes from the NCTCOG/MPO focus group yielded several recommendations for app refinement including changes to the app training, demographic survey, trip plan/trip review, and Travel Buddy. See Appendix A-4 for a summary of the recommendations and changes.

The total number of end user focus group participants consisted of 19 individuals with one from Arizona (5.3 %), seven from Tennessee (36.8 %), and 11 from Texas (57.9 %).

Themes from the potential *MyAmble* end user focus group yielded several recommendations for app refinement including: login process, choice of icons, aesthetics, trip planner, and app training. A summary of the recommendations and changes are listed in Appendix A-5.

Based on the recommendations from the focus groups, the research team worked with faculty and graduate students in computer science to refine *MyAmble.* Graduate students and faculty in social work, engineering, and computer science tested each new version of the app until the final version was ready to launch. Refinements included changes to the back-end database, stored through Google Firebase. The *MyAmble* user manual (pdf) was updated to reflect all of the app modifications, and training videos were created to explain each feature of the app (See Appendix A-6). The videos were embedded in the user manual and were accessible to participants anytime before and while using *MyAmble*. The final version of the app was approved by the University of Texas at Arlington Institutional Review Board prior to any data collection.

2.1.3 MYAMBLE

Below is a brief description of each feature of the app *MyAmble*. These features were designed, implemented, and evaluated in a 2018 pilot study with older adults who were lower income using tablet devices in Arlington, TX (for an overview, see *18,27,41*). The app was subsequently used in a study of older adults using tablet devices in Columbus, OH (*42,43*). A key difference of the current study from the previous studies was the use of mobile phones vs. tablets and a larger, more diverse sample.

MyAmble includes four features: 1) daily trip planner; 2) Travel Buddy; 3) Challenge Logger; and 4) Travel Story. The *daily trip planner* was designed so that participants recorded their experiences with transportation mobility throughout the day. Participants

may also add any additional unplanned trips to their day, and why they did not plan for this trip in the morning trip planner. Any trip that participants record in the daily trip planner but are unable to complete is flagged in *MyAmble* as a missed trip. Overall, the daily trip planner is designed to extend the typical travel diary to capture more detail about each realized and unrealized transportation event and unserved travel demand. The Travel Buddy was created to be a qualitative data collection feature designed to capture more in-depth, perceptual data related to an individual's lived experience with transportation. Each study participant was partnered one-to-one with a virtual "travel buddy" who was a graduate student member of the research team. The Travel Buddy questions are sent to participants via text messages in the app. (See Appendix A-6). The Challenge Logger enabled participants to document real-time transportation barriers through videos and/or photos. GPS data was linked to photos/videos for further analysis. The Travel Story feature contains a series of questions that study participants can complete on their own any time during the study period. The Travel Story allows for the examination of the contextual factors behind the participants' lived experiences with transportation across their life span.

2.1.4 MYAMBLE DEPLOYMENT

Across all sites, the research team identified and recruited study participants with support from key nonprofit community partners.

In Texas, key community partners included The Senior Source Inc. and the Office of Community Affairs and Strategic Alliances at the State Fair of Texas. Staff from these two agencies recruited participants as well as assisted with connecting the research team with the following agencies: Bridge Builders, YMCA Park South, TR Hoover Community Development Center, The Salvation Army of North Texas, Cornerstone Baptist Church, and Trinity Restoration Ministries. Agencies shared study flyers with their clients and constituents as part of participant recruitment for the study. Snowball sampling was also used as part of participant recruitment.

In Tennessee, key community partners included the Knoxville-Knox County Community Action Committee (CAC) and the Knoxville Community Development Corporation (KCDC). The KCDC focused on recruiting participants from several housing communities that serve lower-income families. Several community agencies also distributed the study flyer including: Crossroads Transitional Housing, Smokey's Pantry, Irongate Recovery and the KCL Lawson McGeen Downtown Branch Library.

In Arizona, key community partners included The Living Street Alliance, a community organization that partners with the City of Tucson to host open-street events and has a well-developed listserve and social media presence through which the project was advertised. The Tucson team also posted flyers in parts of the community where people might be more likely to lack a personal vehicle (e.g., bus stops) as well as at grocery stores along major transit lines downtown.

Participants were sent a link to a university-approved informed consent form via email that explained the purpose of the study, participant incentives, as well as the risks and benefits of the study. Once a participant clicked “agree” to participate they were sent a QuestionPro survey (See Appendix A-8) with bio-psycho-social-economic questions about their life (e.g., health, mood, social relationships, ability to pay for daily need) as well as questions about their transportation experiences (e.g., preferred modes of transportation, ability to access and afford transportation). Upon completion of the survey, participants were sent a unique *MyAmble* user login and password as well as copy of the *MyAmble* user manual (See Appendix A-7). Participants were asked to use the app for 14 days. At the end of the study period, participants were sent a usability survey via email and invited to participate in a follow-up focus group (See Appendix A-8). Participants were offered an $75 gift card for their participation in the 14-day study. A 14 day study period was chosen based on the previous literature related to ecological momentary assessment methods (*44).* The incentive provided a little over $5 per day which was deemed by the institutional review board as non-coercive.

3.0 FINDINGS

3.1.1 DEMOGRAPHICS

Seventy-seven individuals across the three states participated in the pilot study and completed a baseline demographic and transportation resources/behaviors survey at the start of the 14-day app use. Of those, 26.0% of participants were from Arizona (*n* = 20); 40.3 % were from Tennessee (*n* = 31); and 33.8 % were from Texas (*n* = 26). Of those responding (five missing), age ranged from 19 to 67 years old (*M* = 39.84, *SD* = 14.00). In terms of gender, 74.0 % (*n* = 57) identified as female; 23.4 % (n = 18) as male; 1.3 % (*n* = 1) preferred not to answer; and 1.3 % (*n* = 1) did not respond. In terms of race and ethnicity, the majority of participants were white (45.5 %) followed by Black/African American (28.6 %); Hispanic or Latinx (10.4 %); American Indian or Alaska Native (5.2 %); Other (5.2 %); three participants (3.9 %) preferred not to answer; or Asian (1.3%).

The majority of participants were female (74%), white (46%), and working full time (single job) (26%) or part time (26%). Most participants reported that they did not have a disability (70%). The average age of participants was 38 (*SD* 13.61) years old. Most participants reported having reliable internet access in their home (90%) and were familiar with using apps on a smartphone or tablet (94%). The majority of participants had a legal driver's license (64%). Participants indicated the types of transportation that they had at their home or that they used regularly to get around their community: public transportation (64.9%); walking (59.7%); car (54.5%); Uber/Lyft (44.2%); bicycle (15.6%); paratransit (13.0%); motorcycle (7.8%); scooter/moped (7.8%); and truck (7.8%).

Roughly 31% of participants reported that they have a dependent (child) who travels with them regularly. Most participants reported that they had reliable transportation available to them (27.3% strongly agree, 41.6% agree). Approximately 42% of participants used ride-share (Uber/Lyft) in their regular day-to-day life. Most participants agreed that their community had public transportation for people to use if they did not have personal transportation (23.5% strongly agree, 50.6% agree). Almost 65% of the participants reported that transportation barriers limited them from connecting to their community (23.4% yes, 41.6% sometimes). Nearly 37% of participants reported that finding or accessing transportation greatly impacted their budget/finances (always (19.5%) or often (16.9%).

Participants were asked questions related to their psycho-social wellness (e.g., physical health, mental health, social relationships). Participants reported that physical pain prevented them from doing what they wanted to do (a moderate amount, 18.2%; very much, 15.6%; an extreme amount, 2.6%). Most of the participants felt satisfied with their personal relationships (satisfied, 31.2%; very satisfied, 26.0%). When asked about mood and transportation, participants reported that they had felt depressed or down because they were not able to get out of the house and go somewhere because of transportation (sometimes, 54.5%; frequently, 19.5%; all the time, 7.8%).

Participants reported that transportation affected their ability to see doctors for medical appointments (somewhat, 26.0%; often, 5.2%). More than half of the sample reported that a lack of or unreliable transportation had affected their ability to fill prescriptions and medications (a little, 31.2%; somewhat, 16.9%; and often, 6.5%).

TABLE 3.1.1.1: *MyAmble* User Demographics, (n= 77, AZ, TN, TX)

	***n* (%)**	***mean* (*SD*), *median***
Gender		
Female	57 (74.0%)	
Male	18 (23.4%)	
Prefer Not to Answer	1 (1.3%)	
No Response	1 (1.3%)	
Race/Ethnicity		
White	35 (45.50%)	
Black or African American	22 (28.60%)	
Hispanic or Latinx	8 (10.40%)	
American Indian or Alaska Native	4 (5.20%)	
Other (enter answer)	4 (5.20%)	
Prefer Not to Answer	3 (3.90%)	
Asian	1 (1.30%)	
Age		38.14 (13.61) 34.5
Marital Status		
Divorced	5 (6.49%)	
Married	16 (20.78%)	
Prefer Not to Answer	2 (2.60%)	
Separated	5 (6.49%)	
Single or never married	46 (59.74%)	
Widowed	3 (3.90%)	
Highest Level of Education		
Bachelor's Degree	23 (29.87%)	
Some College	20 (25.97%)	
High School	16 (20.78%)	
Associate degree	6 (7.79%)	
Master's Degree	6 (7.79%)	
Trade/Vocational/Technical School	3 (3.90%)	
Less than High School	3(3.90%)	
Current Employment Status		
Full-time (single job)	20 (25.97%)	
Part-time	20 (25.97%)	
Not Currently Employed but Looking	11 (14.29%)	
Social Security Disability Benefits	8 (10.39%)	
Full-time (multiple jobs)	5 (6.49%)	
Not Currently Employed and Not Looking	4 (5.19%)	

Retired	3 (3.90%)	
Prefer Not to Answer	3 (3.90%)	
Other (enter answer)	3 (3.90%)	
Disability (*as defined under the ADA*)		
No	54 (70.13%)	
Yes, physical	7 (9.09%)	
Yes, mental	5 (6.49%)	
Prefer Not to Answer	4 (5.19%)	
Yes, mental and physical	2 (2.60%)	
Yes, emotional	1 (1.30%)	
Yes, cognitive and physical	1 (1.30%)	
Yes, emotional, mental and physical	1 (1.30%)	
No Response	1 (1.30%)	
Yes, emotional and mental	1 (1.30%)	
Military Status		
Not a Veteran	72 (93.51%)	
Active/Veteran	3 (3.90%)	
No Response	2 (2.60%)	

3.1.2 DAILY TRIP PLANNER

Seventy-seven participants in Arizona, Texas, and Tennessee used *MyAmble* for the 14-day study period. The trip planner includes options for participants to plan and review their daily trips. Participants can also identify unplanned trips and missed trips. Below is a summary of the total entries in the daily trip planner (only planned, unplanned, and missed).

TABLE 3.1.2.1: ***MyAmble* Trip Planner, overall (n=77, AZ, TN, TX)**

	***n* (%)**
Trips	
Planned	1,189 (75.8%)
Unplanned	287 (18.3%)
Missed	93 (5.9%)

Participants *planned* 1,189 daily trip plans during the study period. Of those trips, nearly 88% were reported as very important or important to study participants. Trip destinations most often included work (*n* = 250, 21%); school (n = 150, 12.6%); grocery

shopping (*n* = 136, 11.4%); visiting friends and family (*n* = 110, 9.3%); and eating out at a restaurant (*n* = 72, 6.1%). Nearly 39.3% of the planned trips were planned to be taken with someone else (*n* = 467). The majority of participants reported that they did not need assistance from someone else for their planned trip, and most participants reported feeling safe in regard to their planned trip. See Appendix A-9 for further detail about the planned trip responses.

Participants logged 287 *unplanned* daily trips during the study period. Of those trips, nearly 79.4% were reported as very important or important to study participants. Trip destinations most often included grocery shopping (*n* = 56, 19.5%); visiting friends and family (*n* = 36, 12.5%); other shopping (n = 28, 9.8%); work (*n* = 26, 9.1%); and eating out at a restaurant (*n* = 17, 5.9%). Approximately 46.7% of the unplanned trips were planned to be taken with someone else (*n* = 134). See Appendix A-10 for further detail about the unplanned trip responses.

Participants logged 93 *missed* daily trips during the study period. Of those trips, over 59% were reported as very important or important to study participants. Trip destinations most often included grocery shopping (*n* = 17, 18.3%); work (*n* = 12, 12.9%); school (n = 10, 10.8%); and visiting friends and family (*n* = 10, 10.8%). Missed trips also included questions about mood. For missed trips, participants reported that they felt “a lot” to “very much” frustrated (31.2%); disappointed (29.0%); stressed (34.4%); sadness (25.8%); and that they missed an opportunity (23.7%). Approximatively 48% of participants reported that being able to take the missed trip would have fulfilled a commitment in their life. See Appendix A-11 for further detail about the missed trip responses.

Participants reported in the *trip review journal* the extent to which they completed the trips that they planned for the day. Participants logged 592 trip reviews during the study period. Of these trip reviews, trips were reported as very much completed (64.7%); a lot completed (20.6%); somewhat completed (9%); a little completed (1.9%); and not at all completed (3.9%). Participants also reported accomplishing more than one activity in a trip. The overall benefits of completing the trips were employment (22.5%); goals accomplished (12.2%); social engagement (10.6%); grocery (10%); health (9.6%); time with family (9.3%); errands (9.3%); and school (5.9%). Other benefits Appendix A-12 for further detail about the trip review journal.

MyAmble captures latent demand by asking participants each day: 1) Are there any other activities that they would like to complete but cannot?; and 2) Why are you not including these activities? Latent demand was captured from participants in two ways: the *negative journal*, and the *positive journal*. The journal names were hidden from participants and were only used in the back-end, secure database.

The negative journal questions are populated in MyAmble if a user indicates that they do not have a plan for the day (they select “no, I do not have a plan for today”). A total of fifty-seven users answered the set of questions from negative journal. The questions in negative journal were set in two parts: negative journal 1 and negative journal 2.

In negative journal 1, the users were asked: “Are there any activities that you would like to complete today but cannot?” If the user responds, “yes,” the negative 1 journal questions ask: 1) What type of activities did you want to complete today but cannot? 2)

Why could you not include them? and 3) What transportation options would have made this possible for you? 25 entries were recorded in this negative journal 1 with the activities the users wanted to complete. The majority of these activities include grocery (20%), shopping (12%), work (12%), and family (12%). Participants indicated that money (28%) and transportation (26%) would have made these trips possible. See Appendix A-13 for further detail about the negative journal 1.

Negative journal 2 the next set of questions when the user responds “no” to the question “Are there any activities that you would like to complete today but cannot?”. The users were then asked: “Are there any activities that you would like to complete today but cannot?” If the user responds “no,” the negative 2 journal questions ask: “If you do not have any planned trips, why are you not traveling?”. A total of 236 entries were made in this part. Staying at home (57%) is the most reported reason participants were not traveling. Twenty-nine responses were excluded as the participants responded ‘N/A’ (11%). See Table 18 in the appendices for further detail about the negative journal 2. The *positive journal* asks users at the end of trip planning: “Are there any other activities that you would like to complete today but cannot?” If the response is “yes,” participants are asked: 1) What types of activities did you want to complete but could not?; 2) What prevented you from taking these trips?; 3) What transportation option/s would have made this/these trip/s possible for you?, 4) To what extent would completing this trip have improved your mood?; and 5) How important is/are this/these trips to you? Twenty-three participants completed a positive journal with a total of 32 entries. Grocery shopping (25.0%) and shopping – other (25%.0) were the most reported type of activities. Participants reported that lack of funds (21.9%), and transportation issues (18.8%) were what prevented them most from taking these trips. Approximately 34.4% of participants indicated that a car would have made this trip/these trips possible for them. Participants reported that completing these trips would have improved their mood (93.8%). Participants reported these trips as very important (46.9%). See Appendix A-14 for further detail about the positive journal.

Overall, approximately 19% of participants completed a *negative journal 1*. Nearly 74% of participants completed a *negative journal 2*. Roughly 30% of participants completed a *positive journal*. In general, these results point toward the ability of *MyAmble* to capture the desired, but unfulfilled, travel of participants.

3.1.2 TRANSPORTATION DEMAND AND QUALITY OF LIFE

Through the *MyAmble* mobile application and over a span of 14 days, The *MyAmble* field test collected data about met and unmet transportation demand and their impact on quality of life. The final data set included a total of 1,088 completed and uncompleted trip activities. This section investigates relationships between trip status (complete, missed, and latent), trip purposes, and trip outcomes.

Each of the database records identifies a trip activity as complete, missed, and latent. A complete trip activity represents a planned trip that reached its desired destination. A missed trip is a trip that the respondent originally intended to complete, but they did not complete as originally planned. The respondents provided a reason why each trip was

missed. Latent trips describe trip activities desired by respondents, but never included in trip planning because of their lack of access to transportation or its unaffordability.

The data records also include 22 types of activities associated with each trip; these include doctor appointment, grocery shopping, eating out at restaurant, friends and family, library, work, pharmacy, other shopping, school, exercise, mall, entertainment, religious service, gas station, hospital, job search, social services, post office, bank, hotel, court and others. For this analysis, the study aggregates these activities using two approaches: trip purpose and Maslow's Hierarchy of Needs (HON) (*9*). The study classifies the activities into four aggregate trip purposes: social, economic, food, and health. Activities such as friends and family, library, other shopping, mall, religious services, gas station, entertainment, and hotel comprise the social purpose. The economic purposes include work, school, job search, post office, bank, and court. The food purposes involve grocery shopping and eating out at restaurants. The health purposes include doctor's appointments, pharmacy, exercise, and hospital activities. Even with 22 different activities identified, respondents designated 144 (13%) trip activities as other activities. This indicates that *MyAmble* may require more activity options for future studies.

The study classifies the 22 trip activities from the *MyAmble* app into the first three levels of Maslow's HON. The level 1 category includes eating at restaurants, grocery shopping, hospital, hotel, and social services. The level 2 category contains bank, court, doctor's appointment, gas station, job search, pharmacy, post office, school, and work. The study groups the other levels of the hierarchy into a 3+ category and includes entertainment, exercise, family and friends, library, mall, other shopping, and religious services.

