EQUITY AND SMART MOBILITY

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Communities**
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CNT

GENERAL MOTORS

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EXECUTIVE SUMMARY

Transportation is central to quality of life and well-being, linking people to employment, goods and services, health care, education, social activities, recreation, and cultural activities. However, access to transportation options in the U.S. is not always equitable, leaving many communities of color, especially those of limited means, struggling to obtain reliable, frequent, and affordable transportation to meet everyday needs.

Recent and rapid changes in the transportation landscape, such as transportation network companies (TNCs such as Uber and Lyft), and car and bikeshare systems, pose new equity challenges and opportunities. This study examines equity and smart mobility in ten U.S. counties and their central cities: Atlanta, GA; Chicago, IL; Columbus, OH;

Detroit, MI; Houston, TX; Los Angeles, CA; New York City Burroughs of Brooklyn, Bronx, and Queens; Phoenix, AZ; St. Paul and Minneapolis, MN; and Seattle, WA (see Box 1 on next page) – to understand the extent that smart mobility services and assets are equitably available, and

For this study, "equitable smart mobility" is defined as transportation systems that incorporate technology while increasing access to mobility options, enhancing opportunity in low-income communities of color, and supporting a clean environment.

Box 1: Examined Cities

Seattle, WA

St. Paul & Minneapolis, MN

Chicago, IL

Detroit, MI

New York City Burroughs of Brooklyn, Bronx, & Queens

Columbus, OH

Phoenix, AZ

Los Angeles, CA

Atlanta, GA

Houston, TX

impact accessibility, employability, livability, and mobility. For this study, "equitable smart mobility" is defined as transportation systems that incorporate technology while increasing access to mobility options, enhancing opportunity in low-income communities of color, and supporting a clean environment. The research focused on public transit, car-sharing platforms (including TNCs), and bikes and bike-sharing platforms.

The demand for smart mobility options by communities of color is based on acute need rather than choice. Regardless of income, African Americans are more likely to live in households that do not own cars. A large proportion of African American (43%) and Hispanic households (42%) that do not own cars are living in poverty, while only 28% of white households without cars are in poverty, and over 51% are earning 201% or more of the poverty rate.

Access to transit in general is equitably distributed. In the ten city/county study areas, access to transit is equitably available in central cities for

all income and racial groups. However, a closer examination reveals that *access to quality transit—frequent service to key destinations—is not equitably available.*

- African Americans living below poverty have access to 7% fewer transit trips per week than whites.

- People of color have access to 10% fewer high frequency routes during the commuting rush hour.

- African Americans have access to 31% fewer jobs requiring an associate degree or less, on average, via a 30-minute transit ride than whites.

Access to non-transit mobility choices is not equitable.

- Whites have access to almost three times as many carshare locations within a half a mile as African Americans, and 2.5 times as many as Hispanics, in the central cities.

- Whites have access to almost two times as many bikeshare locations within a half a mile as African

Americans, and 3.5 times as many as Hispanics, in the central cities.

- In the central city, African Americans hailing TNCs from their homes have longer wait times than people of other races, and the greatest disparity is in the early morning (22% longer) and morning rush (17% longer).

Access to smart phones and bank products (credit/debit cards) often required to access smart mobility options can be challenging.

- Lower income households are 19–27% less likely to own smartphones than higher income households.

- African Americans and Hispanics are 4.5 times as likely to be unbanked (no one in household has a bank account) and two times as likely to be underbanked (have a bank account but also obtain financial products or services outside of the banking system, such as payday loans or check cashing) in comparison to whites.

Across income levels, African-American residents pay a larger portion of their household expenses for transportation costs, 24–26% more than white residents in the central city.

Equitable access to key destinations via transit reveals mixed results. Data from the American Household Survey available for six of the 10 metro regions (Chicago, Detroit, Houston, New York, Seattle and Minneapolis/St. Paul) for race (ethnicity is not available) indicates:

African American residents pay a larger portion of their household expenses for transportation costs,
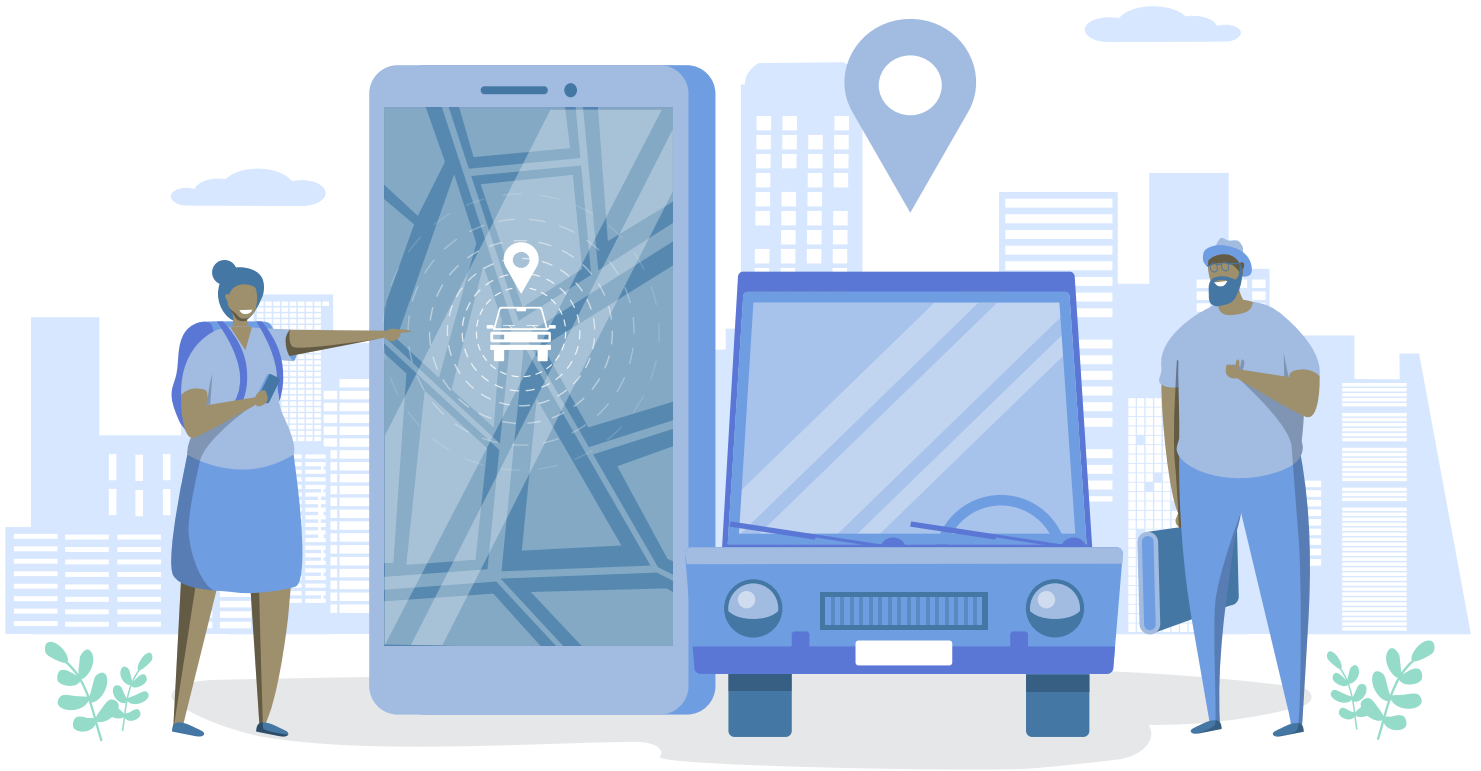## *24–26%*
more than white residents

- One in four African Americans living below poverty are not able to access a grocery store by public transit.

- Across all incomes, more African Americans have access to healthcare services in the central city via transit when compared to whites and other people of color.

- One in four lower-income African Americans living in central cities do not have access to a personal banking facility by transit, compared to 35% of white residents.

A comprehensive understanding of equity issues in smart mobility is challenged by gaps in data availability. Many public providers make data available, but significant and sophisticated analysis is necessary to yield insight into equity issues. Private operators, such as Uber and Lyft, have resisted sharing data on service availability and users. Some cities have negotiated data releases from private operators as a requirement for service agreements, and the data are beginning to be shared publicly.

However, the data provide incomplete information and must be supplemented by more detailed analysis at the local level, as well as with qualitative information from surveys and interviews.

For instance, while available data may supply transit stop locations, further investigation is needed to reveal barriers such as dangerous traffic conditions impeding access to those stations, or perceptions of safety and security threats near transportation options. In tandem with this national study, the Institute for Sustainable Communities plans to release a pilot version of such a local analysis of the Metro-Phoenix area.

Interviews with industry professionals, public sector representatives, and social justice leaders indicate that consistent advocacy, planning participation by communities of color, and equitable policy solutions are necessary to illuminate and resolve equity issues.

INTRODUCTION

Transportation is central to quality of life and well-being, providing connections to employment, goods and services, health care, education, social activities, recreation, and cultural activities. However, access to transportation options in the U.S. is not always equitable, leaving many communities of color, especially those of limited means, struggling to obtain reliable, frequent, and affordable transportation to meet everyday needs.
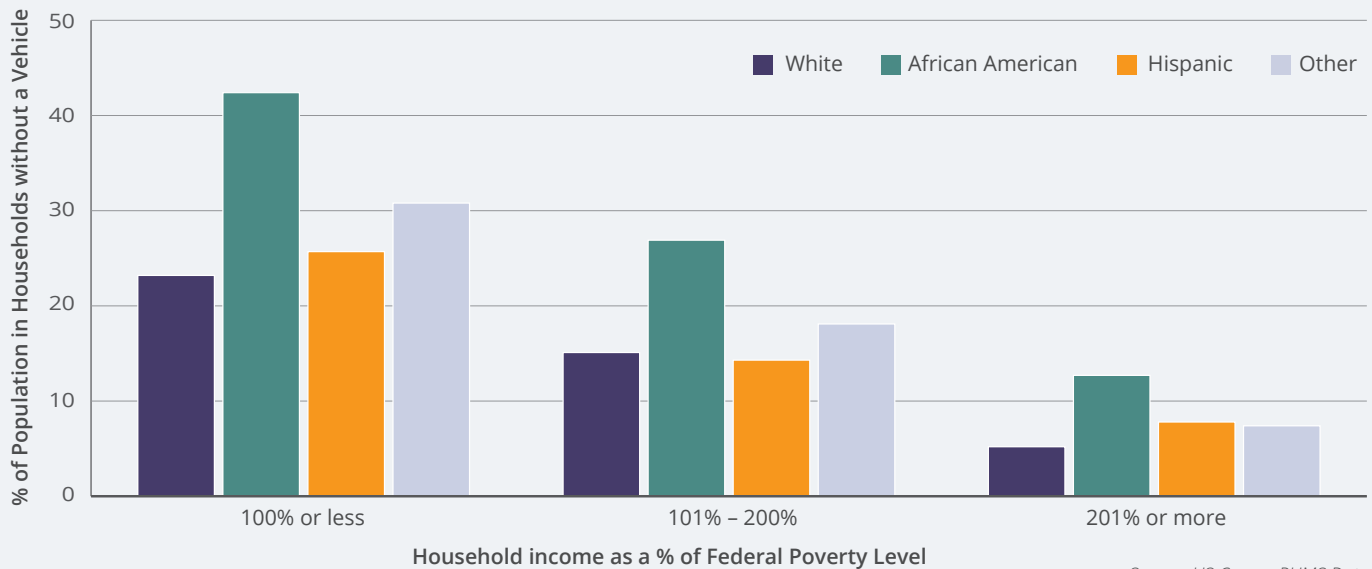
Transportation is also a rapidly evolving industry, with new modalities and changing technologies impacting accessibility, costs, and travel times for consumers and cities. Rapidly emerging "smart mobility" options, such as expanding transit, transportation network companies (TNCs) like Uber and Lyft, and car and bike sharing, are penetrating large cities and their surrounding areas, providing new alternatives to reliance on traditional automobile travel.

These rapid changes in the transportation landscape also pose new equity challenges and opportunities. This study examines equity and smart mobility in ten U.S. counties and their central cities to understand to what extent smart mobility services and assets are equitable,

For decades, the American transportation experience has been centered around auto ownership, with an increasing number of households owning more and more cars.

Table 1: Regardless of income, African Americans are more likely to live in households with no vehicles

Source: US Census PUMS Data

and impact accessibility, employability, livability, and mobility. For this study, "equitable smart mobility" is defined as transportation systems that incorporate technology while increasing access to mobility options, enhancing opportunity in low-income communities of color, and supporting a clean environment. The research is focused on public transit, car-sharing platforms (including TNCs), and bikes and bike-sharing platforms.

For decades, the American transportation experience has been centered around auto ownership, with an increasing number of households owning more and more cars. To better understand the need for equitable smart mobility options, we must review current patterns of equity and automobile ownership. An examination of the 2017 American Community Survey data on auto ownership reveals that, regardless of income, African Americans are more likely to live in households that do not own any automobiles. Other people of color and

Hispanic households are more likely than white households not to own vehicles, with the exception of Hispanic households earning between 101 and 200% of the federal poverty rate, who are slightly less likely than whites not to own a car.

Further examination of carless households reveals that a large proportion are African American (43%) and Hispanic (42%) households living in poverty. Only 28% of white households with no cars are in poverty and over 51% are earning 201% or more of the poverty rate. (See Table 1 above).
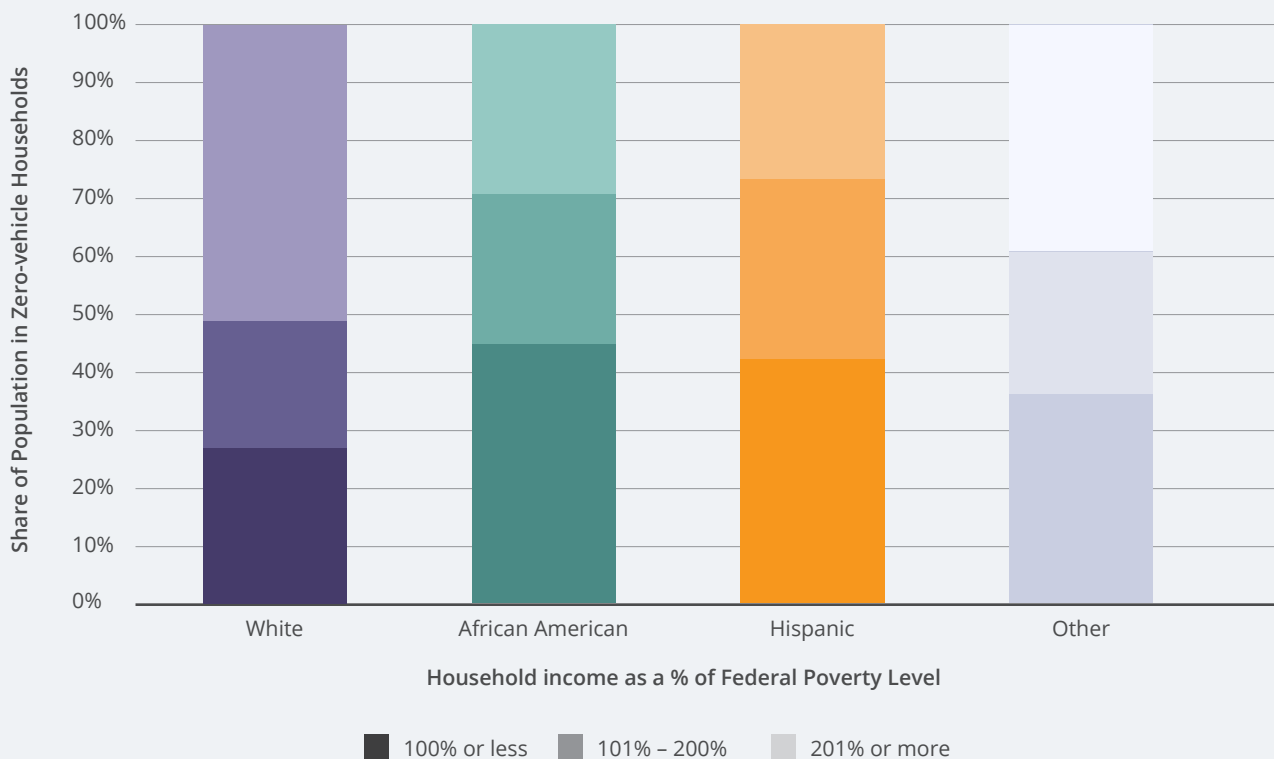
This data demonstrates a clear need for people of color households, especially those living below the poverty level, to find alternative transportation options to automobile ownership. Smart mobility options offer a range of choices; this report will examine the equitable accessibility, cost, and effectiveness of these alternatives.

This study examines smart mobility options and equity in ten cities and their surrounding counties: Atlanta, GA; Chicago, IL; Columbus, OH; Detroit, MI; Houston, TX; Los Angeles, CA; New York City Burroughs of Brooklyn, Bronx, and Queens; Phoenix, AZ; St. Paul and Minneapolis, MN; and Seattle, WA. (Full geographic descriptions can be found in the Methods section of the Appendix.)

Data was sourced from the U.S. Census, Bureau of Labor Statistics, the National Transit Database, CNT's AllTransitTM dataset of public transportation, car, and bikeshare companies, and Uber and Lyft (limited to constraints of their API). Yet, despite this wide range of sources, many gaps in data availability were noted, and will be discussed in the report.

In addition to data analysis, 15 interviews were conducted with community and transportation equity advocates, industry leaders, local government officials, and innovators in the smart mobility field.

Table 2: African American and Hispanic people in zero-vehicle households are more likely to be in poverty

Household income as a % of Federal Poverty Level

- 100% or less
- 101% – 200%
- 201% or more

Source: US Census PUMS Data

ACCESSIBILITY

Before considerations of smart mobility costs and quality, access is the principal overriding indicator of the capacity of communities of color to use smart mobility options. To determine the extent which convenient and equitable avenues of access to smart mobility are available to communities of color, we reviewed disparities in service availability, affordability and financial barriers, and issues related to knowledge, comfort, and capacity to use these technologies.
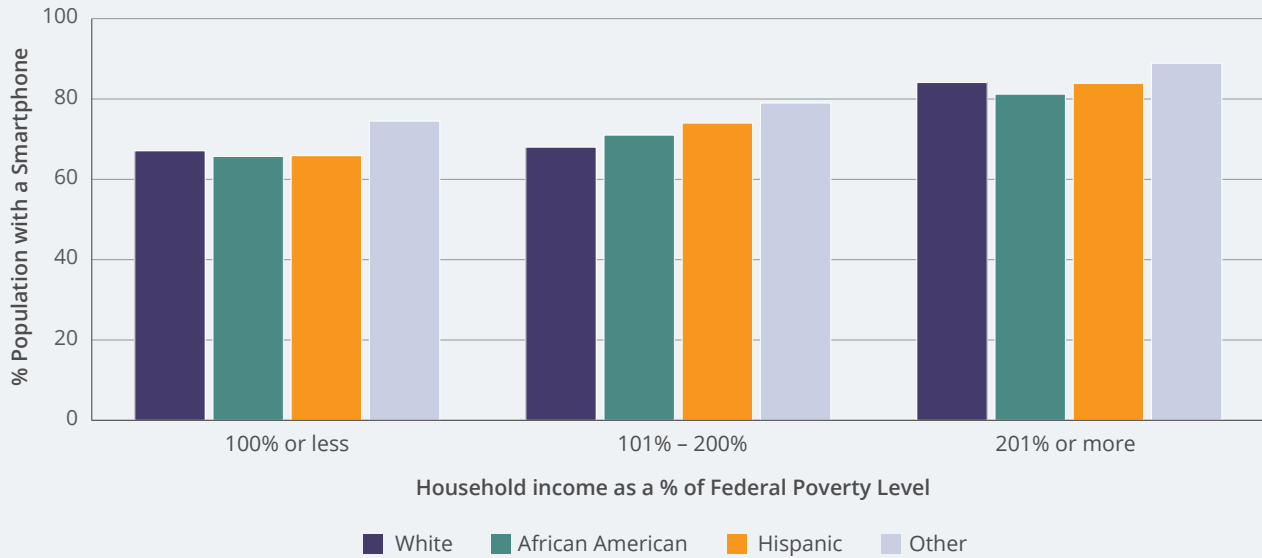
What do we mean by access?

For the purposes of this report, having access means availability of the requirements needed to reasonably use a smart mobility service. They include things like: smartphones, bank services, proximity, and reliability.

ACCESS TO SMARTPHONES FOR SMART MOBILITY APPS

Definition of access: Smartphone ownership rates

Smartphone ownership allows people to access information about mobility while traveling, and in the case of TNCs, reserve a ride. One may check when the next bus is due, see where bicycles are available nearby, book a car ride, or adjust travel plans in response to congestion, service disruption, or changing plans. Smartphone ownership is widespread but varies by income level, increasing with income, with relatively small difference in race ethnicity.