TABLE 3.1.1.1: Cross-tabulation of trips with respect to activity grouping and trip importance

Labels	economic	food	health	social	Others	Grand Total
Very Important	204	62	57	84	81	488
Important	123	82	43	114	42	404
Neutral	26	45	9	40	18	138
Less important	1	8	1	6	2	18
Not important	4	5	0	8	1	18
Blank	6	7	2	7	0	22
Grand Total	358	202	110	252	144	1088

The 941 (86.5%) completed trips include 324 economic trips, 167 food-related trips, 97 health trips, 216 social trips and 137 other trips. The 93 (8.5%) missed trips include 28 economic trips, 22 food trips, eight health trips, 28 social trips and 7 other trips. The 54 (3.5%) latent trips include 12 economic, 20 food, seven health, and 15 social trips. This distribution indicates that other trips experience the highest completion rate (95.1%) followed by 89% completion rate in economic trips, and both food (79.9%) and social (83.4%) experience lower than mean completion rates. Higher than mean missed trip rates occur for food (10.5%) and social trips (10.8%). For latent trips, food (9.6%) and health (6.3%) trips show higher rates.

TABLE 3.1.1.2: Cross-tabulation of trips based on activity grouping and trip status.

Labels	economic	food	health	social	Others	Grand Total
Completed	324	167	97	216	137	941
Missed	28	22	8	28	7	93
Latent	12	20	7	15	0	54
Grand Total	364	209	112	259	144	1088

Using the HON aggregation, the completed trips include 236 trips from Maslow's level 1, 373 trips from Maslow's level 2, 195 trips from Maslow's level 3 and 137 other trips. The missed trips contain 25 trips from Maslow's level 1, 35 trips from Maslow's level 2, 26 trips from Maslow's level 3 and 7 other trips. The latent trips include 27 trips from Maslow's level 1, 13 trips from Maslow's level 2 and 14 trips from Maslow's level 3. This distribution indicates that other trips experience the highest completion rate (95.1%) followed by level 2 trips with completion rate 88.6% and both level 1 (81.9%) and 3 (83%) trips experience lower than mean completion rates. Higher than mean missed trip rates (11.1%) occur for level 3 trips. For latent trips, level 1 trips (9.4%) show higher rates. The relatively high rate of latent demand for level 1 trips appears somewhat troubling.

MyAmble allowed respondents to rate the importance of the trips and defined five degrees of importance; very important, important, less important, neutral, and not important. Of very important trips, 488 were recorded: 204 economic trips, 62 food trips, 57 health trips, 84 social trips and 81 other trips. Of important trips, 404 were recorded: 123 economic trips, 82 food trips, 43 health trips,114 social trips and 42 other trips. 18 less important trips were recorded: one economic trip, eight food trips, one health trip, six social trips and two other trips. Of neutral trips, 138 were recorded: 26 economic trips, 45 food trips, nine health trips, 40 social trips and 18 other trips. 18 not important trips were recorded: four economic trips, five food trips, eight social trips and one other trip.

In terms of Maslow's HON, 4488 very important trips were recorded; 109 level 1, 222 level 2, 76 level 3 and 81 other trips. Of important trips,404 were recorded:110 level 1, 151 level 2, 101 level 3 and 42 other trips. Of 138 neutral trips, 47 were from level 1, 34 from level 2, 39 from level 3 and 18 other trips. 18 less important trips included eight level 1, two level 2, six level 3 and 2 other trips. 18 not important trips were recorded: five each from level 1 and level 2, seven from level 3 and one other trip. The missed trips and completed trips align well with importance where more important trips experience higher completion rates. The latent trips most often appear important or very important.

TABLE 3.1.1.3: Cross-tabulation of trips based on Maslow's Hierarchy and trip importance

Labels	level 1	level 2	level 3	Others	Grand Total
Very Important	109	222	76	81	488
Important	110	151	101	42	404
Neutral	47	34	39	18	138
Less important	8	2	6	2	18
Not important	5	5	7	1	18
Grand Total	279	414	229	144	1088

To evaluate mental and physical health of the participants, questions like how often they have negative feelings such as blue mood, despair, anxiety, depression, and how much medical treatment they need, such as prescription medication, oxygen, etc., are respectively considered. The mental score is calculated on a scale of 1-5 where 1 represents never having negative feelings; 2 represents seldom; 3 represents quite often; 4 represents very often; and 5 represents always. Of 77 participants, two participants have a mental score of 5; 11 participants have a mental score of 4; 25 participants have a mental score of 3; 36 participants have a mental score of 2; and three participants have a mental score of 1. Participants with a mental score of 5 completed 26 trips, missed two trips and had one latent trip over the span of 14 days. Participants with a mental score of 4 completed 80 trips, missed 10 trips and have 10 latent trips. Participants with a mental score of 3 completed 414 trips, missed 46 trips and had 18 latent trips. Participants with a mental score of 2 completed 397 trips, missed 34 trips and had 24 latent trips. Participants with a mental score of 1 completed 24 trips, missed one trip and had one latent trip.

TABLE 3.1.1.4: Categorization of trips based on the mental score of participants.

Labels	Completed	Latent	Missed	Grand Total
Always	26	1	2	29
Very Often	80	10	10	100
Quite Often	414	18	46	478
Seldom	397	24	34	455
Never	24	1	1	26
Grand Total	941	54	93	1,088

The physical score is calculated on a scale of 1-5 where 5 represents an extreme amount of medical treatment needed; 4 represents very much; 3 represents a moderate amount; 2 represents a little; and 1 represents not at all. Of 77 participants, four participants have physical score of 5; 13 participants have physical score of 4; 11 participants have physical score of 3; 16 participants have physical score of 2; and 33 participants have physical score of 1. Participants with physical score of 5 completed 38 trips, missed 10 trips and had one latent trip over the span of 14 days. Participants with physical score of 4 completed 82 trips, missed 14 trips and had 15 latent trips. Participants with physical score of 3 completed 136 trips, missed 15 trips and had seven latent trips. Participants with physical score of 2 completed 215 trips, missed 27 trips and had 15 latent trips. Participants with physical score of 1 completed 470 trips, missed 27 trips and had 16 latent trips. The participants with lower scores appear to complete fewer trips than those with higher scores.

TABLE 3.1.1.5: Categorization of trips based on the physical score of participants

Labels	Completed	Latent	Missed	Grand Total
An Extreme Amount	38	1	10	49
Very Much	82	15	14	111

A Moderate Amount	136	7	15	158
A Little	215	15	27	257
Not at All	470	16	27	513
Grand Total	941	54	93	1088

The effect of lack of transportation or unreliable transportation on the participants' ability to fill prescriptions and medications is evaluated to study the effect of transportation on physical health. This ability to fill prescriptions and medications is scored on a scale of 1-5 where 5 represents always; 4 represents often; 3 represents somewhat; 2 represents a little; and 1 represents never. Of 77 participants, four participants have a score of 5; five participants have a score of 4; 13 participants have a score of 3; 24 participants have a score of 2; and 31 participants have a score of 1. Participants with a score of 5 completed 70 trips, missed four trips and had four latent trips over the span of 14 days. Participants with a score of 4 completed 53 trips, missed six trips and had three latent trips. Participants with a score of 3 completed 145 trips, missed 15 trips and had 13 latent trips. Participants with a score of 2 completed 324 trips, missed 37 trips and had 13 latent trips. Participants with a score of 1 completed 349 trips, missed 31 trips and had 21 latent trips.

TABLE 3.1.1.6: Categorization of trips based on participant's ability to fill prescriptions and medications

Labels	Completed	Latent	Missed	Grand Total
Always	70	4	4	78
Often	53	3	6	62
Somewhat	145	13	15	173
A Little	324	13	37	374
Never	349	21	31	401
Grand Total	941	54	93	1088

To study the economic status of the participants, the survey question asks if the participants have enough money to meet their daily needs. This is scored on a scale of 1-5 where 5 represents completely; 4 represents mostly; 3 represents moderately; 2 represents a little; and 1 represents not at all. Of 77 participants, eight participants have a score of 5; 16 participants have a score of 4; 16 participants have a score of 3; 27 participants have a score of 2; and 10 participants have a score of 1. Participants with a score of 5 completed 95 trips, missed nine trips and had eight latent trips over the span of 14 days. Participants with a score of 4 completed 198 trips, missed 10 trips and had two latent trips. Participants with a score of 3 completed 314 trips, missed 28 trips and had five latent trips. Participants with a score of 2 completed 212 trips, missed 33 trips and had 28 latent trips. Participants with a score of 1 completed 122 trips, missed 13 trips and had 11 latent trips.

TABLE 3.1.1.7: Categorization of trips based on participants having enough money to meet their needs

Labels	Completed	Latent	Missed	Grand Total
Completely	95	8	9	112
Mostly	198	2	10	210
Moderately	314	5	28	347
A Little	212	28	33	273
Not at All	122	11	13	146
Grand Total	941	54	93	1088

Participants indicate their feelings about the meaningfulness of their life on a scale of 1-5, where 5 represents an extreme amount; 4 represents very much; 3 represents a moderate amount; 2 represents a little; and 1 represents not at all. Of 77 participants, 15 participants have a score of 5; 22 participants have a score of 4; 28 participants have a score of 3; 9 participants have a score of 2; and 3 participants have a score of 1. Participants with a score of 5 completed 126 trips, missed 16 trips and had 12 latent trips over the span of 14 days. Participants with a score of 4 completed 325 trips, missed 30 trips and had 16 latent trips. Participants with a score of 3 completed 328 trips, missed 32 trips and had 16 latent trips. Participants with a score of 2 completed 104 trips, missed eight trips and had four latent trips. Participants with a score of 1 completed 58 trips, missed seven trips and had four latent trips.

TABLE 3.1.1.8: Categorization of trips based on how meaningful participants feel about their life

Labels	Completed	Latent	Missed	Grand Total
An Extreme Amount	126	12	16	154
Very Much	325	16	30	371
A Moderate Amount	328	16	32	376
A Little	104	6	8	118
Not at All	58	4	7	69
Grand Total	941	54	93	1088

The satisfaction of the participants with their personal relationships is scored on a scale of 1-5 where 5 represents very satisfied; 4 represents satisfied; 3 represents neither satisfied nor dissatisfied; 2 represents dissatisfied; and 1 represents very dissatisfied. Of 77 participants, 20 participants have a score of 5; 24 participants have a score of 4; 19 participants have a score of 3; 12 participants have a score of 2; and 20 participants have a score of 1. Participants with a score of 5 completed 312 trips, missed 26 trips and had 16 latent trips over the span of 14 days. Participants with a score of 4 completed 275 trips, missed 27 trips and had seven latent trips. Participants with a score of 3 completed 161 trips, missed 23 trips and had 21 latent trips. Participants with a score of 2 completed 169 trips, missed 16 trips and had eight latent trips. Participants with a score of 1 completed 20 trips, missed one trip and had one latent trip.

TABLE 3.1.1.9: Categorization of trips based on how satisfied participants are with their personal relationships.

Labels	Completed	Latent	Missed	Grand Total
Very Satisfied	312	16	26	354
Satisfied	275	7	27	309
Neither Satisfied nor Dissatisfied	161	21	23	205
Dissatisfied	169	8	16	193
Very Dissatisfied	20	1	1	22
Blank	0	4	1	5
Grand Total	941	54	93	108

This analysis represents a sample of the rich detailed investigation of transportation needs and their impact on individuals and households. Future work will seek to identify transportation access and affordability as a causal factor for individual and household outcomes. Future work will also investigate trip activity prioritization based on individual/household transportation access and affordability.

3.1.3 TRAVEL BUDDY

Four members of the research team analyzed the Travel Buddy data using the Rigorous and Accelerated Data Reduction (RADaR) method (*45*). Data were coded independently, and the researchers then met to establish consensus and generate overall themes. Five main themes emerged: *transportation safety; neighborhood safety; time, freedom, and convenience; lack of service coverage; and mobility is quality of life.* Spelling and grammatical errors in the Travel Buddy responses have been corrected for purposes of reporting.

Transportation Safety

Theme definition: Perceived personal mobility captures perceived interpersonal safety. Even when the transportation resources are available, people may not experience a sense of mobility or perceive that they have access to transportation, due to feeling unsafe using public transit or other transportation options such as walking. Thus, creating a sense of both physical and psychological security within public transit is essential in order to increase perceived access to, and real utilization of public transit, for people without personal vehicles.

Texas

- I feel safe on public transportation, but not so much while waiting for the bus to arrive. I feel completely safe with Lift/Uber. (TX027)

- I feel pretty good safe with Dart because they have cameras on board. And I feel safer now with Lyft and Uber since they now have the safety app that you can let a family member or friend know your location and driver information. (TX008)
- I've experienced wild things on the DART train people peeing on the train people fighting on the train I'm guessing there needs to be a little bit more security while on Dart trains. (TX049)

Arizona

- Nothing would make me feel safer on the bus. I'm vaccinated, double masked with gloves and sanitizer and assertive social distancing, that's the best I can do. i would love to see the buses kept clean. they are so gross. and the bus stops here are filthy and sticky. i think if the bus routes and vehicles were cleaner, maybe that would be safer. it would be nice if lyft and uber had more female drivers, but i don't know how that could be remedied. (AZ010)

Tennessee

- I feel relatively safe. I also always have my phone ready and my location shared as a just in case for if I'm ride-sharing out of habit. I feel like if I lived in a bigger city, it would be much more of a worry than it currently is. (TN061)
- I feel very safe, but that might not be the case if I had to rely on taking public transportation, especially at night. (TN022)

Neighborhood Safety

Theme definition: Context matters for mobility, and transportation must be co-designed with other elements within the built and social environment. Participants made decisions about using public transit based on perceived levels of safety within their neighborhoods and so ensuring safety features such as reliable lighting around public transit stops is critical. As an example, planting flowers and making bus stops socially welcoming places through upkeep and covered benches could also ease rider concern.

Texas

- I don't feel safe with public transportation because the area I live in is not good and as far as the personal transportation the private is the best option because I have more control over what happens versus being in the company of people I don't know that could cause harm to me or my family. (TX018)
- I feel safe using public transportation in day lite hours, but not after dark. That is because of the low-income neighborhood I live in. (TX021)
- As far as riding the dart bus I feel an unease due to the homeless people that live around in this area, I'd feel safer if there was more protection like security guards are policemen securing the area...I take Lyft rides where I need to go...I only take the bus when the sun is out. (TX049)

Arizona

- My current address I feel completely safe at! as I stated before the property we just moved from was where I did not feel safe. That is one of the main reasons we moved, to get into an all around safer neighborhood… At our old address the only way I would go anywhere close or after dark would of been if my drove me. (AZ011)

Tennessee

- it's a rough neighborhood where I live… maybe security by bus stops in certain areas [would make me feel safer]. (TN030)
- I feel very safe with all my options. The only concern I have is not having sidewalks in our neighborhood.. Well it just means that you have to walk in the road and some drivers are really impatient. So sometimes as a pedestrian you have to hop onto someone's lawn or quickly move to uneven grounds, risking you to maybe fall or twist an ancle. (TN028)

Time, Freedom, and Convenience – Time is Money

Theme definition: Riders make rational, cost-benefit decisions about public transit versus other resources like ride-sharing based on convenience. Time is valuable and so they may choose to spend slightly more money to use a ride-share service if it is faster or more on-demand than a public bus.

Texas

- I like riding the bus because there is a greater flexibility in my travels. It's cheaper than buying gas, it's pretty safe. (TX54)
- I like the bus cause it can go anywhere in Dallas, but also like a taxi when I can afford it. (TX038)
- I prefer Lyft because I don't have to ride-share and you go directly to your destination, however with Dart it's move convent if you have go to the market and a lot of times you know the drivers and they know you. (TX008)
- cars have autonomy. not waiting in the rain and cold. if you don't wake up 2 hours before work, you can still make it on time with a car. (TX020)
- I would go with No.1 being ride-share services/Uber/Lyft because they're quite affordable, for at least as $10 What makes them so unique is that they offer personalized transportation options with no fixed schedules/routes and most importantly, an infinite number of on-demand stops! No. 2 I have Taxi cabs and Limo services. They are a bit expensive but for what it's worth, the services they provide, make you to definitely want to pay for it. The drivers are punctual, friendly, efficient as well as the cabs are very cozy! I would definitely recommend them! I prefer them based on how convenient and reliable they are. Convenience is the key, I mean, it would make me rather wait for too long before I depart. I mean, time is of essence, you know. (TX022)

- I prefer Uber because they're reliable and affordable, always available at anytime. The taxi is also a means of transportation I like because they're easily accessible. (TX043)

Arizona*

- I like the city bus here in Tucson because it actually has a really good route and most of the time can get you to where you need to go…. if I could fix anything it would be having an option to get you somewhere faster when using public transportation. (AZ011)
- I would love to use public transportation but the route available to work would take an hour+ and three bus transfers. (AZ002)
- The bus system is extensive but slow and you have to transfer at least once to get across the city. Besides the bus, you really have to have a car to get around. Or rode your bike but that does not feel safe here (reckless/aggressive drivers). (AZ007)

*Tucson implemented free transit during COVID-19

Lack of Service Coverage

Theme definition: A lack of accessible transit near a person's residence or destination.

- I'm near downtown so I have several decent bus lines. the problem is that certain parts of the city are difficult to reach on the bus. even when these areas are relatively close via car. (TX020)
- I'm generally satisfied with the options available at my disposal for now. But if I am being honest, I would suggest that more bus stations be made available. It will aid the transportation of people better. (TX043)
- I've been unable to attend potential job interviews because of lack of transportation many times. It's been very frustrating to see a job that I would love to do, but realize I would have no way to get there daily or that it would take hours via bus. My last job I was riding the bus 2 hours and walking around 1.5 miles just to get there and another 2 hours and walking to get home every day, just because how the bus routes are laid out. I don't want to do that again. (TN020)
- I am homeless and live in the woods. am currently working with the CAC case worker to get housing and better transportation. so I walk every day from my tent to Broadway to either ride the bus or walk to do what I need to do. travelbuddy: Thank you for sharing that, approximately how far do you typically walk to the bus stop or other locations you attend? tn039: one and a half miles. travelbuddy: Does being homeless present additional transportation issues for you? tn039: yes most definitely it makes it hard to even get bus money to get anywhere other than the area that I live. and it also means everyday walking from my camp which is a mile and a half to the closest gas station and therefore a mile and a half back so that's 3 mi just the gas station and back and that's not going to get food or doing anything else. (TN039)

- it makes me feel very unsafe when I have to walk from the bus stop to work. there's not a bus stop near my work and there's no sidewalks to walk on so I walk very close to other drivers at night there's no lighting and I have to walk through the Walmart parking lot while it's dark I started carrying pepper spray, I'm in recovery at a halfway house and I've been offered drugs numerous amount of times. (TN018)
- I live close to the main bus station which is handy. I don't usually have to transfer buses. But since the buses don't go everywhere, I do spend a lot of time walking. Now that I have a job within 5 blocks of where I live, I use the bus maybe once every 2 weeks. (TN057)
- it sucks to be stuck here. its not that i go out much, but that when I need to go out, id like to do it safely and efficiently. the bus is not safe and taking 4-6 hours for a trip that takes me 1 hour is frustrating. It's also hard on my body... i have to take 600 mgs of ibuprofen before leaving the house and then 600 mgs more when I get home, to manage the pain. (AZ010)
- being the fact that public transportation is harder on me and they don't necessarily come near my house and hard for me to walk to them I'm very blessed that conveniently my school is only two to three miles away. (AZ025)

Mobility is Quality of Life

Theme definition: Transportation is more than a geographic movement of persons from place to place. Transportation is an essential tool to help people be mobile, and mobility is a basic human need in that it allows people not only to access essential resources, but also to connect socially and to participate in their communities. As such, transportation should be viewed as an essential public infrastructure.

- It [transportation] connects me with friends and family. it's my connection to my community. it's how I stay active and current. (TX008)
- I feel the less active I am, the less quality of life I have and transportation play a big part on my daily activity. (TX027)
- Since I don't drive, I have to rely on my busy family. Since I live in DeSoto, the bus stop is not walking distance…I love exploring various areas. I love thrift stores and bookstores. Sometimes, it's a bummer that public transportation is not closer. (TX054)
- yes, I'd be able to go to Cedar Hill where a granddaughter live, Balch Springs to another granddaughter live without disruption of others to take me. To[o] costly for Lift or Uber and paratransit nor Dart goes to suburban cities. (TX027)
- Where I live, driving is not needed too much. I live on a bus route near a train station. However, my church is not on a convenient bus route. my family[']s not on a bus route at all. Therefore, that driving is very important. (TX021)

Travel Buddy summary: Overall, participants had mixed responses to their transportation options. For some, safety may be related to the time of day and

neighborhood context while waiting for public transit rather than riding on a bus. However, several participants reported feelings of increased safety using Lyft/Uber compared to riding public transit. Some participants also reported a need for additional buses. The desire for autonomy, convenience, and flexibility was reported by participants. Some participants suggested that Lyft/Uber better supported these desires.

3.1.4 CHALLENGE LOGGER

Participants were asked to take photos and/or videos of the Challenge Logger feature in *MyAmble*. Six participants took photos related to transportation and mobility challenges. Participants provided a brief description of their photo or video. Quotes have not been edited. GPS coordinates have been blinded to protect the privacy of participants.

TX021
“This is pyramid crack in the sidewalk between D Tires and Pro Wash & Dry near Forest and Greenville in Dallas Tx. it is impossible for wheelchair and walkers. In order to get around it, you have to go into the street and drive around it.”

TX021
“This 2 to 3 inch drop makes it difficult for walkers, realtors, or wheelchairs. It is located in front of the Krogers near Forest and Greenville in Dallas.”

TX036
“this makes it hard for me”

TN018
“there are no sidewalk from the bus stop to my work”

TN018
“that’s where I have to walk to get to the bus there’s no sidewalk it’s very dark”

TN005
“Knoxville tn has new buses”
GPS coordinates blinded to protect privacy of participants

Challenge Logger summary: Similar to the previous pilot study of *MyAmble*, the Challenge Logger was not often used by participants during the study period. However, the six participants that did submit photos were able to describe their challenges in their own words. Findings from the usability survey (later in report) suggest that the Challenge Logger feature may need to be updated for ease of use.

3.1.5 TRAVEL STORY

Participants were asked to complete a series of questions at any time during the 14-day period. Questions were categorized in the Travel Story as: first car, childhood, biking, walking, public transit, stopped driving, and general. All questions asked for open-ended responses.

Nineteen participants answered at least one Travel Story question. The total number of Travel Story responses was 680. Below (see Table 3.1.5.1) are some examples from the Travel Story related to public transit and a general question about the meaning of transportation. Quotes have not been edited.

TABLE 3.1.5.1: Travel Story (n = 680 total responses)

Subject Name	Question	Sample Answers
Public Transit	Have you relied on public transit most of your life?	Mostly; No; just the past 7 years; since 2011; to a degree, seldom
Public transit	How could public transit in your city be improved?	Be on time and lower the cost to ride; free, safe, reliable rides; provided a discount for people who receive SNAP or Medicaid; making available more bus stations; making

		the times closer to pick up in the winter; more accessible; better safety
Public transit	If public transit were free would you use it more?	I am not sure; I have a paratransit pass, there is no cost on public transportation; yes, I definitely would
Public transit	If you were to miss your last bus or train ride home, how would you get home?	Call my son or daughter; call a taxi which I can't afford; I'd use an Uber; Call a relative or friend and start walking; walk
General	What does transportation mean to you? (lifelong perspective)	A peaceful day; employment and livelihood; freedom and autonomy; movement; money; transportation is synonymous with the air that we breathe; it means everything in the way I visit family friends and volunteer in my community

3.1.6 USABILITY SURVEY

The usability survey was an edited version of the System Usability Scale (SUS) (*46*). The SUS consists of 10 questions that participants rate to reflect the ease and functionality of electronic devices. The questions were modified to reflect information about the *MyAmble* app to ensure clarity and understanding for participants with lower education, and responses were shown on a five-point Likert scale (i.e., "Strongly Disagree" to "Strongly Agree"). Other information included in the post-study survey included rating participants' experience with using *MyAmble* and open-ended response sections for comments about each feature of the app, resulting in total of 20 questions. See Appendix A-8.

On average, participants remained neutral about the easiness of using *MyAmble* (M = 3.92, SD = 1.01), but disagreed that the app was very difficult to use (M = 1.89, SD = 1.08); that they needed to learn many things before using *MyAmble* (M = 1.87, SD = 1.12); that *MyAmble* was too complex (M = 2.41, SD = 1.04); and that they would need guidance from a technology or computer science assistant to use the app (M = 1.69, SD = 0.97). Further, participants reported that *MyAmble* consistently worked the same for each login (M = 2.23, SD = 1.22); the features of the app made sense together (M = 3.93, SD = 0.87); future participants could learn how to use the app quickly

(*M* = 4.2, *SD* = 0.69); and they felt very confident using *MyAmble* (*M* = 4.15, SD = 0.87). Overall, participants reported that they had a positive experience using the *MyAmble* app (*M* = 4.3, *SD* = 0.82) despite indifference that they would use *MyAmble* frequently (*M* = 3.58, *SD* = 1.04).

3.1.7 POST-MYAMBLE FOCUS GROUPS

After the study period ended, *MyAmble* participants were invited to participate in a one-time focus group. Participants were sent a university-approved informed consent and a link to a Zoom meeting. (See Appendix A-9). The focus group was facilitated by the research team and the meeting was transcribed. The research team analyzed the transcriptions using directed content analysis.

Eighteen participants across the three sites participated in the end user post-pilot focus groups. In these focus groups, participants reported that the app was generally usable. As one person stated, the app was "*very easy to navigate, very consistent, very organized, very simple, very basic."* Another stated that it was, "*learner and user friendly*." Others identified key parts of the app that made it user friendly. One person said that the, "*Travel Buddy kept me focused and engaged.*" Another said, "*I'm so happy to be able to reminisce and recall the memories [from the Travel Story feature]*." Participants did report challenges related to broadband connectivity and that impeded app use at times. Others recommended more reminders built into the app to encourage users to complete the diary or specific items. Some participants recommended reducing user burden through more automatic answers. An additional interesting recommendation was to add items related to budgeting and financing as it relates to daily transportation plans.

A focus group with an MPO was also conducted to gather feedback for the implementation plan. Participants were sent a university-approved informed consent and link to a Zoom meeting. (See Appendix A-10). The research team met to debrief after the MPO focus group and drafted an implementation plan (See Appendix A-11) based on this discussion.

4.0 CONCLUSION

MyAmble offers value to local planning organizations in the form of more diverse data, intentional representation from environmental justice populations, and a resource for shared decision making and future planning. Transportation has a long history of problematic inequities and is one of three main forms of infrastructure in the United States to perpetuate segregation (*47*). Overreliance on the federal National Household Travel Survey (NHTS) has led to transportation planning that fails to accommodate the diverse needs of underserved communities and environmental justice populations. It is critical that MPOs access more diversified data, with over-sampling from underserved populations and communities, to inform our transportation planning.

We also know that transportation equity is defined differently by different stakeholders. The first step to improve transportation equity is to define equity in transportation together with citizens who have previously been excluded from decision making (*48*). For example, in Los Angeles, they found that a mobility pilot project performed best when it utilized a framework marked by inclusion and shared decision making with the community members it was serving (*49*). In addition, Eke and Ebohon (*50*) propose an inclusive smart city data governance framework, and a key piece of that framework is that data must come from all involved/affected communities (including data from all communities).

As our feasibility study has shown, *MyAmble* is an effective data collection resource for reaching underserved community members who may not be represented in the NHTS due to lack of a permanent address, mistrust of researchers, or not having the social support to complete and return the NHTS. When used, *MyAmble* offers insight into the travel needs of people who are disproportionately less likely to own a car, but also live in lower-density communities where land use necessitates car ownership for full mobility. In particular, *MyAmble* shows promise in identifying transportation-related gaps for latent demand activities that could have negative impacts on psycho-social well-being (e.g., Level I Maslow - basic needs). The result is that planners have access to more representative data about their community members' transportation needs. In specific planning contexts, *MyAmble* would be particularly helpful; for example, when planning transportation plans designed to link to affordable housing, VA services, or health care centers that serve individuals who are lower income. It is important to note that our study was conducted during COVID-19. We acknowledge that travel was negatively impacted during COVID-19 due to social distancing requirements which likely means that our data under-estimated people's average daily travel and transportation needs.

The research team estimates that the cost for data collection per participant is between $240 to $340. This includes the participant incentive and staff time for Travel Buddy. The research team included graduate level social worker students who focused on the Travel Buddy communications. Given the training and skills of social work professionals related to communication and community-based data collection methods, the research team recommends partnering with social service agencies or universities with social work programs to help collect the Travel Buddy data.

In addition, *MyAmble* can be used as a tool for shared decision making by engaging more diverse groups of community members in the transportation planning process. Our participants reported enjoying using the app, and many started to think about their travel behaviors and how the built environment influenced their options and what they would need for better mobility beyond just car ownership (e.g., places for sidewalks, times for more bus routes). Many underserved community members may be unable to attend community meetings due to very busy schedules, third-shift work hours, and family care obligations, but one could engage them remotely through the Travel Buddy feature in *MyAmble*.

In the future, items about emerging technologies could even be incorporated into *MyAmble* to help inform decisions about future planning scenarios. For example, in terms of latent demand, items could be added about participants' willingness to use autonomous vehicles in order to get out of the house when other mobility options are not available. Or, what resources underserved population members would need in order to utilize electric vehicles (e.g., placement of charging stations, cost, trust in the technology, etc.).

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6.0 APPENDICES

APPENDIX A-1

UNIVERSITY OF TEXAS ARLINGTON | OFFICE OF RESEARCH ADMINISTRATION
REGULATORY SERVICES

1/15/2021

IRB Approval of Exempt Protocol

PI: Noelle Fields
Department: School of Social Work
IRB Protocol #: 2021-0169
Study Title: *Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand*
Exempt under 45 CFR 46.104 (d)(2)
Effective Approval: 1/15/2021

Protocol Details

- Original Protocol Approval Date: 1/15/2021
- Federally Funded: DOT, Mentis Bluesheet #2017-609-S28 & 2021-216
  - Subject to 45 CFR 46, Revised 2018

The IRB has approved the above referenced submission in accordance with applicable regulations and/or UTA's IRB Standard Operating Procedures.

Principal Investigator and Faculty Advisor Responsibilities

All personnel conducting human subject research must comply with UTA's IRB Standard Operating Procedures and RA-PO4, Statement of Principles and Policies Regarding Human Subjects in Research. Important items for PIs and Faculty Advisors are as follows:

- **Notify Regulatory Services of proposed, new, or changing funding source**
- Fulfill research oversight responsibilities, IV.F and IV.G.
- Obtain approval prior to initiating changes in research or personnel, IX.B.
- Report Serious Adverse Events (SAEs) and Unanticipated Problems (UPs), IX.C.
- Fulfill Continuing Review requirements, if applicable, IX.A.
- Protect human subject data (XV.) and maintain records (XXI.C.).
- Maintain HSP (3 years), GCP (3 years), and RCR (4 years) training as applicable.

APPENDIX A-2

Focus Group

Hello,

My name is Dr. Noelle Fields, and I am asking you to participate in a research study titled, "*Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand*." This research study is a collaboration of the University of Texas at Arlington, the University of Tennessee, Knoxville, and the University of Arizona.

This study is about using smart-phone apps to study latent demand among environmental justice (EJ) populations. As a volunteer, you would be participating in a one-time, online focus group. You can choose to participate in this research study if you are at least 18 years old, speak English, and possess knowledge or experience necessary to evaluate the app and speak to its potential as a tool for transportation-related data collection.

One reason why you might want to participate in this study is to share your opinions about an app, *MyAmble*, that will be used in the future to explore latent travel demand and/or unserved trips. The app is also designed to be used as a data collection tool for metropolitan planning organizations and other stakeholders in transportation. Your feedback will be used to help the research team re ne the app. You might not want to participate if your schedule does not allow you to participate in our focus group.

Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any bene ts or services that you would normally receive. Even if you choose to begin the study, you can also change your mind and quit at any time without any consequences. There are no alternative options to participating in this project, but you do not have to participate if you do not want to.

If you decide to participate in this research study, I will ask you to participate in a one-time, one-hour, virtual focus group that will be audio recorded. A focus group is a group discussion where a member of the research team will ask questions and all participants can speak openly about their experiences and views. We will talk about the app and will show you pictures or a video during the focus group. During the focus group, we will ask you questions about your opinions of the app. After

focus group. During the focus group, we will ask you questions about your opinions of the app. After the focus group ends, the audio recording will be professionally transcribed.

The focus group will take place on Zoom or Microsoft TEAMS which are used for teleconferencing. You will also be asked to complete a brief (10 minute) online demographic/background survey. If you agree to participate in the study, you will first complete the brief survey and then you will be emailed a link to the Zoom or Microsoft TEAMS meeting that will take place at a later date.

Although you probably won't experience any personal benefit from participating, you can feel proud that your participation will help the research team improve the app. The overall goal of the app is to explore ways on how to improve transportation for people who do not have a car and/or rely on public transportation. The study activities are not expected to pose any additional risks beyond those that you would normally experience in your regular everyday life or during routine medical/psychological visits. You will not receive any compensation for participating in this study.

The research team is committed to protecting your rights and privacy as a research subject. We may publish or present the results, but your name will not be used. While absolute confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law.

Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law. The limits of this confidentiality include disclosure as required by federal, state, or local law of child and elder abuse/neglect and/or other illegal activities.

If you have any questions about this study, you can contact me at noelle.elds@uta.edu or 614-947-9783 For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

By typing in your name, email, and phone number below, you are providing your consent to participate in this study. After doing so, please hit the "Next" button to proceed to the survey.

First and Last Name:

Email Address:

Phone Number:

Please select your gender:

- Female
- Male
- Other
- Prefer not to say

Please select your race/ethnicity:

- Hispanic or Latinx
- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Paci c Islander
- Caucasian or White
- Multiracial
- Other
- Prefer not to say

Please write your age (in years):

Please state your job title:

Please select your highest degree obtained:

- ◯ Bachelor's
- ◯ Master's
- ◯ PhD
- ◯ Other

Please specify:

Please select your current field of work:

- ◯ Social work
- ◯ Urban planning
- ◯ Transportation
- ◯ Engineering
- ◯ Other

Please specify:

APPENDIX A-3

Focus Group

Hello,

My name is Dr. Noelle Fields, and I am asking you to participate in a research study titled, "*Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand*." This research study is a collaboration of the University of Texas at Arlington, the University of Tennessee, Knoxville, and the University of Arizona.

This study is about using smart-phone apps to study the travel needs of people who may not have a car and/or who rely on public transportation. As a volunteer, you would be participating in a one-time, online focus group. You can choose to participate in this research study if you are at least 18 years old, speak English, and have a smart-phone.

One reason why you might want to participate in this study is to share your opinions about an app, *MyAmble*, that will be used in the future to explore how people travel and what types of transportation they use to "get out and about" in their day to day life.

You might not want to participate if your schedule does not allow you to participate in our focus group. Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any bene ts or services that you would normally receive. Even if you choose to begin the study, you can also change your mind and quit at any time without any consequences. There are no alternative options to participating in this project, but you do not have to participate if you do not want to.

If you decide to participate in this research study, I will ask you to participate in a one-time, one-hour, virtual focus group that will be audio recorded. A focus group is a group discussion where a member of the research team will ask questions and all participants can speak openly about their experiences and views. We will talk about the app and will show you pictures or a video during the focus group. During the focus group, we will ask you questions about your opinions of the app. After the focus group ends, the audio recording will be professionally transcribed.

The focus group will take place on Zoom or Microsoft TEAMS which are used for teleconferencing

The focus group will take place on Zoom or Microsoft TEAMS which are used for teleconferencing. You will also be asked to complete a brief (10 minute) online demographic/background survey. If you agree to participate in the study, you will first complete the brief survey and then you will be emailed a link to the Zoom or Microsoft TEAMS meeting that will take place at a later date.

If common time for a focus group cannot be found for you to join, then the you have the option to participate in a interview instead.

Although you probably won't experience any personal benefit from participating, you can feel proud that your participation will help the research team improve the app. The overall goal of the app is to explore ways on how to improve transportation for people who do not have a car and/or rely on public transportation.

The study activities are not expected to pose any additional risks beyond those that you would normally experience in your regular everyday life or during routine medical/psychological visits.

You will be provided a $10 e-gift card to Wal-Mart for participating in this study, which will be emailed to you within 14 days after the focus group session. The internal Revenue Service (IRS) considers all payments made to research subjects to be taxable income. You are responsible for reporting the study payment to the IRS.