Table 3: Smartphone Ownership

Source: US Census American Community Survey

The analysis found that the majority of households across income and race cohorts had access to a smartphone, but that lower income households were 19–27 % less likely to own smartphones than higher income households. There is less disparity in smartphone ownership across race/ethnicity cohorts.
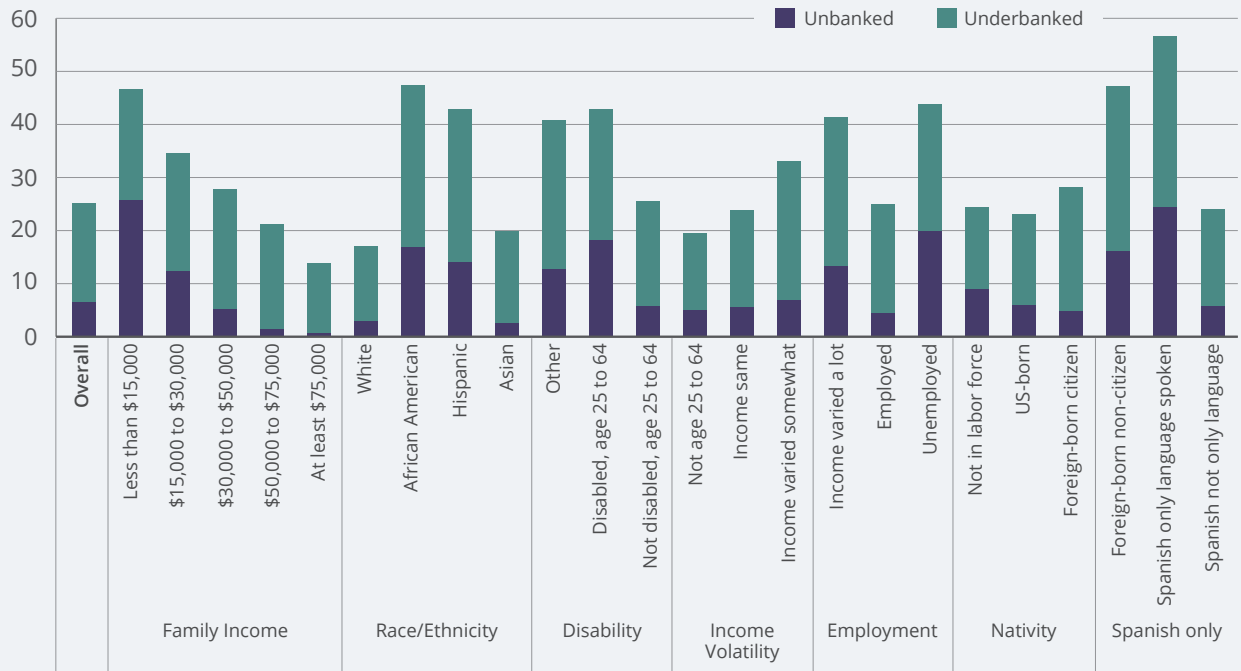
In addition, previous studies have found that low-income people and people of color are more likely to own smartphones than to have desktop computers and home Internet access.[1] Increased availability of transportation information optimized for mobile phones may increase access to this information for low-income people and people of color.

Factors other than race and income may affect smartphone ownership and use, including age, technological literacy, and access to a data plan and apps. Uber, Lyft,

and other transit agencies offer options to book trips and check schedules via webpages that are accessible from a mobile browser or a laptop or desktop computer. These platforms can help people who cannot download apps or who have a computer at home but not a smartphone. Uber and Lyft both have platforms that enable social service agencies, hospitals, and other businesses to request, pay for, and manage rides for their clients or customers. In addition, some third-party developers have designed services for seniors and others who do not have Internet access or are more comfortable booking a ride through a phone call. These services typically charge an additional fee on top of the ride fare. Public transit agencies and social service providers also operate dial-a-ride services, but these services are often restricted to those above a certain age, below a certain income, within a certain

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1   https://www.pewresearch.org/fact-tank/2017/08/31/smartphones-help-blacks-hispanics-bridge-some-but-not-all-digital-gaps-with-whites/

Table 4: Unbanked and underbanked U.S. population by various demographic categories, 2017

Source: Federal Deposit Insurance Corporation

geography, and/or traveling to specific destinations (like medical appointments). These rides also usually must be scheduled in advance.

ACCESS TO CREDIT CARDS

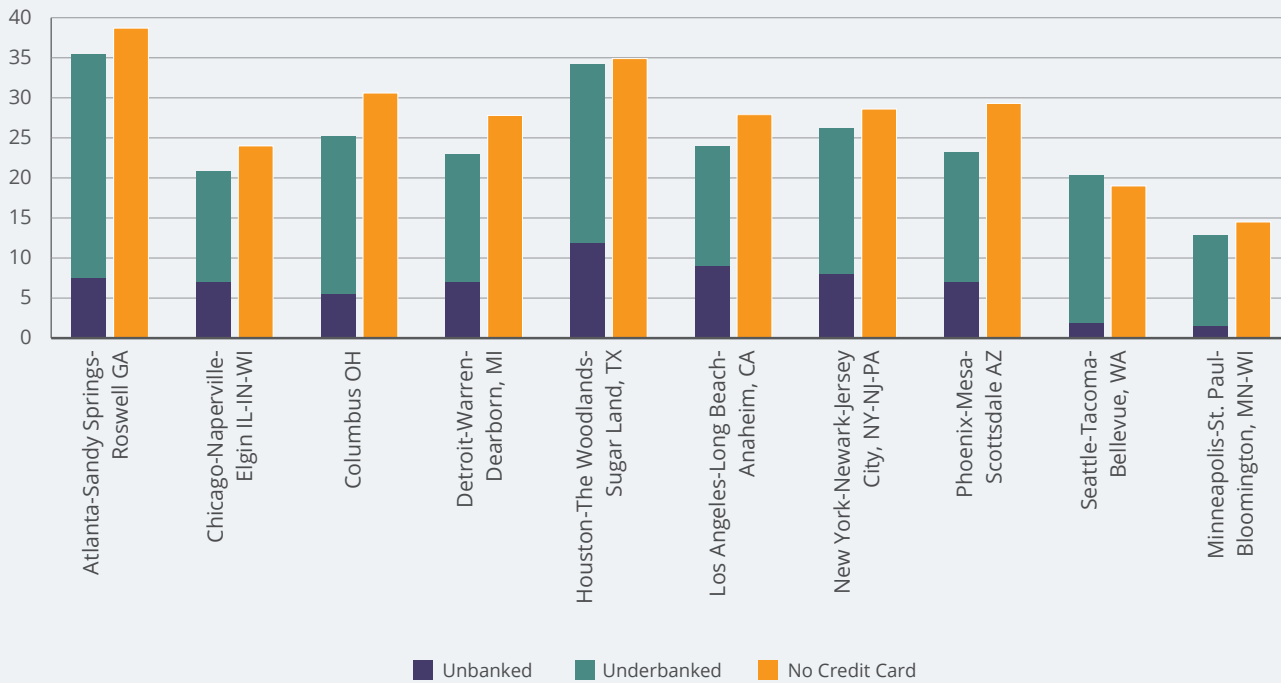## Definition of access: Unbanked and underbanked

Requirements for credit cards are a significant barrier to smart mobility access for low-income people and people of color. Many forms of smart mobility, including TNCs, bikeshare, and carshare systems, require users to pay for these services with a credit card, debit card, or mobile wallet. Public transit agencies are also increasingly enabling riders to pay fares by mobile wallet or link a credit or debit card to fare cards and transit payment apps. There are several reasons why these services run on cashless payment systems. Centralized cashless payment allows the companies to manage transactions remotely and allows users to book and pay for rides through one interface. In addition, an increasing share of Americans, particularly younger and higher-income people, prefer to make purchases with a credit or debit card, with a recent Pew survey finding that 41% of people making more than $75,000 per year make no purchases with cash in a typical week.[2]

However, access to credit cards, debit cards, and overall banking services

2   http://www.pewresearch.org/fact-tank/2018/12/12/more-americans-are-making-no-weekly-purchases-with-cash/

Table 5: Unbanked, Underbanked and no credit card households by MSA

Legend: ■ Unbanked ■ Underbanked ■ No Credit Card

Source: Federal Deposit Insurance Corporation

varies by race, income, ability, and other demographic factors. The Federal Deposit Insurance Corporation (FDIC) defines unbanked households as those where no one has a checking or savings account, and underbanked households as those that have an account at an insured institution but also obtained financial products or services outside of the banking system (such as payday loans or check cashing).[3]

UNBANKED households are those where no one has a checking or savings account, and UNDERBANKED households are those that have an account at an insured institution but also obtained financial products or services outside of the banking system.

Spanish-only speakers, African Americans and Hispanics, non-citizens, the unemployed, disabled, and people earning less than $15,000 per year are most likely to be unbanked or underbanked. **African Americans and Hispanics are 4.5 times as likely to be unbanked and two times as likely to be underbanked in comparison to Whites.** There is significant overlap among many of these categories, indicating that lack of access to financial institutions is concentrated in communities grappling with multiple forms of disadvantage. (See Table 5)

County-level, city-level, and disaggregate demographic data is not available on the unbanked and underbanked populations of the study cities. However, several of the MSAs, including Atlanta, Columbus, Houston, and New York, have higher than

3   FDIC National Survey of Unbanked and Underbanked Households, 2017 https://www.fdic.gov/householdsurvey/2017/2017report.pdf

the national average of unbanked and underbanked residents.
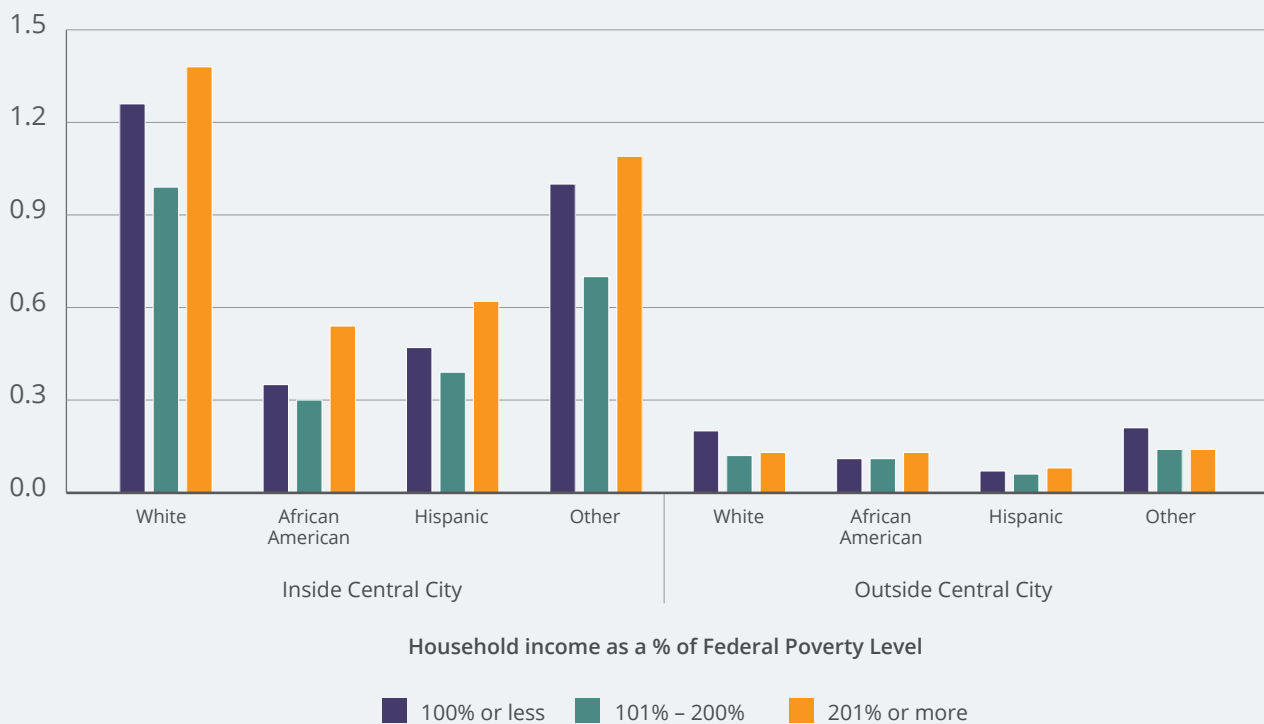
CARSHARE LOCATIONS INSIDE AND OUTSIDE CITY

Definition of access: Number of carshare locations within a half a mile per population of 10,000

In the 10-county study area, car sharing, an option for hourly car rental, is more widely available in the central cities, and whites of all income levels have far greater access than people of color. Whites have access to almost three times as many carshare locations within a half a mile as African Americans, and 2.5 times as many as Hispanics. Other people of color (Asians, two or more races, etc.)

have more access to carshare locations than African Americans or Hispanics, but with approximately 25% less access than whites.