The research team is committed to protecting your rights and privacy as a research subject. We may publish or present the results, but your name will not be used. While absolute confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law.

Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law. The limits of confidentiality include disclosure as required by federal, state, or local law of child and elder abuse/neglect and/or other illegal activity.

If you have any questions about this study, you can contact me at noelle.elds@uta.edu or 614-947-9783 For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

By typing in your name, email, and phone number below, you are providing your consent to participate in this study. After doing so, please hit the "Next" button to proceed to the survey.

First and Last Name:

Email Address:

Phone Number:

What is your gender:

- Female
- Male
- Other
- Prefer not to answer

Please explain:

What is your race/ethnicity:

- ◯ American Indian
- ◯ African American or Black
- ◯ Caucasian or White
- ◯ Hispanic or Latinx
- ◯ Multiracial
- ◯ Other
- ◯ Prefer not to answer

Please explain:

What is your age (in years):

What is your highest level of education:

- ◯ Less than high school
- ◯ Some high school
- ◯ High school degree or equivalent
- ◯ Vocational/Technical school degree (2-year)
- ◯ Some college
- ◯ Bachelor's degree
- ◯ Master's degree
- ◯ Doctoral or professional degree (PhD, MD)
- ◯ Other
- ◯ Prefer not to answer

Please explain:

Are you currently enrolled in school (online or in-person)?

- ◯ Yes, part-time
- ◯ Yes, full-time
- ◯ No
- ◯ Prefer not to answer

What best describes your current working status?

- ◯ Full-time employed, one job
- ◯ Full-time employed, multiple jobs
- ◯ Part-time employed, one job
- ◯ Part-time employed, multiple jobs
- ◯ Out of work and looking for work
- ◯ Out of work but not looking for work right now
- ◯ Retired
- ◯ Homemaker
- ◯ Other
- ◯ Prefer not to answer

Please explain:

Are you currently receiving disability bene ts?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

What best describes your current marital status?

- ◯ Single, never married
- ◯ Widowed
- ◯ Separated
- ◯ Divorced
- ◯ Married
- ◯ Other
- ◯ Prefer not to answer

Please explain:

What best describes your current living arrangement?

- ◯ I am the only adult in my household
- ◯ I live with a spouse or romantic partner
- ◯ I live with an adult roommate or family member
- ◯ Other
- ◯ Prefer not to answer

Please explain:

Do you have children (of any age) living with you?

- ◯ Yes
- ◯ No

How many children (of any age) currently live with you:

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5 or more
- ◯ Prefer not to answer

What best describes your current housing status:

- ◯ Emergency shelter
- ◯ On the street
- ◯ Staying with family/friends
- ◯ I rent a house/apartment
- ◯ I own a house
- ◯ Transitional housing
- ◯ Car
- ◯ Other
- ◯ Prefer not to answer

Please explain:

Do you have a valid driver's license:

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

Does your household own at least one car:

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

What are your **MAIN** forms of transportation (select as many as applicable):

- [ ] Bus
- [ ] Walking
- [ ] Car
- [ ] Ride-sharing
- [ ] Getting rides from family/friends
- [ ] Other
- [ ] Prefer not to say

Please explain:

How **Easy** or **Difficult** is it for you to pay for daily needs (*for example: gas, groceries, rent)*?

- ◯ Very Easy
- ◯ Easy
- ◯ Neutral
- ◯ Difficult
- ◯ Very Difficult

Do you own a cell phone?

- ◯ Yes
- ◯ No
- ◯ Prefer not to say
- ◯ Other

Please explain:

Do you use apps on your cell phone?

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

How often do you use the following:

	Multiple times a day	Once a day	Once a week	Once a month	Never
Cell phone	◯	◯	◯	◯	◯
Tablet	◯	◯	◯	◯	◯
Laptop/computer	◯	◯	◯	◯	◯
Apps	◯	◯	◯	◯	◯

APPENDIX A-4

Themes from the NCTCOG/MPO focus group yielded several recommendations for app refinement including changes to the: **app training, demographic survey, trip plan/trip review, and Travel Buddy**. A summary of the recommendations and changes are listed below (*indicates changes that were not implemented in the current study):

Training manual

- Add videos that explain each feature of *MyAmble*

Demographic survey

- Include preferred mode of transportation rather than for each trip in the app
- Distinguish between having a license, having a car, and having the ability to drive
- Add a question about who goes on a trip with the user (e.g. children or dependent adult)
- Add a Likert scale question regarding participants' satisfaction with various transportation
- Add a question to capture the social acceptability of certain modes of transportation

Trip Plan/Trip Review

- Allow for multiple modes of transportation to be used for a single trip
- Include bike and scooter share programs as transportation options
- *Add a trip chain function to indicate a series of stops (grocery, gas, doctor, home)
- *Add a "start" location, rather than assuming every trip starts from home
- *Add an expected time and an actual time for each trip and provide space for a qualitative explanation if there was a large gap
- *Utilize GPS / chronometer of the smartphone (via a button in the app) to log where/when a trip starts and stops.
- *Add a question about how a user returns from a trip to avoid assuming that they took the same mode of transportation coming and going
- *Allow participants to designate a return time that is different from their travel time to a destination
- *Include both travel time and travel distance

Travel Buddy

- Add this set of questions to explore latent travel demands: “Are there any other trips you would take today if you had transportation?” “If so, where?” "What prevented you from taking this trip?" and “What transportation option would have made this trip possible for you?"

- Add a question about why participants prefer not to use certain kinds of transportation
- Add a question about participants' satisfaction with various transportations options
- Add a question about perceived safety regarding various transportation options

APPENDIX A-5

Themes from the potential *MyAmble* user focus group yielded several recommendations for app refinement including: login in process, choice of icons, aesthetics, trip planner, and app training. A summary of the recommendations and changes are listed below (*indicates changes that were not implemented in the current study):

Login
- Provide login name and password

Icons
- Add “volunteer”
- Change social visit to “friends and family”
- Change physical activity to “exercise”
- Add “hotel”
- *if “other” is added frequently, have the app remember what the “other was” versus having to re-enter it every time

Aesthetics
- Change clock size and format
- Change background color on Travel Buddy
- Carefully check wording

Trip planner
- *add additional stops within one trip versus planning multiple trips (i.e. trip chain)
- Put date and time together

Training
- Provide video links with instructions
- Provide email/contact information for Dr. Fields at UT Arlington

APPENDIX A-6

***Travel Buddy* Questions [Travel Buddy is the text messaging feature of *MyAmble*]**

Participants will be asked the following questions through *MyAmble*. A member of the research team will initiate each question through the messaging feature of *MyAmble* so that there is back and forth between the participant and the team member in order to use probing/follow up questions for clarification (if needed).

1. *Tell me about your typical day?*
    a. *What's a good day look like?*
    b. *What about a bad day?*

2. *How do you get out of the house to get your basic needs met? (like food, medication, getting to work)*

- If they say, I don't get out the house, the GRA will ask the following- *On days when you can't get out the house, how do you get your basic needs met?*

2. *How do you get out the house to see friends and family?*

3. *How does having transportation or not having transportation affect your overall quality of life?*

    Probes such as - taking care of your physical health, overall wellness, emotional wellbeing, spiritual health, getting outside to get fresh air,,

4. *How do you get out of the house to get the services that you need?*
    a. *for example, food stamp office, doctor)*

5. *How do you get out of the house to be politically or civically involved if you want to?*
    a. *For example, do things like vote, go to city council meetings*

    b. "If you could move, would you want to move somewhere else? Where? Why?" *(for example at night, or by yourself, are there parts of town that you don't feel safe going to; TIME OF DAY, WHO YOU ARE WITH (or WITHOUT), and WHERE YOU GO)*

6. *How has COVID-19 affected your experiences with transportation?*
    a. *In the past 18 months*
    b. *In the past year*
    c. *In the past 6 months*
    d. *In the past 3 months*
    e. *In the past month*

APPENDIX A-7

MyAmble User Manual

MyAmble Participant User Manual

For the purposes of research conducted at The University of Tennesse at Knoxville College of Social Work, The University of Arizona College of Architecture, Planning, & Landscape, and The University of Texas at Arlington School of Social Work & Department of Civil Engineering

Table of Contents

Project Background: The Big Picture

We are thrilled that you have chosen to participate in this research study. You were selected as a participant for this research study we feel that you can provide valuable feedback regarding the barriers to transportation in your area. We intend to use the information we gather from this study to make recommendations to program administrators and policy-makers to increase the availability of and access to transportation infrastructure.

Many people experience transportation disadvantage, and this simply means that you may have encountered problems accessing transportation due to personal or environmental factors. For example, public transportation routes are not always convenient in terms of times and routes. Grocery stores, shopping, and medical offices may be located very far away from your house.

Regardless of the reason for experiencing transportation disadvantage, you may find that you are unable to attend some of the activities that you would like to. Or, you might find it very difficult to visit the people and places that matter most to you. Some people who experience transportation disadvantage report that their lack of access to reliable transportation negatively affects their quality of life.

We want to understand *where* you are going and *how* you are getting there. We also want to understand *how important* your trips are, how it makes you feel to successfully go where you want to go and how it makes you feel to not go where you want to go. Together, this information will allow us to better understand the transportation options in your area, and what can be done to improve to improve people's quality of life through transportation.

Project purpose

This research study was designed to learn about your experiences with transportation and the impact of transportation has on the quality of *your* life. In particular, the research team is interested in identifying the problems you encounter when you try to plan your day and follow through on this plan, such as going to

work or to the grocery store or to a medical appointment or to visit a family member.

We also want to understand how you are getting the places you need to go. There are many different forms of transportation – such as driving, walking, taking a bus, riding a bike, or using a transportation service. By gathering information about how people in your area are using transportation, we will be able to learn more about what potential improvements could be made to allow people to take the trips that are important to them.

Use of study results

As a participant in this research study, you will utilize a free, electronic travel diary app that you will download to your Smartphone. Your diary entries will be collected and then analyzed to better understand the impact of transportation on your quality of life.

By assessing your diary and the diaries of other research participants, the research team will be able to identify consistent problems that you and others experience while trying to get to places you want to go. Findings from the research study will inform transportation policies in your community.

We hope that the policies informed by this research will: 1) address gaps in transportation access, 2) improve public transportation resources for you and others in your community, and 3) inform potential improvements that can be made in order to allow residents in your area to use all transportation options available to them.

Project timeline for participants

You will participate in this study for two weeks (14 days), unless you choose to stop participating in the study before its completion. An assigned research team member will provide you with the specific start and end dates when it is time for the study to begin.

For 14 days, you will be asked to use an electronic diary to catalogue your travel plans and challenges. This electronic diary – an app called MyAmble – will be sent to you as a free download for your Smartphone.

Please note: It is expected that you will spend approximately 30-90 minutes each day answering questions on MyAmble. You are expected to log in *one time in the morning* and *one time before you go to bed* each day.

Following the 14-day period using MyAmble, you will be invited to participate in an in person or virtual focus group. The purpose of the focus group is to get your feedback on MyAmble and to have an in-depth discussion about your experiences during the study. This will be an opportunity to elaborate on the information you provided using MyAmble.

The total time commitment for the study is about 14 days for using MyAmble and completing a survey and focus group within 30 days of finishing your time using MyAmble. (45 day window to participate in the study).

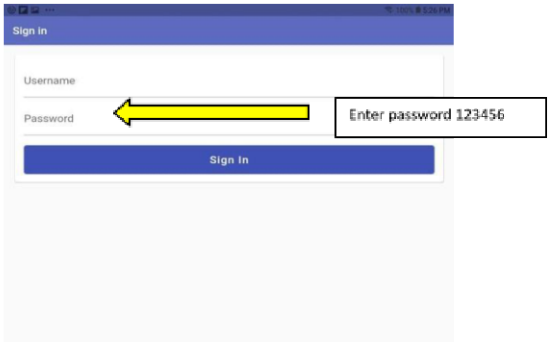
Downloading the MyAmble app

You will receive an email with a link to the MyAmble application. You will open the email on your smartphone and then select to open the link. It will prompt you to download the application to your phone. Your smartphone will ask if you if you want to download it. You will need to click or select "YES" to download it. Once you select "yes", the app will self-install on

your phone.

Please watch the following video to learn how to download the MyAmble application by clicking on this Helpful Video Link.

Username and Password



Your username is your unique study ID provided to you in your email by the research team. Your password is 123456.

Logging in

You will enter your unique study ID section for your username in the field that says **email** and enter the password 123456 in the **password field**. Once you log in, **DO NOT** log out until the 14 days is over.

Introduction to the MyAmble electronic diary

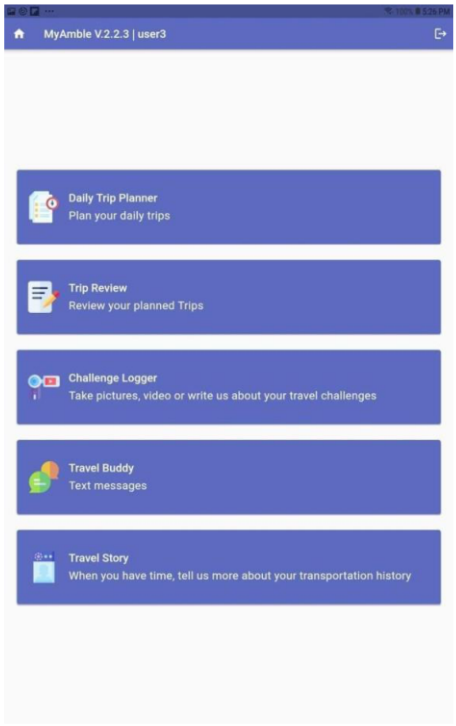
MyAmble is the app through which the research team will capture information about your transportation plans and challenges. MyAmble will prompt you to answer a variety of questions related to your daily transportation experiences. In addition, MyAmble will allow you to take pictures of travel challenges, record numerous trips, and interact with a research team member in real time.

Through MyAmble, you will answer a variety of questions related to your daily transportation experiences and your travel memories. The app will also ask you to reflect on how transportation disadvantage affects your access to resources, social participation, and your quality of life. The app will also ask you how COVID-19 affects your ability to get out and about.

MyAmble Overview

You may access the MyAmble app by clicking on the MyAmble icon on your Smartphone home screen:

When you click on the MyAmble icon, the app will direct you to the home screen for the app. On this home screen, you may select between several different components of the app. These components include the Daily Trip Planner, Challenge Logger, Travel Buddy, and Travel Story.



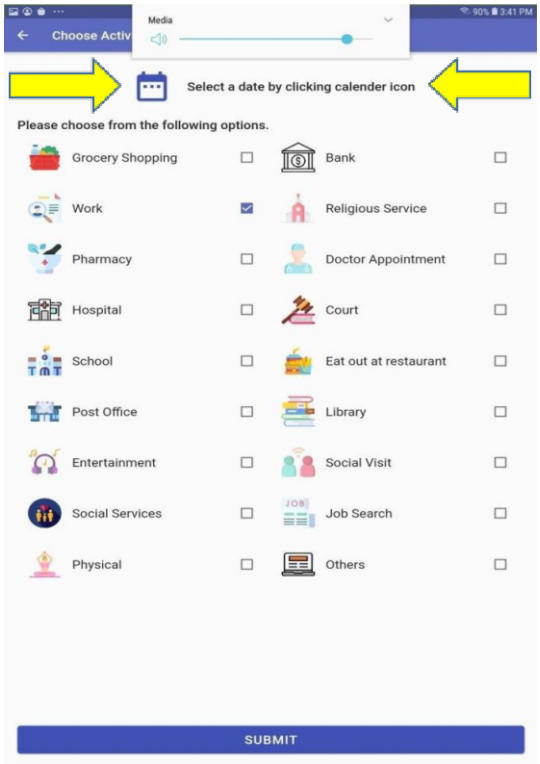
An overview of these components is provided below. Each component poses open- and closed-ended questions related to your travel plans and experiences, as well as questions related to the importance of daily planned and unplanned travel.

MyAmble Components

The MyAmble app consists of several different components, all of which are important for the overall research study. When you first open the MyAmble app, you will be able to select which component you would like to use. (Remember that the components you can choose from are listed on the home screen icon pictured above.) You should use all of the components throughout the research study, but you are likely to find that you use some more than others. You will likely use the Daily Trip Planner more often than any of the other components.

Daily Trip Planner

The Daily Trip Planner in the MyAmble app will provide you an opportunity to share information about your daily travel plans and travel experiences. It will also allow you to comment on the importance of daily planned and unplanned travel.



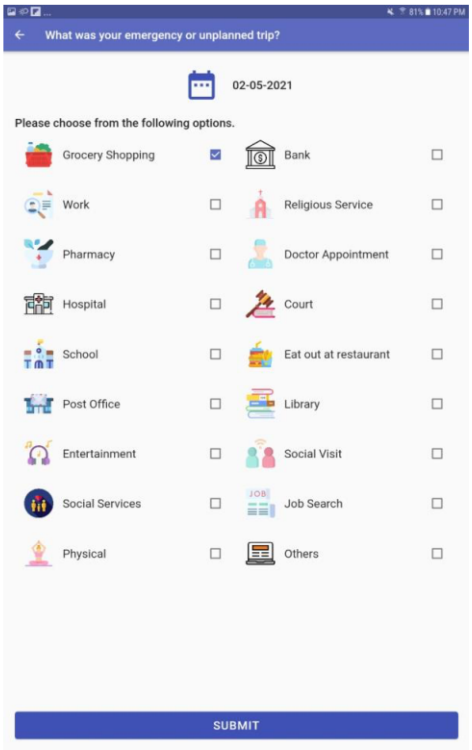
When you open the trip planner, you will be the following question ***Did you complete any emergency or unplanned trip since last login?*** and you respond yes or no. If you reply *YES* then the app prompts you to begin entering the date and destination of the trip and including the trip details.

Selecting *YES* the app prompts you to select a date by clicking the calendar icon which is featured in the picture on the right. Touch the icon and a calendar will open and allow you to select the date of the emergency. You will follow the prompts to complete the entry for this trip. These steps are similar to entering a Daily Trip in the Daily Trip Planner.

If you select *NO* when the app asks whether you have had an emergency travel, you will then begin the process of entering routine trip activity. You will notice the processes are the same whether you enter an emergency trip or a routine trip.

Once you select *NO*, choose which date you are planning by touching the calendar icon at the top of the screen. It will appear the same as above image. You will not be able to move forward without selecting the calendar date.

Next select which places you plan to travel to throughout the day. The Daily Trip Planner will prompt you on how to do so. You select the destination by touching the icon. To unselect the destination, then touch the icon again.



Once you select your icon, then the Daily Trip Planner prompts you to enter some additional information about the scheduled trip.

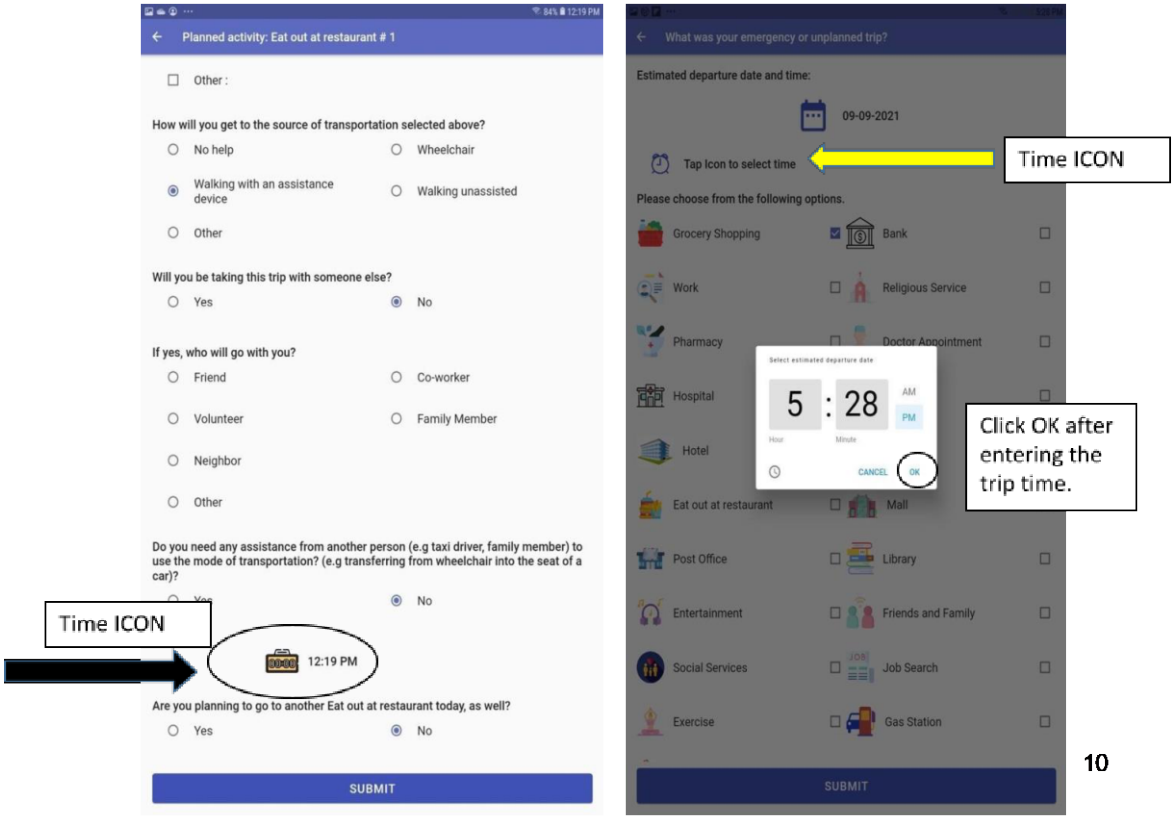
You will be asked *Where are you going for this trip?* And you enter the information by touching the field and your keyboard will appear where you can enter the information or press the microphone on the keyboard to record your response.

We have created a video that reviews ***Trip Planner***. To watch it, please click on this link: Helpful Trip Planner Video

Then you will answer a series of additional questions by tapping word representing your selection. If you are not able to move forward then, review your selections and ensure each question has been selected and then hit submit. If you have difficulty, reach out to the ***Travel Buddy*** feature in the app.

Entering a Time Stamp

You will be prompted to enter the time of the trip. To enter the time, you tap the clock icon and it will prompt you to enter the time. Then click ***OK*** and it save it.

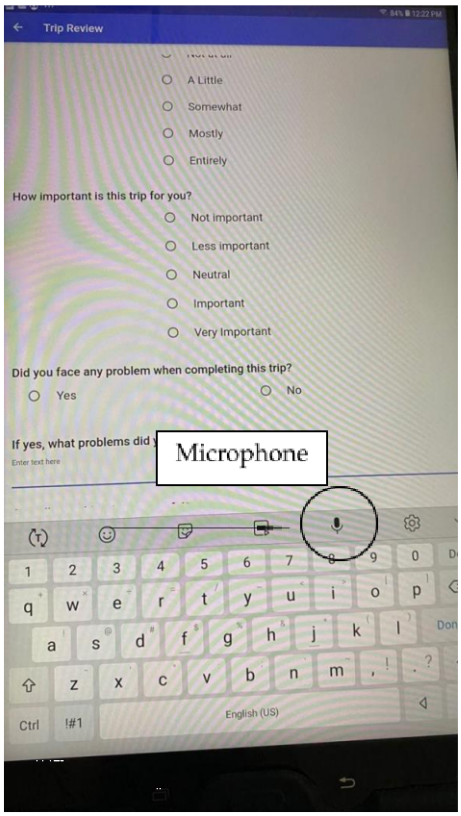


10

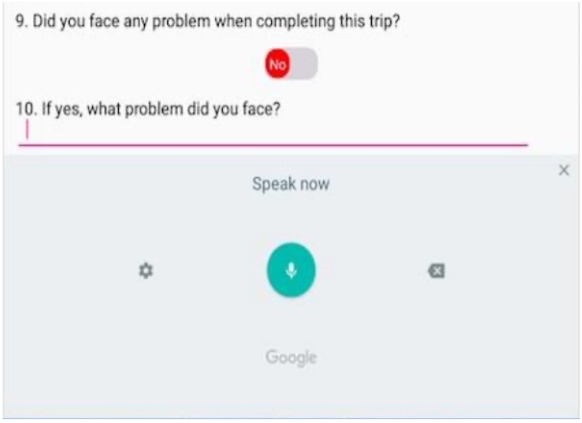
Then, at the end of the day, the Daily Trip Planner will ask you if you were able to complete your daily travel plans. Do not worry about how to fill out the Daily Trip Planner once you mark the locations you plan to include in your travel: The MyAmble app will walk you through each of the questions you need to answer.

When a question is open-ended, you have a couple of different options for how to provide an answer. You may answer an open-ended question by typing sentences or phrases through the Smartphone's keyboard which will automatically appear when you select the field.

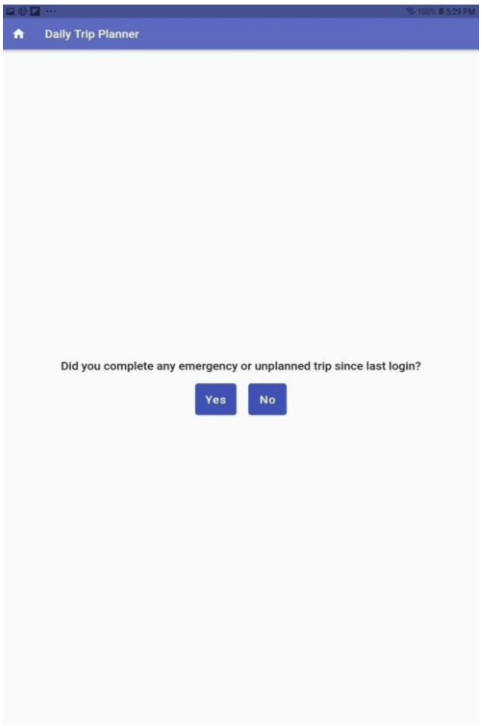
Or, if you would prefer not to type an answer, you may also make a voice recording for your answer by tapping the little microphone icon that is next to the spacebar that will talk-to-text:



Once you tap the microphone icon, you may begin recording your answer:



The Daily Trip Planner also has several closed-ended questions. You will be asked to answer yes/no by pressing on a button.

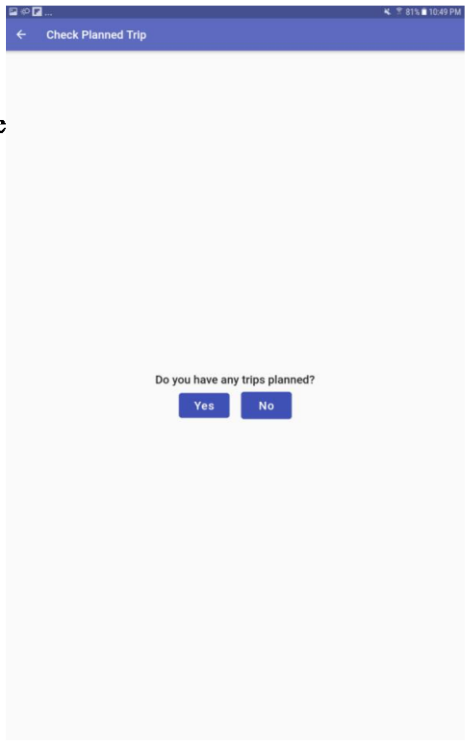


You will complete questions for each of the daily trips you indicate that you had planned. The Daily Trip Planner will walk you through this process for each of the locations you marked as a planned trip.

Additionally, the Daily Trip Planner will ask you whether or not you took any unplanned trips during the course of the day. If you say yes, the MyAmble app will prompt you to answer a series of

questions with the same methods pictured above.

Remember:



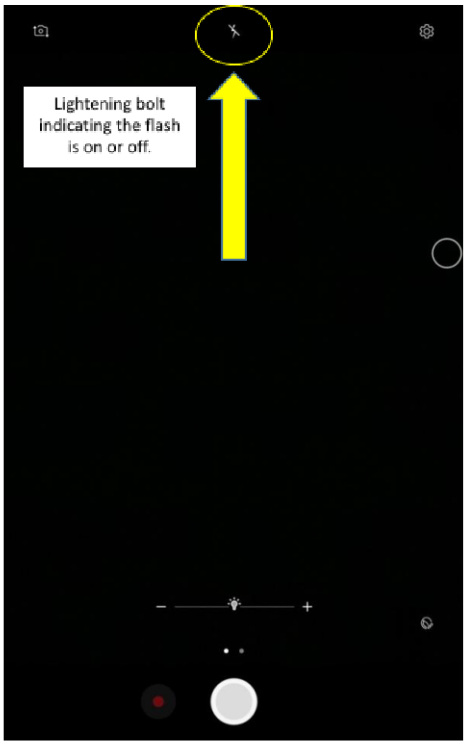
- Please use the trip planner twice a day. You can use it in the morning when you wake up to plan your trips for the day, and again in the evening to review all the trips you took during the day.
- Instead of typing on the keyboard, you can press the microphone button and use the voice-to-text feature.
- The "back" button is very important. Press the "back" button if you need to make the keyboard go away, or if you need to return to a previous page.
- Please answer ***all*** questions. There might be errors if you do not answer all the questions, especially in the Trip Review page.
- In the Trip Planner page with the icons of destinations, there is an icon labeled as "Physical." This refers to physical activity/exercise, not a physical at the doctor's office.
- We have created two videos to help with the Trip Review section of this app. First we have a video if you have **completed a trip**; please click on it to access: Trip Review video when trip is completed. Second we have created a video if you **were NOT able to complete your trip**; please click here to access the video: Trip Review video when you have NOT completed your trip

Challenge Logger

You should access the Challenge Logger component of MyAmble when and if you encounter a challenge while travelling during your day. For example, you may encounter a pothole that makes it impossible for you to cross a sidewalk. Or you may try to get in a van that does not have wheelchair access. If you encounter these challenges, or any other similar challenges, the Challenge Logger will give you an opportunity to take a picture or video of the challenge.

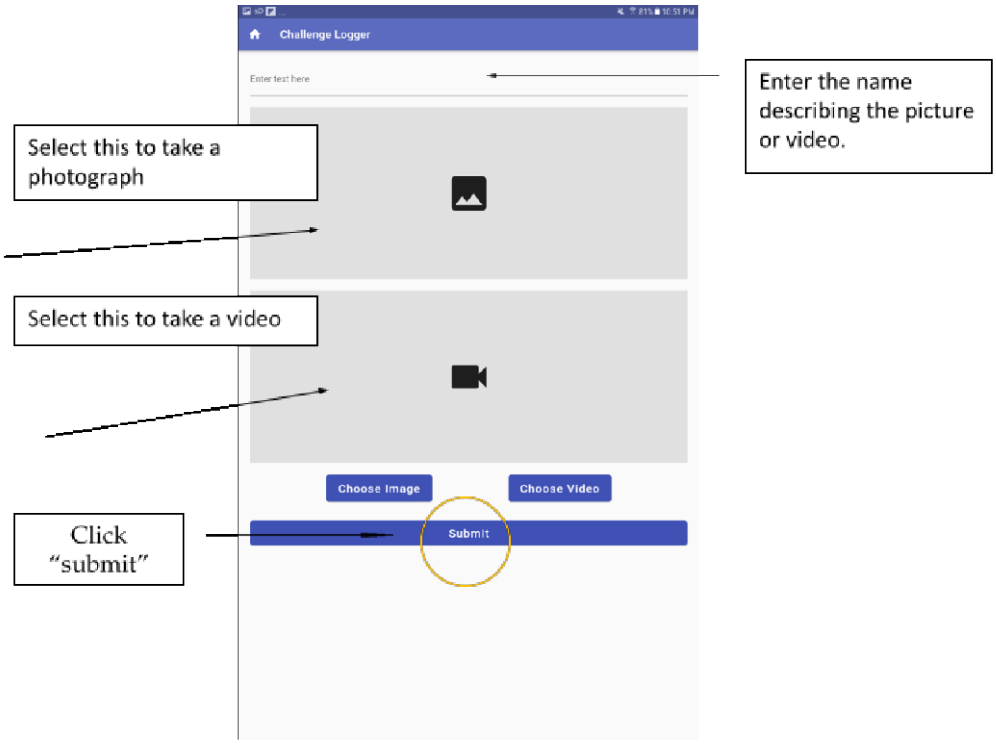
To use the Challenge Logger, follow these steps:

1. Click on either the picture icon to use the camera or video icon shown in the image below. Click on here to access a helpful video on how to use the Helpful Video: Challenge Logger which will show you how to use this feature.
2. Make sure that the flash is on when taking pictures
    a. At the top of the screen, you will see a lightning bolt. If you click this icon, it will change the flash setting on the tablet's camera. The lightning bolt with the line through it indicates that the flash is off. The lightning bolt with an *A* beside it indicates that the flash is automatic. The yellow lightning bolt indicates that the flash is on.
3. Instead of taking a photo through the Challenge Logger, you may also attach an image from your photo gallery by clicking on the "attach from gallery" icon. Please watch this helpful video to learn how to use this feature: Helpful Video: Challenge Logger
4. Click underneath "problem description" to type information about the challenge you encountered.



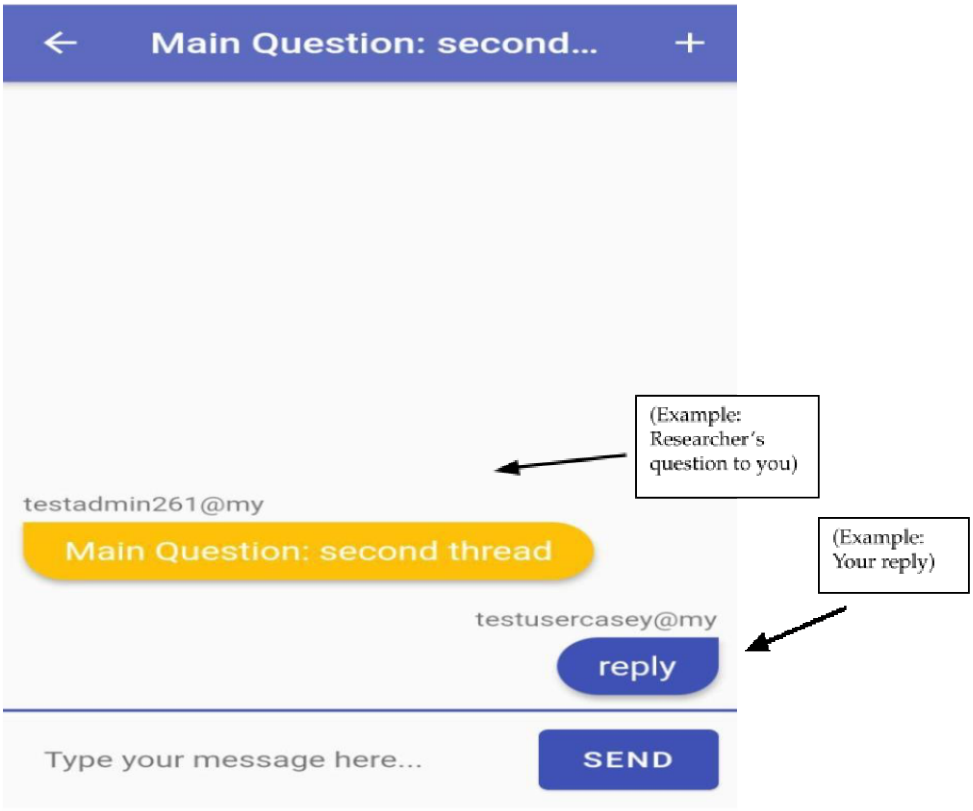
5. Click “send” once the image or video is uploaded.