In the areas outside the central city, access to carsharing is much lower for all groups, with Hispanics having the lowest access, roughly half the access of whites and African Americans. Whites living in poverty and other people of color have the highest access, though it is far lower than any group within the central city.

Table 6: Average carshare locations per 10,000 population

Household income as a % of Federal Poverty Level

■ 100% or less   ■ 101% – 200%   ■ 201% or more

Source: US Census American Community Survey and CNT's AllTransit

Table 7: Average Bike Share Locations per 10,000 population

Household income as a % of Federal Poverty Level

■ 100% or less ■ 101% – 200% ■ 201% or more

Source: US Census American Community Survey and CNT's AllTransit

BIKESHARE LOCATIONS INSIDE AND OUTSIDE CITY

Definition of access: Number of bikeshare locations within a half a mile per population of 10,000

Bikesharing is more widely available in the central cities, and whites of all income levels have far greater access than people of color. Whites have access to almost two times as many bikeshare locations within a half a mile as African Americans, and 3.5 times as many as Hispanics. Other people of color (Asians, two or more races, etc.) have more access to bikeshare locations than African Americans or Hispanics, with approximately 30% less access than whites.
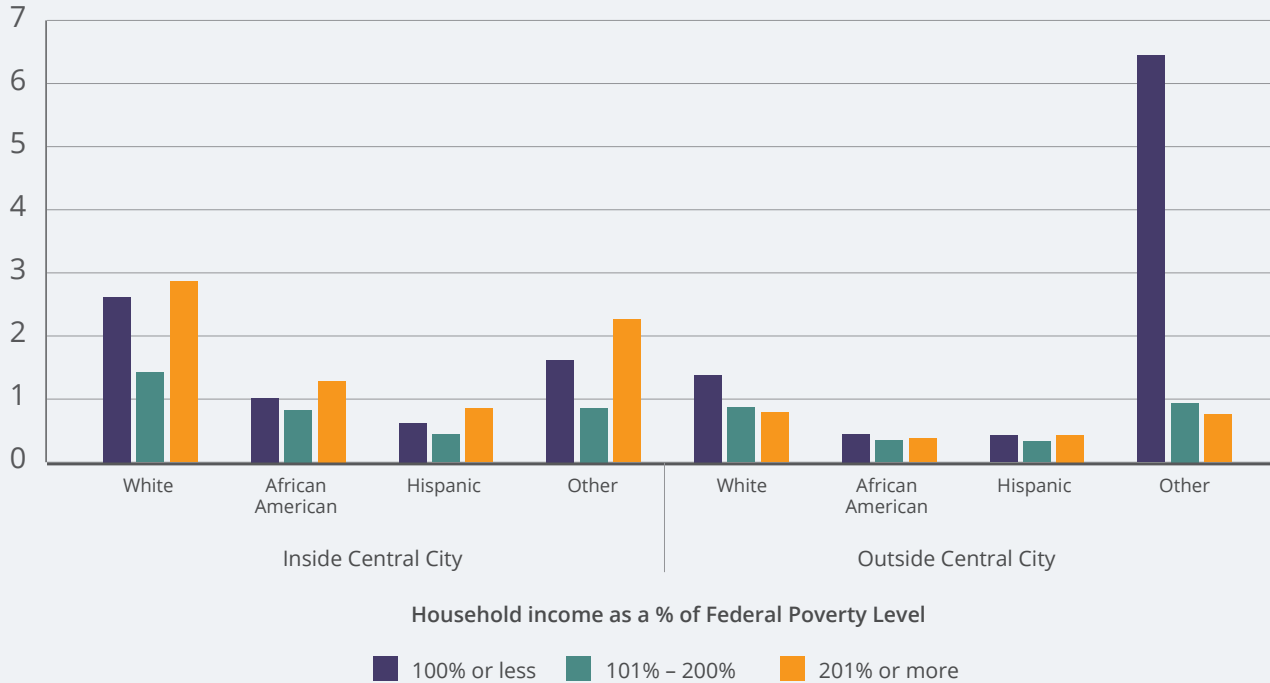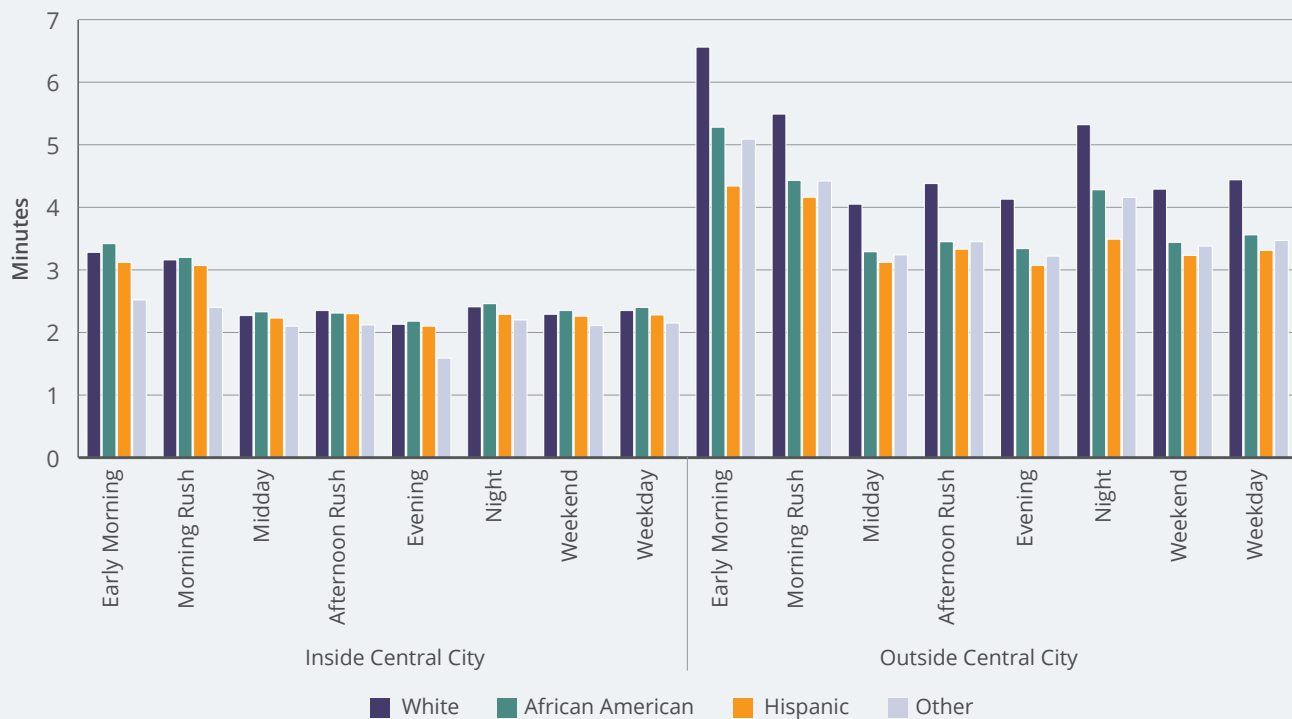
In the areas outside the central city, access to bikesharing is much lower for all groups, with African Americans and Hispanics having the lowest access, roughly one-third the access of whites. Other people of color living in poverty have the highest access of any group within or outside the central city, far surpassing the other groups with roughly 4.5 times the access of non-central city whites living in poverty, and more than 10 times that of African Americans and Hispanics living in poverty.

Table 8: Average TNC wait times by time of day and race

TRANSPORTATION NETWORK COMPANY (TNC) WAIT TIMES

Definition of access: Average wait time for a TNC at different times of day

In the central city, African Americans hailing TNCs from their homes have longer wait times than people of other races all times of the day, and the greatest disparity is in the early morning (22% longer) and morning rush (17% longer). Outside the central city, white residents on average have longer wait times when hailing TNCs from their homes.

TNC wait times are shorter inside the central city than outside the central city, and wait times are generally shortest from the middle of the day through the evening. These patterns vary substantially by region, however. In Chicago, wait times for African American residents are longer in both the city and the suburbs. In Detroit, the Hispanic population has longer wait times, except during the early morning and morning rush. In Phoenix, wait times are fairly even across race/ethnicity. In central city Seattle, the greatest disparity is at night. In Minneapolis, people of color who are not African American or Hispanic have the longest wait times (see Appendix).

Note that this analysis is based on TNC availability where people live, and is not a measure of wait times experienced by race. Nor can it offer insight into wait time differences by race for people hailing rides from locations other than near home. However, the findings provide

some indication of racial disparities in TNC availability, in that racial disparities in wait times are largest in the morning, when people are most likely to be trying to get a ride from their homes. There are studies showing some elements of discrimination based on perceived race of passenger, and anecdotal stories about drivers avoiding particular neighborhoods.[4]

4   Don MacKenzie, "Do ride-sourcing drivers discriminate against passengers?", University of Washington, 2016

EMPLOYABILITY

Transportation connections are essential for travel to jobs and economic opportunities. An analysis of journey-to-work data from the American Community Survey in the central city indicates that African Americans and Hispanics were more likely to depend on transit to get to work across all income levels. People living in poverty had similar rates of driving alone. The exception is other people of color, who have a lower rate of driving. As income increases, whites have a higher tendency to drive alone. Hispanics carpooled more often than other groups across all income groups. Whites bike to work twice as much as other groups, had a higher rate walking as well.

African Americans and Hispanics were more likely to depend on transit to get to work across all income levels.

JOURNEY TO WORK TRANSPORTATION MODE

Definition of employability: Mode of transportation for commute trips

Table 8: Transportation Mode to Work *(Inside Central City)*

WALKED

TRANSIT

Legend: White | African Americans | Hispanics | Other People of Color

Source: US Census American Community Survey

BIKED

WALKED

TRANSIT

■ White ■ African Americans ■ Hispanics ■ Other People of Color

Source: US Census American Community Survey

Table 9: Access to jobs requiring Associate degree or less

Source: U.S. Census Bureau Longitudinal Employer Household Dynamics and AllTransit

ACCESS TO JOBS REQUIRING AN ASSOCIATE DEGREE OR LESS – BY TRANSIT, BIKE/CARSHARE, TNCs

Definition of employability: Number of jobs accessible that require an associate degree or less

Access to jobs via a 30-minute transit trip was analyzed, and in particular, the types of jobs sought by low-income communities: those requiring an associate degree or less. Inside the central city, and across all income groups, African Americans had less access to jobs requiring an associate degree or less than whites or Hispanics. Other people of color had the most access to these jobs via transit, and Hispanics had more access than whites or African Americans. Outside the central city, African Americans have similar access as whites to these jobs via transit, and Hispanics and other people of color have similarly more access than whites or African Americans.

Access to jobs outside the 30-minute transit ride was also analyzed in a one-mile and five-mile buffer, showing similar results across race and income groups. These areas pose potential opportunity for increasing access by providing bikeshare in the one-mile buffer and using a TNC in the five-mile buffer.

LIVABILITY

Livable communities offer a variety of housing and transportation choices, along with thriving commercial amenities that facilitate equitable and sustainable travel for daily activities.[5] Compact communities close to jobs and amenities with ample transportation choices also contribute to affordability, allowing households to reduce their reliance on costly and polluting automobiles.