You may do so by clicking on either the camera or video icon shown in the image below. If you want to use the video setting in the Challenge Logger please click on this helpful video that demonstrates the use: Helpful Video: Challenge Logger. Make sure that the flash is on when taking pictures. At the top of the screen, you will see a lightning bolt. If you click this icon, it will change the flash setting on the tablet’s camera. Or, you may attach an image from your photo gallery by clicking on the “ choose image” icon. Then, you can click underneath “problem description” to type information about the challenge you encountered. Click “submit ” once the image or video is uploaded. To watch a video on how to use ***Challenge Logger*** click here:



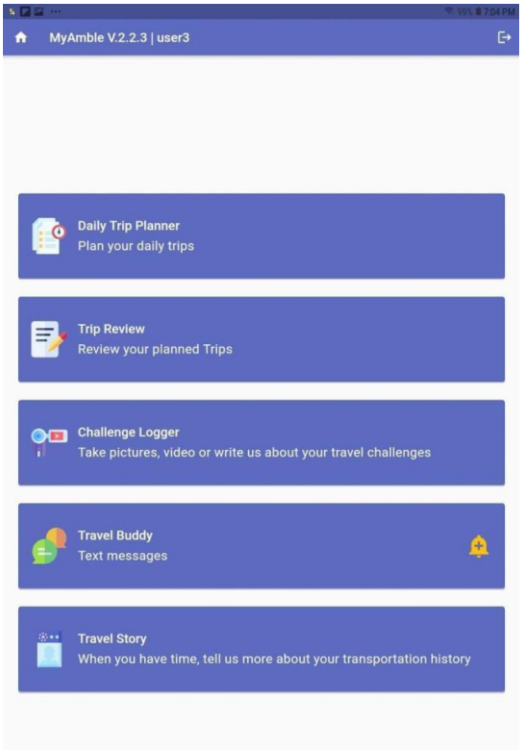
Travel Buddy

The Travel Buddy component of MyAmble is a chat feature that will ask you to answer open-ended questions related to how transportation challenges affect different aspects of your life. Your research team member will ask you questions through the Travel Buddy feature every day or so for you to answer. The following picture shows you what this chat looks like on your tablet:



When you hear your tablet play an alert notification, this means that you've received a Travel Buddy question that is waiting for your answer. You will also

note there is a small bell shape that indicates a new message. This pops up on the travel buddy icon. Additionally when you select the travel buddy icon, the new message will display the bell to reflect it is new. To view message, click on the MyAmble icon on your tablet and you will see a "pop up" notification, which will take you directly into the Travel Buddy feature when you click "ok." From there, you will be able to answer the message. Or, if you are already in MyAmble , just return to the main MyAmble home screen to see the "pop up" notification and click, "ok." When you click "ok" you will be taken directly to Travel Buddy. The picture below shows what t our tablet device:



Remember:

- Travel Buddy alerts will not appear while you are on the home page. Alerts will appear if you have the app closed, and you can press the alert to open MyAmble. Alerts will appear when you *open* the home page from another page in the app, but not if you are already on the home page.

- Instead of typing on the keyboard, you can press the microphone button and use the voice-to-text feature
- To watch a helpful video explaining the ***Travel Buddy*** feature please click here: Helpful Video: Travel Buddy

Travel Story

Finally, the Travel Story feature of MyAmble is an opportunity for you to answer questions about your travel memories. Questions in the Travel Story portion of MyAmble include questions about your first car, first road trip, and more. You do not have to answer all the questions in one sitting. You can keep returning to Travel Story to fill in your answers to questions throughout the 14 days of the study. You may answer questions by either typing on the tablet's keyboard or using the voice recorder button. Images of these buttons are included on previous pages if you would like to reference them. Please review this helpful video on how to use the ***Travel Buddy*** feature: Helpful Video: Travel Buddy

Who Should I Contact with Concerns?

If you have questions about the tablet, you should first reference your tablet's "Tablet help" icon on your tablet to troubleshoot your problem. If the user guide does not answer your question, you should contact your research team member at the phone they have provided you.

If you have questions or concerns about the research study, or choose to withdraw from the research study, you should contact the Principal Investigator, Dr. Noelle Fields. You may reach her at 817-272-7390 . You can also contact the co-Principal Investigator, Dr. Courtney Cronley. You may reach her at 865-742-1150.

If you have any questions about your rights as a research participant or a research-related injury, you may contact the University of Texas at Arlington's Office of Research at 817-272-3723.

The school and college affiliation of this study is The University of Texas at Arlington, located at 211 South Cooper Street Arlington, Texas 76019. The University of Arizona, located at 1040 N. Olive Road Tucson, Arizona

85721-0075. The University of Tennessee at Knoxville, located at 1618 Cumberland Avenue, 401 Henson Hall, Knoxville, Tennessee 37996.

APPENDIX A-8

Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand

Hello,

My name is Dr. Noelle Fields, and I am asking you to participate in a research study titled, "Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand." This research study is a collaboration of the University of Texas at Arlington, the University of Tennessee, Knoxville, and the University of Arizona.

This study is about using smart-phone apps to study every-day traveling among people who may experience transportation disadvantage. As a volunteer, you would be participating in a study (about one hour per day) where you would log your daily travel plans into the MyAmble app on your smart-phone or tablet. You can choose to participate in this research study if you are at least 18 years old, speak English, have access to a smart-phone or tablet, and understand the basics of using an app.

One reason why you might want to participate in this study is to share your experience about daily travel in order to report difficulties about making trips every day and what could improve to make your trips easier or able to be completed. The app MyAmble has been created just for collecting this type of information and is designed to inform transportation services about your travel experiences and needs. Your participation and feedback will be used to both inform transportation services in your area and help the research team improve the app. You might not want to participate if you do not have access to a smart-phone or tablet, do not have daily access to the internet, or do not think that you would be able to spend 30-60 minutes per day to complete entries on the app.

Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any benefits or services that you would normally receive. Even if you choose to begin the study, you

can also change your mind and quit at any time without any consequences. There are no other options to participating in this project, but you do not have to participate if you do not want to.

If you decide to participate in this research study, I will ask you to:

- Complete a survey that will collect some basic demographic/background information (30-60 minutes)
- Download the free MyAmble app (5 minutes)
- Review training videos for the MyAmble app (15-30 minutes)
- Use the MyAmble app daily for 2 weeks (30-60 minutes per day for 14 days)
- Complete a user feedback survey about the MyAmble app (30 minutes)
- The total amount of time for your participation in the study is about 16 hours

Although you might not experience any personal gain from participating, you can feel proud that your participation will help transportation services improve travel in your area and help the research team improve the app. The overall goal of the app is to explore ways on how to improve transportation for people who do not have a car and/or rely on public transportation. The study activities in the app are not expected to have any additional risks beyond those that you would normally experience in your regular everyday life or during regular medical/psychological visits.

The location feature (I.e., GPS) will be turned on (or you can select to turn it off) while you use MyAmble in order to help identify the precise location of your daily travels. This will allow the research team to better understand your transportation experiences using the GPS feature of MyAmble. Your name is not connected with the GPS data. We will use your unique study identi er number with the GPS data.

First, you will be offered a $10 gift card to Wal-Mart or Target for meeting the enrollment criteria, which consist of completing all of the following:

- The consent form (what you are reading now)
- The demographic survey (continues after consent is given)
- **AND** logging your rst trip in the MyAmble app

Then, you will be offered a $75 gift card to Wal-Mart or Target for further participating in the study. We will offer the rst half of the gift card on Day 7 ($37.50) and the remaining amount ($37.50) after you complete the nal day of the travel diary **and** the usability survey. The total sum for your

participation in the entire study is $85. Gift cards will be emailed or mailed to you within 5 business days of meeting the criteria. The Internal Revenue Service (IRS) considers all payments made to research subjects to be taxable income. you are responsible for reporting the study payment to the IRS.

After 14 days, you are free to keep the application installed on their device or you can uninstall it. Any information that you may send via the app after 14 days will not be used as a part of the research study. Additionally, the research team will not communicate with you via the app after 14 days.

The research team is committed to protecting your rights and privacy as a research participant. We may publish or present the results, but your name will not be used. While total con dentiality cannot be guaranteed, the research team will make every effort to protect the con dentiality of your records as described here and to the extent permitted by law. Your records will be kept completely con dential according to current legal requirements. They will not be revealed unless required by law. The limits of this con dentiality include disclosure as required by federal, state, or local law of child and elder abuse/neglect and/or other illegal activities.

If you choose/select ("allow") MyAmble to leave on your location (when asked at install and download), your location will be linked to the GPS on your phone, which may pose a risk to your privacy. In order to minimize the risks posed to your privacy, you have the option to:
1) Select "deny" at install/download so that that MyAmble never uses GPS for location
2) Select "allow this time" every time you enter the app so that you can choose the days that you want to allow GPS location functionality to occur.

The demographic survey will take about 30-60 minutes to finish.

If you have any questions about this study, you can contact me at noelle elds@uta.edu or 614-947-9783 For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

- ◯ Yes, I consent.
- ◯ No, I do not consent.

Please type your name below.

Please type a current email address below.

Please type a good phone number where we can reach you below.

From which state are you participating in the study?

- ◯ Arizona
- ◯ Tennessee
- ◯ Texas

The following questions are to gather some basic information about you. Please answer all the questions.

What is your age?

What is your gender?

- Male
- Female
- Non-binary
- Transgender
- Prefer not to answer

What is your race/ethnicity?

- American Indian or Alaska Native
- Native Hawaiian or Other Paci c Islander
- Asian
- Black or African American
- Hispanic or Latinx
- White
- Prefer not to answer
- Other (enter answer)

What is your current marital status?

- ◯ Single or Never married
- ◯ Married
- ◯ Separated
- ◯ Divorced
- ◯ Widowed
- ◯ Remarried
- ◯ Prefer not to answer

What is your current employment status? (Check all that apply)

- ☐ Full-time (single job)
- ☐ Full-time (multiple jobs)
- ☐ Part-time
- ☐ Not currently employed but looking for employment
- ☐ Not currently employed and not looking for employment
- ☐ Social Security Disability Bene ts
- ☐ Retired
- ☐ Prefer not to answer
- ☐ Other (enter answer)

What is your highest level of education?

- ◯ Less than High School
- ◯ High school
- ◯ Some College
- ◯ Trade/Vocational/Technical School
- ◯ Associate Degree
- ◯ Bachelor's Degree
- ◯ Master's Degree
- ◯ Professional Degree or Certi cate
- ◯ Doctorate Degree

Does your household currently include any current or veteran military service members? (Check all that apply)

- ☐ No
- ☐ An Active-Duty service member
- ☐ An activated National Guard or Reserve member
- ☐ Retiree or veteran who is eligible to receive federal bene ts (examples: care at the VA, Tri-Care for life, pension)
- ☐ Military bene ciary who is eligible to receive federal bene ts (examples: Survivors Compensation, Transitional Compensation, Tri-Care, etc.)

Do you identify as having a disability as de ned under the Americans with Disabilities Act? This includes having a physical or mental impairment that substantially limits one or more major life activities. (Check all that apply)

- [ ] No
- [ ] Yes, cognitive
- [ ] Yes, emotional
- [ ] Yes, hearing
- [ ] Yes, mental
- [ ] Yes, physical
- [ ] Yes, visual
- [ ] Prefer not to answer

Does your ability affect how you travel in your day-to-day life?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

Do you currently access any of these community resources (Check all that apply)

- [ ] None of these
- [ ] SNAP (Supplemental Nutrition Assistance Program)
- [ ] WIC (Special Supplemental Nutrition Assistance Program for Women, Infants, and Children)
- [ ] Transportation Voucher
- [ ] Food pantry
- [ ] Other (enter answer)

Do you have reliable Internet access in your home?

- ◯ No
- ◯ No, but I can go somewhere else with reliable Internet access
- ◯ Yes

Do you have access to a smart-phone or a tablet?

- ◯ No
- ◯ Yes, a smart-phone
- ◯ Yes, a tablet
- ◯ Yes, both a smart-phone and a tablet

Are you familiar with using apps on a smart-phone or tablet?

- ◯ No
- ◯ Somewhat
- ◯ Yes

The following questions are to gather some basic information about your transportation options, transportation barriers, and effects of COVID-19 on transportation. Please answer all the questions.

Do you currently have a legal driver's license?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

Do you currently drive?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

Do you own a car?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

Is there anyone in your household who does have a valid driver's license?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

What type(s) of transportation do you have at your home that you **use regularly** to get around your community? (Check all that apply)

- [ ] None of these
- [ ] I walk
- [ ] Car
- [ ] Truck
- [ ] Motorcycle
- [ ] Bicycle
- [ ] Scooter
- [ ] Wheelchair/Electric Wheelchair
- [ ] Moped
- [ ] Uber/Lyft
- [ ] Paratransit
- [ ] Public Transportation/Bus

What is your ***number one preferred*** way to travel?

- ◯ Walking
- ◯ Car
- ◯ Truck
- ◯ Motorcycle
- ◯ Scooter
- ◯ Wheelchair/Electric Wheelchair
- ◯ Moped
- ◯ Uber/Lyft
- ◯ Paratransit
- ◯ Public Transportation/Bus

Do you have any dependents who travel with you regularly? (Examples: child, older adult, etc.)

- ◯ No
- ◯ Child(ren)
- ◯ Older Adult(s)
- ◯ Prefer not to answer
- ◯ Other (enter answer)

Do you have options for transportation if you cannot use your normal way of traveling?

- ◯ None
- ◯ A couple (1-2)
- ◯ A Few (3-4)
- ◯ Many (5 or more)

Are you aware of ride-share services? (examples: Uber, Lyft, etc.)

- ◯ No
- ◯ Not sure
- ◯ Yes

How often do you **regularly** use ride-share (examples: Uber, Lyft, etc.) services in your regular day-to-day life?

- ◯ Never
- ◯ A couple (1-2) times per week
- ◯ A few (3-4) times per week
- ◯ Several (5-6) times per week
- ◯ Many (7 or more) times per week
- ◯ Always

How much do you agree with the following statement:
My community has public transportation for people to use if they don't have personal transportation.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Do you feel like you have reliable transportation available to you?

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

How much do you think the **general public** looks down on people who...

	Not At All	Probably	Neutral	Somewhat	A Lot
Ride the bus as their main form of transportation	○	○	○	○	○
Walk as their main form of transportation	○	○	○	○	○
Use a bike as their main form of transportation	○	○	○	○	○
Use micro-mobility (e.g., E-Scooters) as their main form of transportation	○	○	○	○	○
Use ride-sharing like Uber & Lyft as their main form of transportation	○	○	○	○	○

Has a lack of transportation or unreliable transportation ever affected your...

	Never	A Little	Somewhat	Often	Always
Ability to see doctors for medical appointments.	○	○	○	○	○
Ability to fill prescriptions and medications.	○	○	○	○	○
Ability to see dentists for dental appointments.	○	○	○	○	○

Please rank the following in order of importance to you regarding transportation (1 being the most important and 5 being the least important):

Safety

-- Select --

Cost-Effective

-- Select --

Timely Arrival/Departure

-- Select --

Reliability

-- Select --

Eco-Friendly

-- Select --

Do transportation barriers limit you from connecting to your community?

- No
- Sometimes
- Yes

Does nding or accessing transportation greatly impact your budget/ nances?

- No
- Sometimes
- Often
- Always
- Prefer not to answer

Have you ever felt depressed or down because you were not able to get out of the house and go somewhere you wanted to because of a lack of transportation?

- ◯ Never
- ◯ Sometimes
- ◯ Frequently
- ◯ All the time

How often does weather affect your travel? (examples: dif culties driving in the rain, snow, sleet, etc., unable to get out if it is too hot or cold, unable to wait for the bus in extreme conditions, etc.)

- ◯ Never
- ◯ Sometimes
- ◯ Frequently
- ◯ All of the time

How do you typically navigate your way through places that are unfamiliar to you? (Check all that apply)

- ☐ Phone map application (Google-maps, Apple-maps, Waze, etc.)
- ☐ Physical road map
- ☐ Printed directions
- ☐ Directions from a friend, family member, etc.
- ☐ Other (enter answer)

How much did the COVID-19 affect your ability to travel?

- ◯ I did not leave my home
- ◯ I only left my home to run essential errands (groceries, medical, etc.)
- ◯ I left my home to run essential and non-essential errands
- ◯ I did not feel like COVID-19 affected my travel at all
- ◯ Prefer not to answer

Regardless of whether or not you had COVID-19, to what extent did it affect your physical health? (Examples: going to gym, picking up medication, buying fresh fruits and vegetables, etc.)

- ◯ Not at all
- ◯ Somewhat
- ◯ Moderately
- ◯ A lot
- ◯ Prefer not to answer
- ◯ NA

Regardless of whether or not you had COVID-19, to what extent did it affect your mental health?

- ◯ Not at all
- ◯ Somewhat
- ◯ Moderately
- ◯ A lot
- ◯ Prefer not to answer
- ◯ NA

Has a lack of transportation affected your ability to get the COVID-19 vaccine?

- ◯ No
- ◯ Yes
- ◯ Prefer not to answer

This assessment asks how you feel about your quality of life, health, or other areas of your life. Please answer all of the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures, and concerns. We ask that you think about your life in the last two weeks.

The following questions ask about **how much** you have experienced certain things **in the last two weeks**.

	Not at All	A Little	A Moderate Amount	Very Much	An Extreme Amount
To what extent do you feel that (physical) pain prevents you from doing what you want to do?	◯	◯	◯	◯	◯
How much do you need any medical treatment (for example, prescription medications, oxygen, etc.) to function in your daily life?	◯	◯	◯	◯	◯
How much do you enjoy life?	◯	◯	◯	◯	◯
To what extent do you feel your life to be meaningful?	◯	◯	◯	◯	◯
How well are you able to concentrate?	◯	◯	◯	◯	◯
How safe overall do you feel in your daily life?	◯	◯	◯	◯	◯
How healthy is your physical environment?	◯	◯	◯	◯	◯

The follow questions ask about **how completely** you experienced or were able to do certain things **in the last two weeks**.

	Not at All	A Little	Moderately	Mostly	Completely
Do you have enough energy for everyday life?	◯	◯	◯	◯	◯
Do you have enough money to meet your needs?	◯	◯	◯	◯	◯
Are you able to access and ▯ nd any information you might need in your day-to-day life?	◯	◯	◯	◯	◯
To what extent do you have the opportunity for leisure activities?	◯	◯	◯	◯	◯

How well are you able to physically get around?

- ◯ Very poor
- ◯ Poor
- ◯ Neither poor nor good
- ◯ Good
- ◯ Very Good

The following questions ask you to say **how good or satisfied** you have felt about various aspects of your life **in the last two weeks.**

	Very Dissatisfied	Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
How satisfied are you with your sleep?	◯	◯	◯	◯	◯
How satisfied are you with your ability to perform your daily living activities?	◯	◯	◯	◯	◯
How satisfied are you with your capacity for work?	◯	◯	◯	◯	◯
How satisfied are you with your personal relationships?	◯	◯	◯	◯	◯
How satisfied are you with the support you get from your friends?	◯	◯	◯	◯	◯
How satisfied are you with the conditions of your living place?	◯	◯	◯	◯	◯
How satisfied are you with your access to health services?	◯	◯	◯	◯	◯
How satisfied are you with your transportation?	◯	◯	◯	◯	◯

How often do you have negative feelings such as blue mood, despair, anxiety, depression?

- ◯ Never
- ◯ Seldom
- ◯ Quite Often
- ◯ Very Often
- ◯ Always

APPENDIX A-9

A-9: Trip Planner Planned Trip Details

Variable	N	%
Activity		
Bank	19	1.6%
Court	2	0.2%
Doctor Appointment	38	3.2%
Eat out at restaurant	72	6.1%
Entertainment	20	1.7%
Exercise	38	3.2%
Friends and Family	110	9.3%
Gas Station	20	1.7%
Grocery Shopping	136	11.4%
Hospital	7	0.6%
Hotel	4	0.3%
Job Search	2	0.2%
Library	18	1.5%
Mall	10	0.8%
Other Shopping	43	3.6%
Others	171	14.4%
Pharmacy	22	1.9%
Post Office	18	1.5%
Religious Service	26	2.2%
School	150	12.6%
Social Services	13	1.1%
Work	250	21.0%
Trip importance		
Important	382	32.1%
Less important	22	1.9%
Neutral	114	9.6%
Not important	1	0.1%
Very Important	670	56.3%
Someone else		
No	722	60.7%
Yes	467	39.3%
Who else		
boyfriend	1	0.2%
Child	59	11.7%
Co-worker	40	7.9%

Family Member	140	27.7%
Friend	171	33.9%
Girlfriend	4	0.8%
Neighbor	2	0.4%
partner	5	1.0%
Personal Care Attendant	3	0.6%
sponsor	4	0.8%
Spouse	50	9.9%
strangers on the bus	1	0.2%
Volunteer	25	5.0%
Assistance needed		
No	722	60.7%
Yes	467	39.3%
Feel safe		
No	44	3.7%
Yes	1145	96.3%

APPENDIX A-10

A-10: Trip Planner Unplanned Trip Details

Variable	N	%
Activity		
Grocery Shopping	56	19.6%
Others	53	18.5%
Friends and Family	36	12.6%
Other Shopping	28	9.8%
Work	26	9.1%
Eat out at restaurant	17	5.9%
Gas Station	12	4.2%
Doctor Appointment	9	3.1%
Exercise	9	3.1%
School	8	2.8%
Pharmacy	6	2.1%
Library	5	1.7%
Religious Service	5	1.7%
Bank	3	1.0%
Entertainment	3	1.0%
Hotel	3	1.0%
Social Services	3	1.0%
Hospital	1	0.3%
Job Search	1	0.3%
Mall	1	0.3%
Post Office	1	0.3%
Trip importance		
Important	101	35.3%
Less important	7	2.4%
Neutral	48	16.8%
Not important	4	1.4%
Very Important	126	44.1%
Someone Else		
No	152	53.1%
Yes	134	46.9%
Who Else		
BF	1	1%
boyfriend	2	1%

Child	22	16%
Co-worker	1	1%
Family Member	43	32%
Friend	32	24%
Girlfriend	2	1%
Neighbor	3	2%
partner	1	1%
significant other	1	1%
Spouse	26	19%
Assistance Required		
No	275	96.2%
Yes	11	3.8%
Feel safe		
No	13	4.5%
Yes	273	95.5%

APPENDIX A-11

A-11: Trip Planner Missed Trip Details

Variable	N	%
Activity		
Bank	1	1.1%
Court	1	1.1%
Doctor Appointment	3	3.2%
Eat out at restaurant	5	5.4%
Entertainment	3	3.2%
Exercise	5	5.4%
Friends and Family	10	10.8%
Gas Station	2	2.2%
Grocery Shopping	17	18.3%
Library	1	1.1%
Other Shopping	9	9.7%
Others	7	7.5%
Post Office	4	4.3%
Religious Service	2	2.2%
School	10	10.8%
Social Services	1	1.1%
Work	12	12.9%
Trip Importance		
Important	25	26.9%
Less important	6	6.5%
Neutral	17	18.3%
Not important	15	16.1%
Very Important	30	32.3%
Frustration Level		
A little	8	8.6%
A lot	11	11.8%
Not at all	36	38.7%
Somewhat	20	21.5%
Very much	18	19.4%
Disappointment Level		
A little	16	17.2%
A lot	14	15.1%
Not at all	31	33.3%
Somewhat	19	20.4%
Very much	13	14.0%
A little	10	10.8%
A lot	15	16.1%
Not at all	41	44.1%
Somewhat	10	10.8%

Very much	17	18.3%
Sadness Level		
A little	16	17.2%
A lot	8	8.6%
Not at all	39	41.9%
Somewhat	14	15.1%
Very much	16	17.2%
Missed Opportunity		
A little	14	15.1%
A lot	9	9.7%
Not at all	39	41.9%
Somewhat	18	19.4%
Very much	13	14.0%
Commitment Fulfilled		
No	48	51.6%
Yes	45	48.4%

APPENDIX A-12

A-12: Trip Review Journal

Variable	N	%
Overall, what were the benefits of completing today's trip/s?		
Basic Needs	3	0.5%
Grocery	59	10.0%
Errands	55	9.3%
Family	55	9.3%
Health	57	9.6%
School	35	5.9%
Social	63	10.6%
exercise	14	2.4%
Shopping	9	1.5%
Religious	9	1.5%
Work	133	22.5%
To what extent did you complete the trips you planned for today?		
A little	11	1.9%
A lot	122	20.6%
Not at all	23	3.9%
Somewhat	53	9.0%
Very much	383	64.7%
What in general, would you say your health is?		
Excellent	106	17.9%
Fair	89	15.0%
Good	225	38.0%
Poor	6	1.0%
Very Good	166	28.0%

APPENDIX A-13

A-13: Latent Demand – Negative Journal

Variable	N	%
Are there any activities that you would like to complete today but cannot? What type of activities did you want to complete but could not? (Negative Journal 1)		
Eat out	2	8%
Errands	2	8%
Exclude	3	12%
Family	3	12%
Grocery	5	20%
Health	1	4%
Money	2	8%
shopping	3	12%
Staying home	1	4%
Work	3	12%
Why could you not include them?		
Health	1	4%
Money	7	28%
No means of transportation	5	20%
not planned	1	4%
Not planned	2	8%
Others	1	4%
Exclude	5	20%
Public Transportation	1	4%
Weather	2	8%
If you do not have any planned trips, why are you not travelling? (Negative journal2)		
At work	1	0.4%
Covid	3	1.1%
Haircut	1	0.4%
Health	9	3.4%
Holiday	7	2.7%
Sick	4	1.5%
Library	1	0.4%
Money	5	1.9%
N/A	29	11.1%
Other	5	1.9%
School	1	0.4%
Staying home	148	56.7%
Store	1	0.4%

Transportation	4	1.5%
Transportation took too long	1	0.4%
Traveling took too long	2	0.8%
Weather	11	4.2%
Work	3	1.1%

APPENDIX A-14

A-14: Latent Demand – Positive Journal

Variable	N	%
Are there any other activities that you would like to complete today but cannot? What type of activities did you want to complete but could not?		
Church	1	3.13%
Errands	3	9.38%
Exercise	2	6.25%
Grocery	8	25.00%
Grooming	1	3.13%
Health	2	6.25%
School	1	3.13%
Shopping	8	25.00%
Social	2	6.25%
Work	4	12.50%
What prevented you from taking these trips?		
Health	5	15.63%
Money	7	21.88%
Nothing	1	3.13%
Other	6	18.75%
Other plans	1	3.13%
Time	3	9.38%
Transportation	6	18.75%
Work	3	9.38%
How important is/are this/these trip/s to you?		
Important	11	34.38%
Neutral	6	18.75%
Very Important	15	46.88%
What transportation option/s would have made this/these trip/s possible for you?		
Bus	5	15.63%
Bus/someone driving	1	3.13%
Bus/ride-share	1	3.13%
Bus/walking	1	3.13%
Car	11	34.38%
Car/bus	2	6.25%
Car/ride-share	1	3.13%
Someone driving	2	6.25%
n/a	3	9.38%
Ride-share	3	9.38%

Walking	2	6.25%
To what extent would completing this trip have improved your mood?		
A Little	4	12.50%
Entirely	7	21.88%
Mostly	13	40.63%
Not at all	2	6.25%
Somewhat	6	18.75%

APPENDIX A-15

EJ MyAmble User Feedback Survey

Please type your name below.

Please type a current email address below.

Please type a good phone number where we can reach you below.

From which state are you participating in the study?

- Arizona
- Tennessee
- Texas

The following questions will ask you about your experience with using the MyAmble phone application. Please answer all of the questions.

Please rate the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think that I would use MyAmble a lot.	○	○	○	○	○
I found that MyAmble was more complex than it needed to be.	○	○	○	○	○
I thought that MyAmble was easy to use.	○	○	○	○	○
I think that I would need help from someone with computer experience to be able to use MyAmble.	○	○	○	○	○
I found the different parts of MyAmble made sense together.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I found that MyAmble did not work the same way every time I used it.	○	○	○	○	○
I think most people could learn to use MyAmble quickly.	○	○	○	○	○
I found MyAmble to be very difficult to use.	○	○	○	○	○
I felt very confident using MyAmble.	○	○	○	○	○
I needed to learn a lot of things before I could use MyAmble.	○	○	○	○	○

The following questions will ask you what you liked and disliked about using the MyAmble application. Please answer all of the questions.

I had a positive experience using the MyAmble app.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

Something I liked about the MyAmble app was:

Something I would change about the MyAmble app is:

What feature of the MyAmble application did you like best? Why?

Which feature of the MyAmble application did you like least? Why?

Was using the 'Travel Buddy' feature (the icon that allowed you to communicate with and ask questions to the administrator) a good experience?

- ◯ Yes
- ◯ Sometimes
- ◯ No

Do you feel like you participated more because of the 'Travel Buddy' feature?

- ◯ Yes
- ◯ Sometimes
- ◯ No

Did you use the 'Challenge Logger' by adding photos or videos of your transportation barriers?

- ◯ Yes
- ◯ No

If you did use the 'Challenge Logger' icon by adding photos or videos of transportation barriers, did you enjoy using it? Why or why not?

Comments/Suggestions:

APPENDIX A-16

EJ Focus Group

Hello,

My name is Dr. Noelle Fields, and I am asking you to participate in a research study titled, "Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand." This research study is a collaboration of the University of Texas at Arlington, the University of Tennessee, Knoxville, and the University of Arizona.

This study is about using smart-phone apps to study every-day travel among people who may experience transportation disadvantage. As a volunteer, you would be participating in a one-time, online focus group. You can choose to participate in this research study focus group if you are at least 18 years old, speak English, and are willing to talk about the app and the possibility of using this app in research about transportation.

One reason why you might want to participate in this study is to share your opinions about an app, MyAmble, that will be used in the future to explore travel, namely completing/not completing trips and why not. The app is also designed to be used as a data collection tool for transportation planning organizations and other community organizations that work in transportation. Your feedback will be used to help the research team improve the app. You might not want to participate if your schedule does not allow you to participate in our focus group.

Your decision about whether to take part in the focus group is up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any benefits or services that you would normally receive. Even if you choose to begin the focus group, you can also change your mind and quit at any time without any harm to you. There are no other options to taking part in this focus group, but you do not have to participate if you do not want to.

If you decide to take part in this focus group, I will ask you to be part of a one-time, online one- hour, focus group that will be audio recorded. A focus group is a group discussion where a member of the research team will ask questions and all participants can speak openly about their opinions. During the focus group, we will ask you questions about your experience using the app, your opinions of the app, what went well and what did not go well, etc. After the focus group ends, the audio recording will

app, what went well and what did not go well, etc. After the focus group ends, the audio recording will be professionally transcribed, meaning the words will be written out exactly as they were recorded in the meeting.

The focus group will take place on Zoom or Microsoft TEAMS which are used for teleconferencing. You will be asked to complete this consent form and enter in your personal contact information (5 minutes). If you agree to participate in the study, then you will be emailed a link to the Zoom or Microsoft TEAMS meeting that will take place at a later date. If a common time for a focus group cannot be found for you to join, then you have the option to participate in an interview instead.

Although you probably won't experience any personal benefit from taking part in this study, you can feel proud that your feedback will help the research team improve the app. The overall goal of the app is to explore ways on how to improve transportation for people who do not have a car and/or rely on public transportation. The focus group is not expected to put you at any additional risks beyond those that you would normally have in your regular everyday life.

You will be provided a $10 e-gift card to Wal-Mart or Target for participating in this study, which will be emailed to you within 14 days after the focus group session. The Internal Revenue Service (IRS) considers all payments made to research subjects to be taxable income. You are responsible for reporting the study payment to the IRS.

The research team is committed to protecting your rights and privacy as a member of the focus group and a research participant. We may publish or present the results, but your name will not be used. While complete confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law. The limits of this confidentiality include disclosure as required by federal, state, or local law of child and elder abuse/neglect and/or other illegal activities.

If you have any questions about this study, you can contact me at noelleelds@uta.edu or 614-947-9783. For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

- ◯ Yes, I consent.
- ◯ No, I do not consent.

Please type your name below:

Please type a current email address below:

Please type a good phone number where we can reach you below:

APPENDIX A-17

Focus Group - PROFESSIONALS

Hello,

My name is Dr. Noelle Fields, and I am asking you to participate in a research study titled, "Understanding the Usability of a Smart-Phone App-based Data Collection to Characterize Latent Transportation Demand." This research study is a collaboration of the University of Texas at Arlington, the University of Tennessee, Knoxville, and the University of Arizona.

This study is about using smart-phone apps to study latent demand among environmental justice (EJ) populations. As a volunteer, you would be participating in a one-time, online focus group. You can choose to participate in this research study if you are at least 18 years old, speak English, and possess knowledge or experience necessary to evaluate the app and speak to its potential as a tool for transportation-related data collection.

One reason why you might want to participate in this study is to share your opinions about an app, MyAmble, that will be used in the future to explore latent travel demand and/or unserved trips. The app is also designed to be used as a data collection tool for metropolitan planning organizations and other stakeholders in transportation. Your feedback will be used to help the research team re ne the app. You might not want to participate if your schedule does not allow you to participate in our focus group.

Your decision about whether to participate is entirely up to you. If you decide not to be in the study, there won't be any punishment or penalty; whatever your choice, there will be no impact on any bene ts or services that you would normally receive. Even if you choose to begin the study, you can also change your mind and quit at any time without any consequences. There are no alternative options to participating in this project, but you do not have to participate if you do not want to.

If you decide to participate in this research study, I will ask you to participate in a one-time, one-hour, virtual focus group that will be audio recorded. A focus group is a group discussion where a member of the research team will ask questions and all participants can speak openly about their experiences and views. We will talk about the MyAmble app study ndings, discuss how to re ne

experiences and views. We will talk about the MyAmble app study findings, discuss how to refine the app further, and collaborate on how this type of data from MyAmble may be used for transportation planning in the future. During the focus group, we will ask you questions about your opinions of the app. After the focus group ends, the audio recording will be professionally transcribed.

The focus group will take place on Zoom or Microsoft TEAMS which are used for teleconferencing. You will also be asked to complete a brief (10 minute) online demographic/background survey. If you agree to participate in the study, you will first complete the brief survey and then you will be emailed a link to the Zoom or Microsoft TEAMS meeting that will take place at a later date.

Although you probably won't experience any personal benefit from participating, you can feel proud that your participation will help the research team improve the app. The overall goal of the app is to explore ways on how to improve transportation for people who do not have a car and/or rely on public transportation. The study activities are not expected to pose any additional risks beyond those that you would normally experience in your regular everyday life or during routine medical/psychological visits. You will not receive any compensation for participating in this focus group.

The research team is committed to protecting your rights and privacy as a research subject. We may publish or present the results, but your name will not be used. While absolute confidentiality cannot be guaranteed, the research team will make every effort to protect the confidentiality of your records as described here and to the extent permitted by law.

Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law. The limits of this confidentiality include disclosure as required by federal, state, or local law of child and elder abuse/neglect and/or other illegal activities.

If you have any questions about this study, you can contact me at noelle.elds@uta.edu or 614-947-9783 For questions about your rights or to report complaints, contact the UTA Research Office at 817-272-3723 or regulatoryservices@uta.edu.

- ◯ Yes, I consent.
- ◯ No, I do not consent.

Please enter your contact information below:

First and Last Name:

Email Address:

Phone Number:

Please select your gender:

- ◯ Female
- ◯ Male
- ◯ Other
- ◯ Prefer not to say

Please select your race/ethnicity:

- ◯ Hispanic or Latinx
- ◯ American Indian or Alaska Native
- ◯ Asian
- ◯ Black or African American
- ◯ Native Hawaiian or Other Paci c Islander
- ◯ Caucasian or White
- ◯ Multiracial
- ◯ Other
- ◯ Prefer not to say

Please write your age (in years):

_____

Please state your job title:

_____

Please select your highest degree obtained:

- ◯ Bachelor's
- ◯ Master's
- ◯ PhD
- ◯ Other

Please specify:

Please select your current eld of work:

- ◯ Social work
- ◯ Urban planning
- ◯ Transportation
- ◯ Engineering
- ◯ Other

Please specify:

APPENDIX A-18

Implementation Plan

MyAmble provides access to new data and can enhance community engagement. Based on the findings from the study, the *MyAmble* development team believes that the app it can provide benefit to MPOs, but they also recognize the need for on-going technical development and enhancement to achieve its greatest utility. For technical development, one of the major recommended enhancements requires identifying and forming a partnership with a travel diary app developer. The research team presents three major recommendations for MPOs to consider in utilizing *MyAmble* to enhance operations and practices.

Data already gathered through *MyAmble* and future data gathered through *MyAmble* may be used to create new performance measures that directly align with measuring and monitoring the transportation needs of vulnerable populations. These performance measures should at least include new metrics for vulnerable population latent demand and missed trips; however, the quantitative data gathered from *MyAmble* may provide insights into more granular performance measures (e.g. by activity or significance of impact). The themes that emerge from *MyAmble*'s qualitative data may identify other performance measures for MPOs to develop and monitor. The qualitative data collected from *MyAmble* may also be used directly to monitor progress within individual communities or throughout larger regions. *MyAmble* may also enhance environmental justice assessments and provide an alternative approach to community engagement and public participation. *MyAmble* may represent a critical element in a comprehensive community-based public participation plan to strengthen engagement with the entire population including protected classes.