Smart mobility options can promote livability through better health outcomes associated with active transportation modes, especially in dense urban areas. The system efficiency resulting from reduced single occupancy vehicle usage has the potential to reduce air pollution and its negative health impacts.

Local weather conditions also influence travel behaviors – lack of bus stop shelters in a hot environment can dissuade public transit riders and pose a health risk. Likewise, bikesharing might not be consistently feasible in colder temperatures.

Smart mobility and its increased transportation choices has created undesirable outcomes as well. Investments in transportation amenities have driven displacement of low-income people and people of color, as evidenced after the opening of the 606 trail in Chicago.[6]

5   US DOT Strategic Plan for FY2010-2015
6   Geoff Smith, Sarah Duda, Jin Man Lee, and Michael Thompson: "Measuring the Impact of The 606", Institute of Housing Studies at DePaul University

Table 10: Regardless of income, households of color spend more of their income on transportation costs

Source: Housing and Transportation Affordability Index

PEOPLE OF COLOR SPEND MORE OF THEIR INCOME ON TRANSPORTATION COSTS

Definition of livability: Transportation cost as a percent of income

Transportation costs are the second largest expense for a household, after housing. The Housing and Transportation (H+T®) Affordability Index was used to calculate household transportation costs at the Census block group level, including auto ownership, auto use, and transit use as percent of a household's income.

On average, households of color across the study area spend a higher percent of their income for transportation when compared to white households. This trend of higher spending holds true both within the central city and in the suburbs.

It is widely accepted that housing costs greater than 30 percent of household income cause a financial burden. The H+T® Index recommends that transportation costs not exceed 15% of income, as that goal is readily achievable in compact communities close to jobs and amenities with ample transportation options. Several communities across the U.S. have adopted planning goals to reduce or limit household transportation costs including Chicago, IL[7] and Madison, WI.[8]

7   The Chicago Metropolitan Agency for Planning (CMAP) used 15% transportation costs as a livability measure in its GO TO 2040 comprehensive regional plan.
8   Madison Area Transportation Planning Board – The 2016 Performance Measures Report evaluates neighborhoods by setting a 45% housing and transportation affordability goal. http://www.madisonareampo.org/planning/documents/Performance_Measures_Report.pdf

Table 10 on the previous page demonstrates the increased transportation cost burden for lower-income residents of all races, with people of color facing a higher magnitude of financial strain. Across income levels, in the central cities, African American residents pay 24–26% more and Hispanics pay 21–27% more of their income for transportation costs than whites.

LOWER CONNECTIVITY IS ASSOCIATED WITH POOR HEALTH OUTCOMES

Definition of livability: Health implications of access to transportation

Residents who lack transportation connections to employment within a reasonable time are often forced to own cars, requiring them to spend large amounts of time driving, which can reduce physical activity. In a recent study, transit riders reported more walking trips in a day when compared to non-transit users. This behavior is similarly witnessed across income cohorts[9] and higher physical activity is known to aid better health outcomes.

A 2007 study in New York City found that using active transportation modes was inversely proportional to obesity rates, and Body Mass Indices (BMIs) decreased with higher subway and bus stop density, among other build environment factors.[10] Another study analyzing county-level data found that an increase of public transit usage by 1% is associated with a 0.47%-point decrease in obesity rates.[11]

Often in urban areas, people living in food deserts[12] are lower-income residents of color. Lack of transportation access to healthy foods, especially fresh produce also negatively influences health.

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9   Ugo Lachapelle and Lawrence D. Frank (2008): "Mode of Transport, Employer-Sponsored Public Transit Pass, And Physical Activity", Journal of Public Health Policy

10   Andrew Rundle, Ana V. Diez Roux, Lance M. Freeman, Douglas Miller, Kathryn M. Neckerman and Christopher C. Weiss (2007): "The Urban Built Environment and Obesity In New York City: A Multilevel Analysis," American Journal of Health Promotion, Vol. 21, pp. 326-334;

11   Zhaowei She, Douglas M. King, Sheldon H. Jacobson (2019): "Is promoting public transit an effective intervention for obesity? A longitudinal study of the relation between public transit usage and obesity", Transportation Research Part A

12   Food deserts are defined as parts of the country vapid of fresh fruit, vegetables, and other healthful whole foods, usually found in impoverished areas. This is largely due to a lack of grocery stores, farmers' markets, and healthy food providers. American Nutrition Association.

Table 11: Average Temperatures by Month

Legend:
- St Paul/Minneapolis
- Chicago
- Detroit
- Columbus
- New York City
- Seattle
- Atlanta
- Los Angeles
- Phoenix
- Houston

Source: NOAA

ADVERSE WEATHER CONDITIONS INFLUENCE TRANSPORTATION CHOICE

Definition of livability: Role of weather conditions on transportation mode choice

Weather conditions heavily influence travel behavior, in particular non-auto travel. Extreme temperatures, precipitation, and adverse weather cause fluctuations in shared mobility usage in places with inclement weather conditions. Average monthly temperature data from the National Oceanic and Atmospheric Administration in each of the ten study areas is displayed above in Table 11.

The effects of weather on transit ridership has been studied in Pierce County, Washington[13] and researchers found that cold temperatures, rain, and snow negatively affected transit ridership. Lower-income people of color are financially constrained and cannot make choices based on comfort. It is imperative to provide adequate amenities at transit stops such as shelters, heating, and shade.

Walking and biking in extreme temperatures is not a reasonable form of commute. TNCs that employ surge pricing, or varying pricing in response to demand, often do so during poor weather, making already expensive rides even more financially challenging for low-income people.

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13   https://www.nctr.usf.edu/wp-content/uploads/2012/04/JPT15.1Stover.pdf

Air Quality

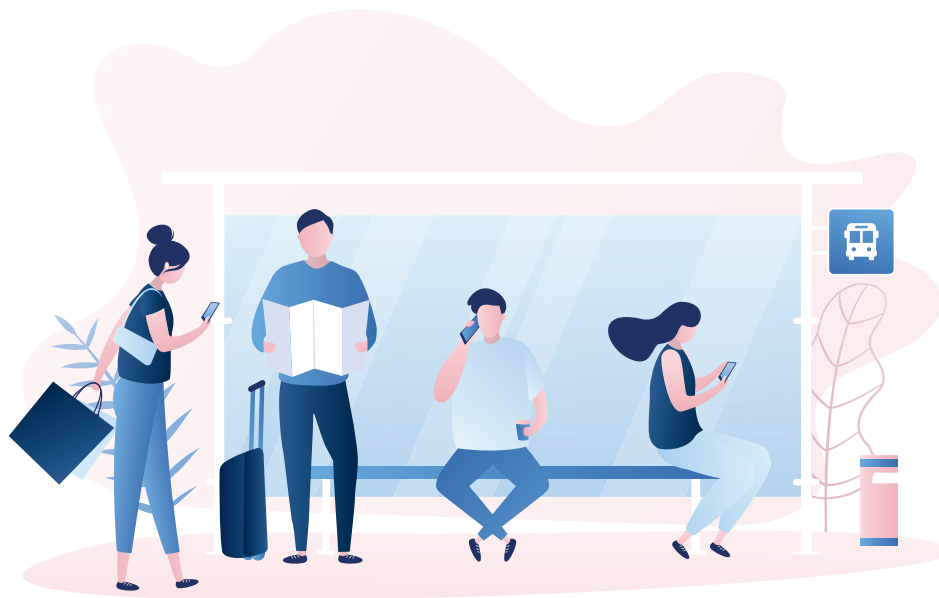### Definition of livability: Air quality

While it is perceived that air quality affects the entire city similarly, the effects of micro-environment on air quality is enormous. Studies have shown that people of color and lower-income populations are disproportionately exposed to air pollution. In a recent study, data showed that African Americans and Hispanics experienced 37% higher exposures to particulate matter than whites.[14]

As the goods and services industry is changing and more e-retail purchases are being made, truck mileage in lower-income neighborhoods where distribution centers are more likely to be located is increasing. There is a growing need for cities to employ policies that reduce such pollution in transportation and operations.

Transit Stop Quality

Definition of livability: Quality of transit stops

Several factors influence travel mode choice, but stop amenities (lights, benches, shelters) and safety play a big role. Only a handful of agencies share information on quality of stops and the lack of data makes it difficult to study who is being affected. However, our interviews indicated that in some places, extreme weather and traffic safety issues inhibit the use of transit and bikes.

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14   Ihab Mikati, Adam F. Benson, Thomas J. Luben, Jason D. Sacks, and Jennifer Richmond-Bryant, 2018:
Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status. American Journal of
Public Health 108, 480_485, https://doi.org/10.2105/AJPH.2017.304297

MOBILITY

A well-connected transportation network provides access to vital amenities and frequent service. Service hours also impact equity, since many workers need transportation choices for non-traditional shift times.

QUALITY OF TRANSIT

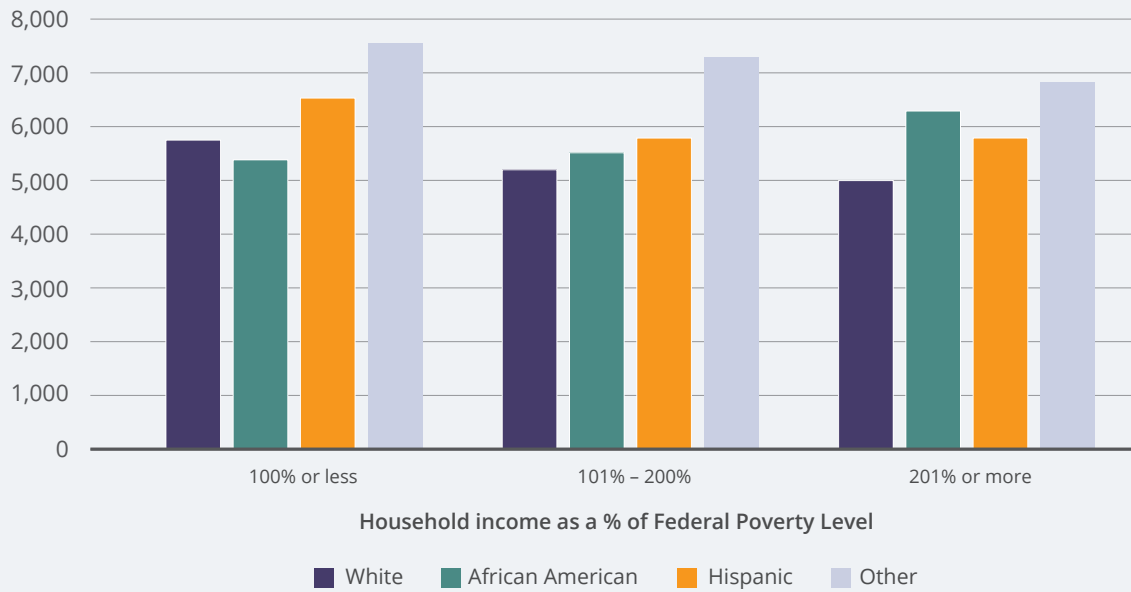**Definition of mobility: Total number of transit trips available per week and number of high-frequency routes available**

The number of transit trips available per week is a measure of how often a transit route serves people. In Table 12, African Americans living below poverty are more likely to have fewer transit trips available to them, on average, across the study area. Hispanics and other people of color across all income ranges have more trips available per week.

Researchers at the Mineta Transportation Institute found that the strongest determinant of bus ridership was quality of service.[15] Frequency of routes is another indicator of transit quality. A transit route is considered to be frequent if it provides service every 15 minutes or less. Table 13 shows that, on average, across the ten areas, white residents living in poverty have access to more routes than people of color, and have access to 9% more high-frequency routes during the rush hour than African-American residents living in poverty. Hispanics and

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15   Bhuiyan Alam, Hilary Nixon, Qiong Zhang. Investigating the determining factors for transit travel demand by bus mode in US metropolitan statistical areas. Mineta Transportation Institute, 2015. https://transweb.sjsu.edu/sites/default/files/1101-transit-bus-demand-factors-in-US-metro-areas.pdf

Table 12: Transit trips per week

Household income as a % of Federal Poverty Level

■ White   ■ African American   ■ Hispanic   ■ Other
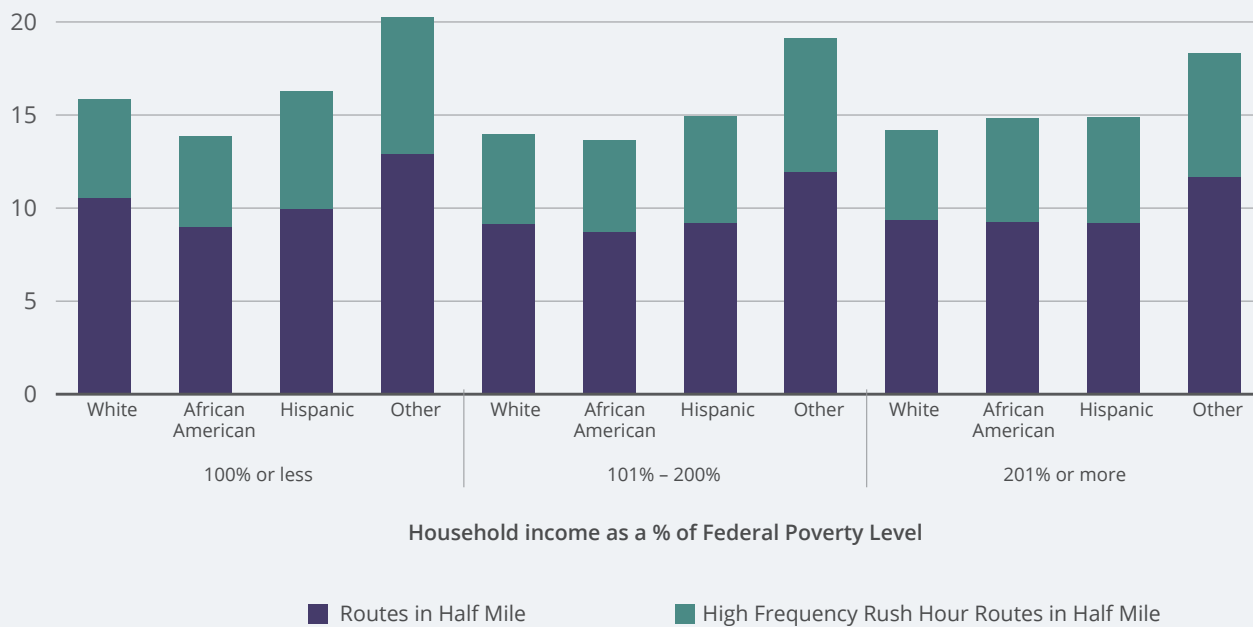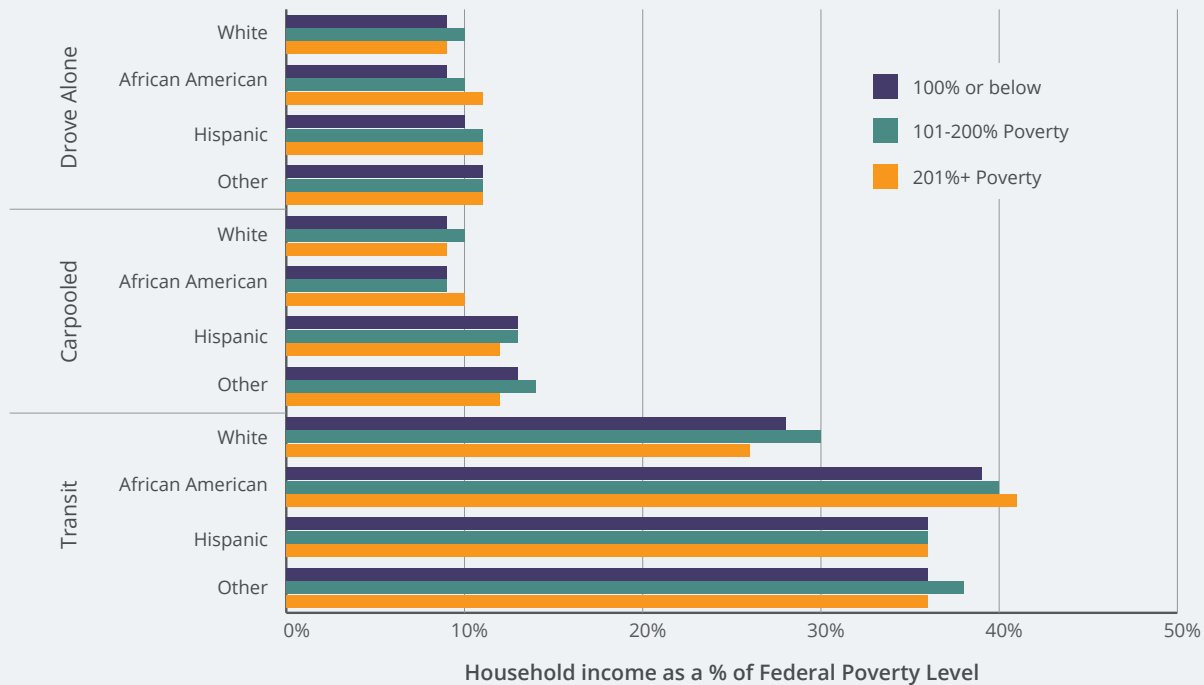
Source: AllTransit™

other people of color have access to more high frequency routes when compared to the other two groups.

Table 13: Total routes and high frequency routes available

Household income as a % of Federal Poverty Level

■ Routes in Half Mile   ■ High Frequency Rush Hour Routes in Half Mile

Source: AllTransit™

Table 14: Percent workers with 60 minutes or longer commute time

Source: US Census American Community Survey

TRAVEL TIME FOR WORK TRIPS

Definition of mobility: Percent of workers with 60 minutes or longer commute time, by mode

In 2017, the average time to get to work was 26.4 minutes nationally.[16] Several studies have suggested that a reasonable time to get to work is 30 minutes. Many Americans spend more time on their daily commute due to reasons such as distances to work, lack of direct transit routes, and congestion. The data below shows the percent of people across different races and incomes who experience more than twice the national average commute time.

On average, across the study area, people who spend longer than 60 minutes while commuting by car are equally distributed across all races and income, indicating that longer commutes are likely influenced by built environment characteristics.

Hispanics carpool more than other races, and 36% of them commute longer than 60 minutes and are equally distributed in all three income brackets.

Transit trips tend to take longer than auto trips, especially for people of color who are likely to live in areas with lower access to quality transit. Forty percent of African Americans living in poverty, and 38% of Hispanic transit riders living in poverty spend more than an hour getting to their workplaces. This trend of longer commutes among transit users of color is also seen across income – people of color using public transit are more likely than white transit users to have longer commute times.

16   US Census Quickfacts, 2017
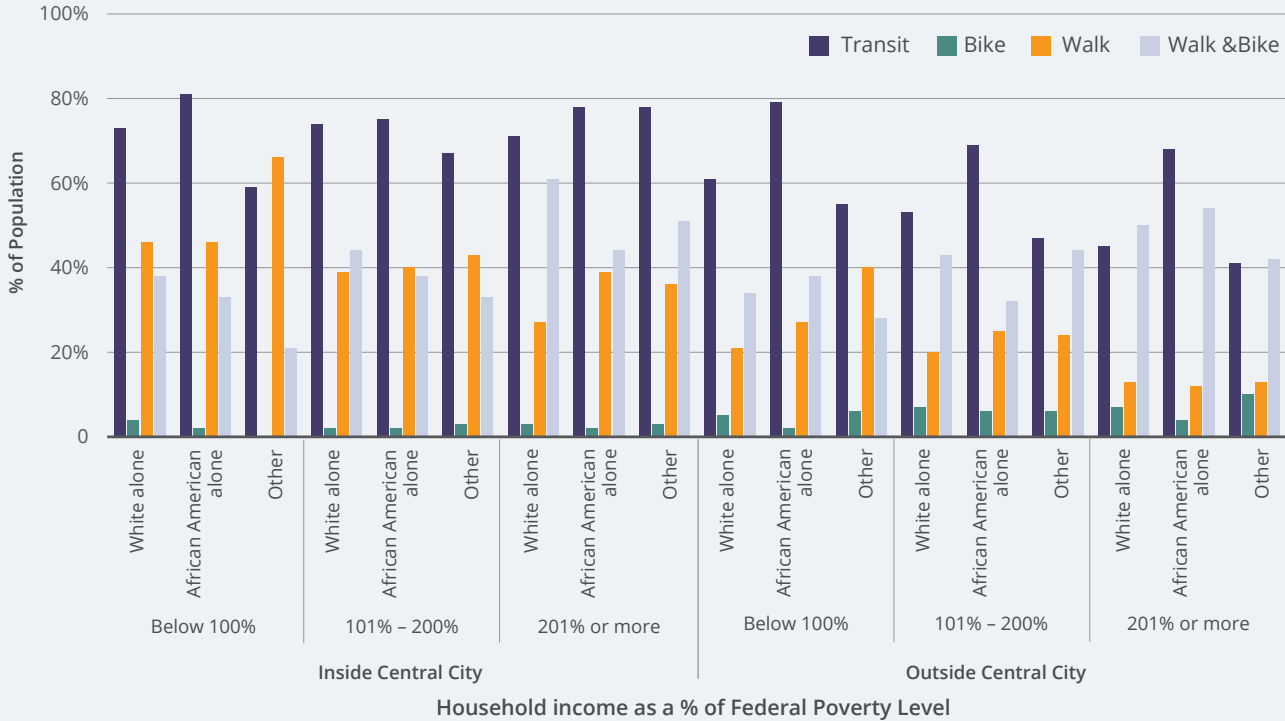
ACCESS TO KEY DESTINATIONS

Definition of mobility: Percent population with access to grocery stores, healthcare services, and personal banking services

A successful transportation system links people to the amenities for their daily needs – food, healthcare, and schools. The American Household Survey collects data on access to certain amenities by public transportation. The data is collected by race only and does not distinguish ethnicity, so a Hispanic person, depending on their ethnicity, might get recorded as white, African American, or other.

The data below records responses of people in six of the 10 metro regions (Chicago, Detroit, Houston, New York, Seattle, and St Paul/Minneapolis) for access to a grocery store, healthcare services, and personal banking facilities by public transit, biking, and walking.