The MPO working group can determine priorities and potentially collaborate with a similar MyAmble working group to determine priorities for join efforts including pooled funds. The working groups combined with a regular commitment of funds to on-going *MyAmble* development will provide significant support to developing the functionality, training, and support necessary for adopting *MyAmble* into existing practices.

While this study presents an initial implementation plan, the implementation plan should be regularly reviewed and revised to align it with MPO needs. The implementation plan includes three primary thrusts (see Figure 1): further technical development of the app, MPO guidance and training for integrating *MyAmble* into practice, and case studies to evaluate *MyAmble*'s effectiveness in providing different data and perspectives to decision-making frameworks.

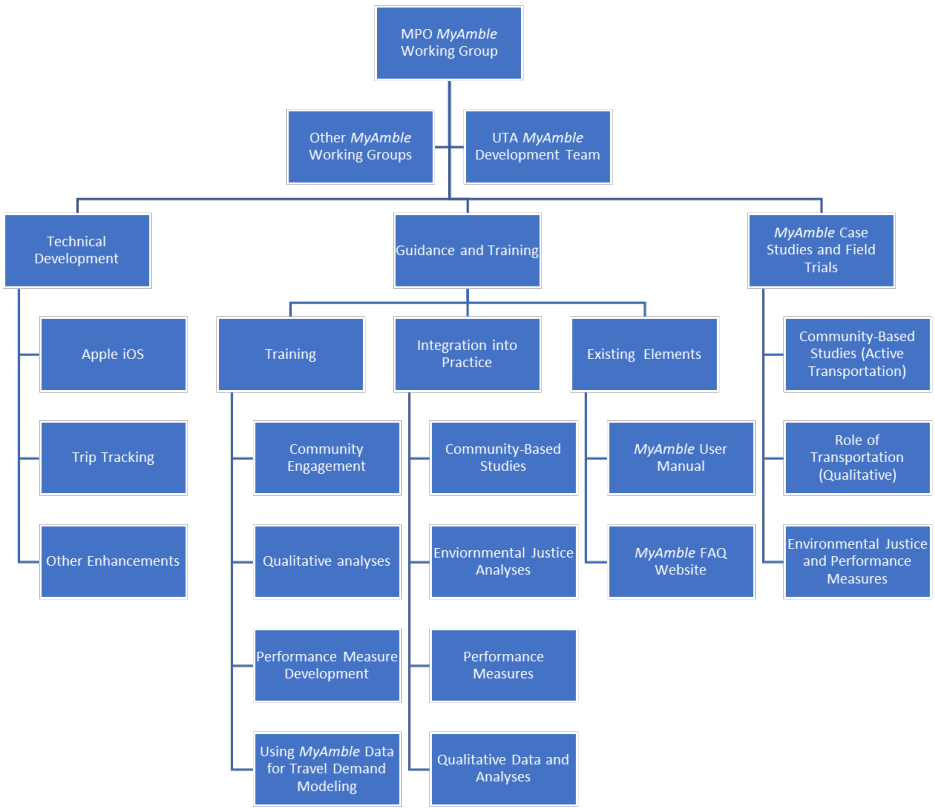


Figure 1. Implementation plan structure

Strategic plan

This implementation plan provides a structure for supporting the creativity of MPO managers as they identify use cases for *MyAmble* and any needs for enhanced functionality. While the implementation plan focuses on the opportunities for improving app features, evaluating use cases, and developing training and support for incorporating *MyAmble* into MPO practices, the execution of this plan requires a group within a MPO to provide leadership. A MPO should consider including all interested parties; however, representatives from public engagement/public participation, environmental justice, active transportation, public transportation, performance measurement, and travel models may all significantly benefit from their participation. With the UTA *MyAmble* development team, MPOs can connect with others to create interest in the potential adoption of *MyAmble* into MPO practices and operations throughout specific regions. The UTA *MyAmble* development team will try to support any strategies identified by the MPO working group to facilitate interest and collaboration.

Ideally, a MPO will identify multiple partner MPOs to create a pooled fund and *MyAmble* working group or advisory board. The advisory board can determine pooled fund task order priorities and determine locations for any *MyAmble* case studies. After securing these regional commitments, the advisory board may seek additional resources from the federal and state governments, other MPO organizations, or foundations. Strategic investment in *MyAmble* and adopting it into current practices positions MPOs to take a leadership role in transforming transportation planning to explicitly consider the voices and needs of vulnerable underserved communities and populations. Figure 2 provides an overview of the strategic plan to support *MyAmble* implementation.

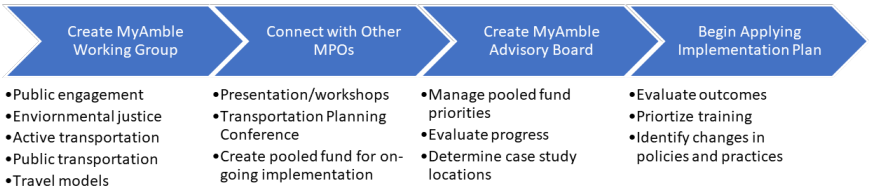


Figure 2. Strategic plan for implementation

Future technical improvements/enhancements

MyAmble still requires some critical enhancements before it will be ready for full scale unbiased deployment. Most importantly, an Apple iOS version of *MyAmble* must be developed to accommodate iPhone users. The Apple iOS version provides access to almost 60% of smartphone users in the United States. *MyAmble*'s utility for agencies and ease of use may be greatly enhanced if it had the option to turn on trip tracking. The trip tracking feature would align with the current innovative strategies available for conducting travel surveys (e.g. Daynamica), which require minimal input from participants and still produce, travel and activity data like origins, destinations, trips, and modes based on GPS data. The trip tracking would greatly simplify the activity reporting stage in *MyAmble*; however, the latent demand and activity planning stages must remain to provide the transportation burden data for vulnerable populations. Ideally, the *MyAmble* development team could partner with an existing travel diary app that accurately estimates travel and activity data instead of developing these features itself because others have already invested in developing these data collection methods. Since this new feature would be an option, *MyAmble* would still accommodate users concerned about sharing location data, data fees, or battery life. Some other technical elements requested by the technical development focus group of the project should be evaluated and prioritized. For example, *MyAmble* users and transportation professionals recommended adding "trip chain" functionality. Other recommendations included allowing for trip planning several days in advance, enhancing the challenge logger feature, utilizing GPS to log trip start and stops, and including both travel time and travel distance.

Elements for Implementation

This section provides a brief description of some initial strategies and techniques for MPOs to consider when implementing *MyAmble* to address specific elements within a particular MPOs operations. This section does not typically present specific training requirements; however, it does discuss some collaboration and potential training requirements.

Existing Elements

A comprehensive *MyAmble* user manual is available as a pdf or Word document. The manual includes the purpose of the project (which can be changed depending on the type of project), project timeline, and introduction to/overview of *MyAmble*. The user manual details each feature of the app and includes embedded demonstration videos. A *MyAmble* user website is also available that includes the download link for *MyAmble* (Android only at this time) as well as trouble-shooting solutions that users might face (e.g. smartphone will not install apps from unknown sources, app stalls, or Travel Buddy messages are delayed/not being sent).

Guidance and Training for Integration into MPO Practices

Community Engagement

Engaging the broader community in transportation research is critical in addressing issues of transportation equity, particularly for underserved populations. However, building strong and trusting relationships takes time as well as expertise in community-

engaged research. In the current study, partnerships with key community agencies led to targeted recruitment strategies (e.g. participants who use public transit, participants who live in at-risk communities, participants who self-report transportation challenges). Additionally, the UTA School of Social Work has hundreds of current and former students embedded in community agencies across Texas as well as many alumni nationwide. Community agencies include: temporary housing for persons who are homeless, programs serving children and families who are lower income as well as older adults and persons with disabilities, hospitals, mental health clinics, and centers for addiction and recovery. Partnering with a university that has a robust social work program may offer better outcomes in terms of recruiting underserved populations as well as engaging in community-based research. Additionally, interprofessional collaborations between civil engineers, transportation planners, and social service providers/nonprofit organizations is cited as an important strategy for community engagement in transportation research with vulnerable populations (see Fields et al. 2020).

Qualitative Analysis

The Travel Buddy feature produces rich data that requires qualitative analysis. Other features of *MyAmble* include open-ended questions that can be quantified or analyzed qualitatively for themes if more context is needed for the data. The purpose of qualitative data is to explore the lived experience of study participants. Unlike quantitative data, the qualitative data generated in the Travel Buddy allows the “voices” of users to be heard and analyzed systematically. Qualitative data can also be a valuable tool for interpreting quantitative data using mixed methods research designs (Creswell, 2021). Researchers in the UTA School of Social Work are well-positioned to partner with organizations in need of support with qualitative data analysis. Alternatively, the UTA School of Social Work could develop a training manual for different types of qualitative data analysis. Because this second approach covers multiple methods, the training manual needs to include a decision support system for selecting an appropriate method to generate the desired data.

Performance measures

The data provided using *MyAmble* creates the opportunity to more directly measure the transportation system’s performance with respect to vulnerable populations and protected classes. These performance measures may be developed based on *Travel Buddy* responses or developed directly from the quantitative data collected by *MyAmble.* Through community engagement, the targeted performance measures for specific neighborhoods or population groups. An MPO should consider adopting performance measures like transportation system-based latent demand and transportation system-based missed or failed trips for specific neighborhoods or population groups. These performance measures may be further contextualized by considering the types of unserved activities and the corresponding impacts on the respondent. All of these metrics should also be considered through an equity lens.

Travel modeling

The unique data provided using *MyAmble* creates the opportunity to directly assess transportation induced latent demand. By directly capturing this data, a more complex picture of latent demand for neighborhood and population groups may be developed. The general approach for latent demand assumes that more travel will occur as travel becomes cheaper or quicker; however, this may not be true for neighborhoods and population groups without adequate access to the transportation system. For these populations, congestion mitigation and the resulting travel time improvements will never serve their latent demand because the system fails to adequately serve them. Identifying the magnitude of this type of latent demand provides a new metric for MPOs to consider when developing a plan and considering transportation system investments. The *MyAmble* likely cannot be incorporated into the primary travel demand models because the *MyAmble* data would be overwhelmed by the data from more typical transportation system users. The UTA *MyAmble* development team recommends creating new models to capture transportation induced latent demand and missed trips and the impacts associated with these unserved activities. These models will have particular importance for all environmental justice analyses of protected classes.

Strategies/Packages for *MyAmble* Use

This section provides a brief description of the *MyAmble* data types and analyses associated with case study applications. The packages also present alternative strategies for support from the UTA *MyAmble* development team. Some of the packages also present data collection strategies and requirements. Packages may also include potential or required partners.

Community-based studies

- *MyAmble* data types: All except *Travel History* may be included. The specific needs will differ depending on the purpose of the community-based study. Most will use *Daily Trip Planner* and *Travel Buddy*. The *Challenge Logger* should be included for all studies considering infrastructure (especially for active transportation)
- *MyAmble* data analyses: Quantitative (statistical), Qualitative, Quantitative (modeling; optional)
- UTA *MyAmble* development team support alternatives: none, consultant (e.g. training/training materials, data collection strategies/recommendations, or data analyses recommendations), data collection only*, extensive (many but not all roles and responsibilities; an MPO is actively involved in all aspects of the project), comprehensive (most roles and responsibilities)
- Partners: Neighborhood/community groups, groups serving targeted populations, local agency (optional; required for projects seeking infrastructure improvements)
- Data collection strategy: Community partner with snowballing
- Data collection requirements: All targeted voices must be adequately represented in the sample

* data collection may be paired with another support alternative

Qualitative data adoption/analysis

- *MyAmble* data types: *Travel Buddy. Daily Trip Planner* and *Challenge Logger* (optional)
- *MyAmble* data analyses: Qualitative
- UTA *MyAmble* development team support alternatives: none, consultant (e.g. training/training materials, data collection strategies/recommendations, or data analyses recommendations), data collection only*, extensive (many but not all roles and responsibilities; an MPO is actively involved in all aspects of the project), comprehensive (most roles and responsibilities)
- Partners: Neighborhood/community groups and groups serving targeted populations
- Data collection strategy: Community partner with snowballing preferred
- Data collection requirements: All targeted voices must be adequately represented in the sample

* data collection may be paired with another support alternative

Performance measures

- *MyAmble* data types: *Daily Trip Planner* and *Travel Buddy*
- *MyAmble* data analyses: Quantitative (statistical), Qualitative (themes for identifying performance measures), Quantitative (modeling; optional)
- UTA *MyAmble* development team support alternatives: none, consultant (e.g. training/training materials, data collection strategies/recommendations, or data analyses recommendations), data collection only*, extensive (many but not all roles and responsibilities; an MPO is actively involved in all aspects of the project), comprehensive (most roles and responsibilities)

* data collection may be paired with another support alternative

Public engagement

- *MyAmble* data types: *Travel Buddy* and *Challenge Logger* (optional)
- *MyAmble* data analyses: Qualitative
- UTA *MyAmble* development team support alternatives: none, consultant (e.g. training/training materials, data collection strategies/recommendations, or data analyses recommendations), data collection only*, extensive (many but not all roles and responsibilities; an MPO is actively involved in all aspects of the project), comprehensive (most roles and responsibilities)
- Partners: Neighborhood/community groups, groups serving targeted populations, local agency (optional; required for projects seeking infrastructure improvements)
- Data collection strategy: Community partner
- Data collection requirements: All targeted voices must be adequately represented in the sample

* data collection may be paired with another support alternative

Travel modeling

- *MyAmble* data types: *Daily Trip Planner; Challenge Logger* (optional)
- *MyAmble* data analyses: Quantitative (modeling)

- UTA *MyAmble* development team support alternatives: none, consultant (e.g. training/training materials, or modeling recommendations), data collection only*, extensive (many but not all roles and responsibilities; an MPO is actively involved in all aspects of the project), comprehensive (most roles and responsibilities)

* data collection may be paired with another support alternative

Example Case Studies for Using MyAmble

The examples provided in this section of the implementation plan describe some of the potential objectives that may be selected for investigation using *MyAmble*. A specific cases study may include any amount of the sample objectives or create new objectives based on MPO goals. Specific budgets for support from the UTA *MyAmble* Development Team will vary based on the role and types of activities While initial case studies may emphasize assessing the usefulness of *MyAmble* and the data that it can provide, future case studies may emphasize evaluating training materials and other elements intended to increase MPO proficiency using *MyAmble* and its data. These two types of case studies should be sufficient to generate support for adopting and integrating *MyAmble* into MPO practices.

Community-Based Studies to Evaluate Active Transportation Infrastructure

Objectives:

1. Evaluate level of active transportation use within the community for both utilitarian and recreational purposes.
    a. Estimate the current public health impacts
    b. Identify community-determined barriers and discontinuities in the active transportation network (*Challenge Logger*)
    c. Estimate impacts of removing barriers and discontinuities in the network
        i. Estimate access impacts
        ii. Estimate public health impacts
2. Evaluate current community level access to opportunities
    a. Assess transportation system-based latent demand and potential community-level impacts
    b. Assess transportation system-based missed or failed trips and community-level impacts
    c. Assess community-level transportation-based Mazlow's Hierarchy of Needs
3. Assess access to public transportation within the community
    a. Determine current public transportation use rates in the community based on access and other factors
    b. Identify community-based reasons for using or not using public transportation
        i. Provide context based on trip purpose
        ii. Provide context based on time of day and day of week
        iii. Provide context based on age and gender
    c. Create recommendations to improve community access to opportunities

Packages:

1. Community-based studies
2. Qualitative data adoption/analysis
3. Performance measures
4. Travel Modeling (optional)

Environmental Justice and Performance Measures
Objectives:

1. Develop performance measures for environmental justice populations (*Travel Buddy*)
    a. Create performance measures linked to population needs and priorities
    b. Evaluate data availability and MPO capability of tracking/evaluating candidate environmental justice performance measures
        i. Prioritize performance measures for adoption and integration into MPO practices
2. Evaluate current environmental justice population access to opportunities
    a. Assess transportation system-based latent demand and potential environmental justice population impacts
    b. Assess transportation system-based missed or failed trips and environmental justice population impacts
    c. Assess environmental justice population transportation-based Mazlow's Hierarchy of Needs
3. Characterize the possible analyses and conclusions connected to qualitative data from environmental justice populations
    a. Identify potential objectives of qualitative analyses
    b. Evaluate potential for integrating qualitative analyses into existing environmental justice practices
    c. Evaluate the potential for using qualitative analyses to create new practices and procedures for environmental justice assessments
4. Assess project, policy, or plan-based impacts on environmental justice populations
    a. Evaluate impact on environmental justice population using current and new performance measures
    b. Identify environmental justice population themes of project, policy, or plan-based strengths and weaknesses

Packages:

1. Qualitative data adoption/analysis
2. Performance measures

3. Community-based studies (optional)
4. Travel Modeling (optional)

Role of Transportation
Objectives:

1. Characterize the role of transportation in accessing opportunities and quality of life for different populations based on the following characteristics:
    a. Income
    b. Vehicle ownership and availability
    c. Protected class
    d. Housing location and cost
2. Evaluate the ability of *MyAmble* to improve public engagement level
    a. Use *MyAmble* to empower the voiceless to identify barriers and challenges within their transportation system and have them addressed in a timely manner (requires partnerships with local agencies)
    b. Use *MyAmble* to gather input about the current transportation system for all community members where they are
3. Determine community-based or population-based monetary and temporal affordability of transportation
    a. Assess monetary affordability and temporal affordability on transportation-based Mazlow's Hierarchy of Needs
    b. Evaluate equity in transportation affordability
4. Evaluate *MyAmble*'s ability to support community partnerships to increase access to vulnerable populations and increase the participation of protected classes *in public participation activities*
    a. Evaluate changes in participation based on protected classes
    b. Identify strengths, weaknesses, opportunities, and threats based on interviews with community partners
5. Formulate a comprehensive community/population-based approach to community engagement for improved public participation using *MyAmble*

Packages:

1. Public engagement
2. Qualitative data adoption/analysis
3. Performance measures (optional)
4. Travel Modeling (optional)