One in four African-American people living below poverty cannot reach a grocery store by public transit, and the number is even lower for walking and biking. Previous studies have shown that many poor, segregated, and neighborhoods of color are food deserts with no access to stores selling fresh produce,[17] leaving residents to rely on neighborhood convenience stores for their food needs. Other people of color also have lower

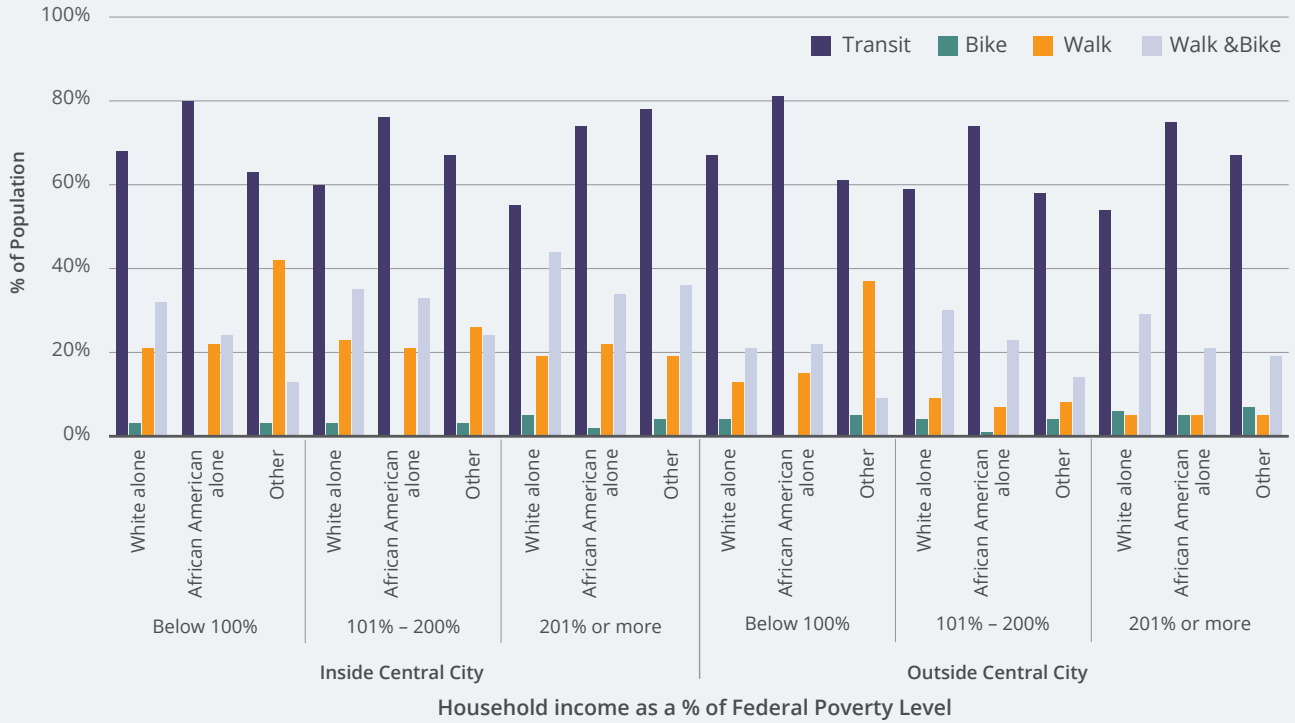**Table 15:** Access to grocery stores

Source: US Census Bureau American Household Survey

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17   Bower, Kelly M et al. "The intersection of neighborhood racial segregation, poverty, and urbanicity and its impact on food store availability in the United States." Preventive medicine vol. 58 (2014): 33-9. doi:10.1016/j.ypmed.2013.10.010. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3970577/

Table 16: Access to healthcare services

Legend: Transit | Bike | Walk | Walk &Bike

Y-axis: % of Population (0% to 100%)

Inside Central City / **Outside Central City**

X-axis categories: White alone, African American alone, Other — grouped under Below 100%, 101% – 200%, 201% or more

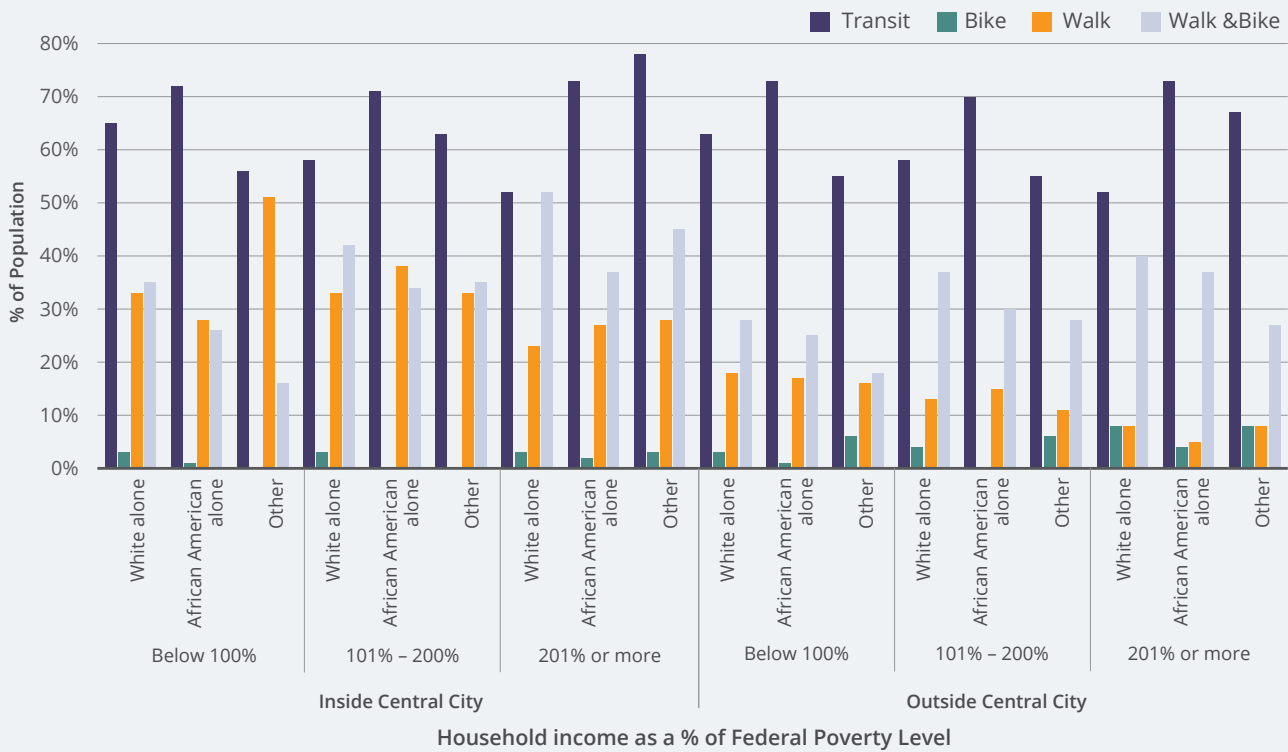Household income as a % of Federal Poverty Level

Source: US Census Bureau American Household Survey

than average access to grocery stores, across all modes and incomes.

More African Americans across all incomes have access to healthcare services in the central city via transit when compared to whites and other people of color. This is also true for African Americans living outside the central city which might be explained by their desire to live closer to transit due to lower auto ownership. Access to healthcare services by walking and biking has the reverse relationship. White residents are more likely to have access to these services than African Americans. The built environment characteristics of the neighborhoods and amenities available within them might explain the lower access to African Americans.

One in four African Americans living in poverty and residing in central cities do not have access to a personal banking facility by transit (see Accessibility section above). In comparison, 35% of white residents cannot access personal banking facilities by transit. But access by active modes (walking and biking) is available to more white residents than African-American residents (9% points more). This trend of African Americans having more access by transit and lesser access by active modes holds across income levels and locations, likely revealing the higher availability of daily need amenities in more affluent and white neighborhoods.

Table 17: Access to personal banking services

% of Population

Legend: Transit · Bike · Walk · Walk &Bike

Categories (repeated): White alone · African American alone · Other

Household income groups: Below 100% · 101% – 200% · 201% or more

Regions: Inside Central City · Outside Central City

Household income as a % of Federal Poverty Level

Source: US Census Bureau American Household Survey

BIKE INFRASTRUCTURE

Bike lanes are an important safety component of the transportation network to provide safe connections to destinations. Bike infrastructure data are not shared in a uniform manner for analysis, and hence measuring their quality can be challenging, and requires more resources for localized studies.

PERFORMANCE MEASURES AND DATA GAPS

Interviews with community and transportation advocates, transportation professionals, and industry leaders revealed broad support for the development of performance metrics to measure equity in smart mobility, though the types of measures desired varied. The most emphasis was placed on access to jobs and other key destinations, affordability, quality of service, and funds invested versus results realized.

PolicyLink reports that they are working to develop performance measures focused on transportation for everyone, not just technical improvements. Some initial measures include percent decrease of transportation costs for people with disabilities and people of color, decrease

in travel time, access to vital destinations, and increase in affordable housing where transportation options are plentiful.

NRDC observed that the measurements often used to select transit projects do not reflect the real goals of the transportation system and the desired outcomes, for example, how well they connect people to jobs and services. There is a need to allocate dollars based on the policy goal of creating better access to jobs and services. When the transportation system is viewed in this frame, projects in areas that are underserved rise to the top.

A local community advocate in Phoenix noted that low-income communities of color do not have the same access to quality transportation in comparison

to higher-income communities; these comparisons can serve as performance measures.

Some public leaders in the field of equity and smart mobility include LA Metro, currently opening an Office of Race & Equity and considering indicators related to equity, and the City of Seattle Department of Transportation with a race & social justice initiative centered around equity.

Obtaining the data to assess current equity issues and track performance of smart mobility systems and initiatives poses additional challenges. One transportation advocate suggested "lots of places use outdated measures (level of service and congestion)." Access to the information and technical skills to conduct more detailed analysis is its own equity issue- "details to measure access aren't cheap, so communities may not be able to afford it, and meanwhile congestion data are free."

There are great inequities between the public and private sector and between cities themselves in relation to new mobility data – some have data, others do not, some have data that are not useful, and some cannot analyze what they have.

Private transportation providers such as Uber and Lyft, as well as car sharing companies, have resisted sharing data about their services and customers that are crucial to understanding equity issues. Since most cities regulate these services to some extent, as well as provide some public amenities (parking, for instance) they are in a position to negotiate the provision of these data. Some cities have taken advantage of this position – in

April 2019 the City of Chicago released a large set of TNC data to the public. Other cities are ramping up their data negotiation efforts with private smart mobility providers, however, results from negotiations may take some time as current agreements must expire before new data-sharing provisions go into effect.

Data on the quality of services have also been difficult to obtain but are currently being sought by public and private entities. The National Transit Database now requires agencies to report the quality of stops (shelters, arrival reporting, etc.), but those data will not be available until 2020.

Finally, several interviewees noted the importance and lack of qualitative data and customized local data collection. Focus groups, surveys, and interviews are needed to investigate experiences not captured in data. For instance, anecdotal information reported in interviews suggested that some TNC drivers turn off their apps in neighborhoods where they perceive a safety risk so they did not have to pick up passengers. One interviewee reported that crime, heavy traffic, and extreme heat inhibited transit and bike use. As quantitative data sources become more available, they need to be supplemented with the qualitative data needed to fully investigate equity issues.

CONCLUSION

We are at the beginning of a major inflection point for how goods, services, and people move in neighborhoods, cities, and beyond. Thus far, transportation sector disruption has been seen as largely beneficial. For the majority of the population it has never been more convenient to get where they are going, and we have barely scratched the surface; advancements like self-driving cars, vehicle sharing, and electric vehicles hold tremendous promise in terms of not only convenience and cost savings, but environmental sustainability.

However, as this report demonstrates, without directly considering and addressing equity, these largely beneficial disruptions will perpetuate and exacerbate existing economic and social inequities driven in the United States by systemic racism.

Addressing equity in smart mobility means we must:

- Invest in the most underserved communities.

- Involve people who have been systematically excluded from the transportation planning process.

- Prioritize projects that serve those most vulnerable.

Several notable programs representing regional and city transit authorities, nonprofits, private companies, or public-private partnerships between the three, are models for making equity a core value that is incorporated into every aspect of the planning and implementation process. In Appendix II, we have outlined several initiatives that serve as model programs to address inequities in smart mobility service delivery and planning.

ANNEX 1 — PROMISING LOCAL POLICIES IN ACTION

Many local policies influence the equitable distribution of affordable housing near transit and smart mobility options, which in turn impacts access to employment and amenities. The following selection of policies highlights some innovative approaches to this issue.

Affordable Housing Near Mobility Choices

Los Angeles

LA Metro, Los Angeles County's transit agency, earmarked $9 million to encourage affordable housing in station areas. Authorized in 2016, the public-private partnership program, [Metro Affordable Transit Connected Housing (Metro MATCH) Loan Program](), provides loans to developers for acquisition and pre-development financing of rental housing in the half-mile radius around high-frequency transit nodes to preserve affordable housing and to boost ridership. It was launched with another program that provides $1 million for small business loans to owners of vacant ground floor retail property adjacent to transit to create new tenant spaces and below market rentals.

 The two programs are intended to support the Metro's 2015 affordable housing policy that:

• Set an objective that 35% Metro's housing portfolio will be affordable.

• Defines affordable housing as covenant controlled and for residents earning 60% or less of area median income (AMI).

• Allows a discount of land value up to 30% of fair market value, proportional to the quantity of affordable units to be created.

The $9 million investment is expected to leverage approximately $75 million from foundations, community development finance institutions (CDFIs), and traditional banks with 25% of funds providing pre-development loans to develop 800 new affordable housing units, and 75% of funds providing a Housing+Transportation Loan for preservation and expansion of 1500-2250 units.

Minneapolis — St. Paul

The City of Minneapolis has been a leader in the adoption of innovative strategies to reduce barriers in creating affordable housing. In 2015, the city passed an ordinance allowing accessory dwelling units (ADUs) on single and two-family lots in all neighborhoods within a half mile of the Green Line LRT along a 1-mile corridor on St. Paul's western end. The ADUs were intended to increase density in transit-adjacent neighborhoods and to increase ridership on the Green Line, and in the four years since passage, 92 permits have been issued by the city.

Minneapolis also reduced parking requirements for residential properties near high-frequency transit. Properties with 50 units or lower, within a quarter mile of transit, are no longer required to provide off-street parking. Buildings with 50 or more units are required to provide 0.5 parking spaces per unit, decreasing costs to developers and ideally

households. Since the requirements decreased in 2015, there has been an uptick in apartment buildings built near transit outside the downtown area.[18]

Seattle

Sound Transit works with community partners to create affordable housing on the agency's surplus properties, as required by a 2016 Washington State statute that also authorized the agency to levy taxes to fund its light rail project. In 2018, Sound Transit adopted its 80-80-80 policy, which requires that the agency make 80% of surplus property available for affordable housing projects making at least 80% of units affordable to people earning less than 80% of AMI. Currently, the three projects underway are geared towards seniors, households, and families making between 30% to 60%[19] of the AMI near light rail stations in Seattle.

Payment options

Chicago and Evanston: Divvy for Everyone and Dockless bicycle pilot

The Chicago Department of Transportation partnered with the JPB Foundation-funded Better Bike Share Partnership to introduce an equity program designed to increase access to the city's bikeshare system. Through the partnership, Chicago's Divvy bikeshare system now offers reduced-cost annual memberships to residents via its Divvy for Everyone initiative, which launched in 2015. Low-income residents of Chicago and Evanston without access to a credit or debit card qualify for $5

Divvy memberships versus the $75 fee. Participants can enroll in-person at registration sites throughout the two cities using a state-issued ID and a one-time cash payment. The program also provides a cash payment option for any usage fees incurred at participating 7-Eleven, CVS, and Family Dollar stores.

Others

Boston

The Massachusetts Department of Transportation and the Massachusetts Bay Transportation Authority (MBTA) began a one-year pilot program with Uber and Lyft to subsidize half the supply cost for the two TNCs to consistently have wheelchair-accessible vehicles (WAVs) available.[20] The new initiative was developed in response to feedback that WAVs are not widely owned by TNC drivers due to high costs.

Institute for Transportation and Development Policy

The report, Connecting Low-Income People to Opportunities with Shared Mobility, commissioned by Living Cities, found that different shared mobility types address different trip needs (e.g. trip to the doctor vs. errands); shared mobility works best as a complement to local mass transit; and low-income communities are not participating in shared mobility for complex reasons. Subsidies without community outreach saw little low-income participation; core strategies to improve shared mobility access are similar across shared mobility system types.

18   Nick Magrino, What Happens When You Ease Parking Requirements for New Housing, 2018.
19   https://www.soundtransit.org/get-to-know-us/news-events/news-releases/board-adopts-policy-promoting-equitable-development-near
20   https://www.mbta.com/news/2019-04-01/massdot-and-the-mbta-partner-transportation-network-companies-support-more

These include targeted siting, logistical fixes, lower costs, improved access, and outreach programs.

Current Equitable and Smart Mobility Partnerships and Programs Addressing Disparities

Austin: Ride Austin

This nonprofit rideshare organization started in 2016 when Uber and Lyft pulled out of Austin after the city passed an ordinance requiring the companies to conduct fingerprint background checks of drivers. As a nonprofit, Ride Austin has been more transparent about its financial model and ridership than the private companies, and published a blog about the company's lessons learned that provides a useful window into the TNC industry. Recently, Ride Austin partnered with the regional transit agency, Cap Metro, to create a microtransit zone after the agency's system redesign left the Austin suburb city of Manor without access to transit. In the partnership, Ride Austin provides door-to-door service within the microtransit zone for $1.25 – the cost of a bus ticket. The service also allows riders to use prepaid Cap Metro passes.

St. Petersburg: Pinellas Suncoast TNC/Taxi last mile and late-night partnership

After voters in Florida's Pinellas County rejected a 2014 proposed one-cent sales tax increase to support bus and light rail service, the transit agency was forced to cut services. In 2016, Pinellas Suncoast Transit Authority became the first transit agency in the country to directly subsidize Uber trips in places where they had cut fixed route bus service. In the initial six-month pilot, PSTA paid half the cost of an Uber or taxi ride, up to $3, that began or ended in a bus stop within the communities of Pinellas Park and East Lake (previously served by a bus route that averaged 26 riders per weekday). The pilot was eventually expanded county-wide as the DirectConnect program, which provides discounted rides to or from one of 24 locations (wheelchair transport users receive a $25 discount). They have also implemented a TD Late Shift program, designed for low-income residents who do not have a ride, to "life-sustaining trips: medical, grocery, work, job-related training/education and other vital services." Users can get both a monthly bus pass and 25 free on-demand trips per month to/from work when bus service is not available (between 10 p.m. and 6 a.m. any day of the week) for $20.

Phoenix

Arizona piloted a program with Uber to provide recently incarcerated individuals with rides to verified employment events, such as job interviews and first day of employment. "Uber for Jobs" began in Maricopa County with graduates of the Arizona Department of Corrections Employment Center in November 2017.[21]

Columbus

The City was recipient of $40 million federal Smart City grant to invest in a wide range of technology research/investment. In 2019, some of the funds will be used for a pilot to study how improved nonemergency transportation

21 https://azgovernor.gov/governor/news/2017/11/arizona-partners-uber-second-chance-rides-program

options could address Franklin County's high infant mortality rate (8.6 deaths per 1,000 live births) through improved transportation options.[22] In Columbus, non-Hispanic African-American infants are almost three times more likely to die than non-Hispanic white infants (14.8 versus 4.9 per 1,000 in 2017), and this transportation project is looking to increase access to prenatal care.

ANNEX 2 — WHAT ARE ORGANIZATIONS DOING?

East Oakland Shared Mobility Equity

This partnership was funded by a $1M grant from Lyft to engage TransForm, a leading Bay Area transportation and equity advocate, to lead a community participatory planning process, hire East Oakland community residents to lead community design for a bikeshare and place-making program, develop a free community bike lending program, and deliver a discounted ride program on AC Transit and Lyft.[23]

Los Angeles Shared Use Mobility Action Plan

The first goal in LA County's ambitious plan is to embed equity outcomes in the plan and its implementation. Objectives prioritized in the plan are to accept cash payments, provide a pathway for

employment, crowd-source location priorities, incent TNCs to operate in underserved communities, increase outreach capacity, and employ multi-lingual staff.[24]

GO Pass Cincinnati Red Bike

Red Bike in Cincinnati is squarely focused on equity. Riders below 200% median income may purchase a discounted GO Pass for $5 per month either online or at a local partner organization's location with cash or a credit card. Red Bike also partnered with a local food market to address the issue of food deserts. Riders visiting the Findlay Market receive a free GO Pass that may be renewed at the market every month. Red Bike also found benefits to having flexible policies that avoid putting passholders into debt. Instead of charging a fee for membership rentals that are returned late, Red Bike found it best to suspend the pass, so a user is not be able to rent another bike without first coming to the Red Bike location. Once at the location, a rider can explain in-person the reason for extending use beyond the 90-minute rental limit and why the card should be reinstated, and employees can use the time to re-explain the rules to the rider.[25]

Lyft is partnering with several organizations to address equity and community needs. This includes a partnership with the American Cancer Society where they book and pay for regular chemotherapy visits, and with the Down Syndrome Society to help in their efforts to provide a journey to work.[26] In

22   https://www.dispatch.com/business/20190111/prenatal-trip-assistance-pilot-will-launch-this-year
23   http://www.transformca.org/landing-page/transportation-equity-east-oakland
24   https://www.nrdc.org/sites/default/files/los-angeles-shared-mobility-climate-equity-report.pdf
25   https://www.cincyredbike.org/gopass
26   https://www.ndss.org/lyft-national-syndrome-society-partner-together-remove-transportation-barriers-able-accounts/

Los Angeles, they are addressing first- and last-mile issues to subsidize rides for people at certain "end of the line" stations, with in a defined "Geo Fence" to get the final distance via a Lyft. Lyft is looking at ways to address three issues in particular – payment options that do not require a credit card, wheel chair accessible vehicles (they are providing such vehicles in some markets), and a concierge service for people without a smart phone.

Smart Columbus is working on a multi-modal app with a common payment system to "load cash" that allows thin credit members to participate in the shared transportation economy, including bikes, cars, and scooters. They are also acting as a non-emergency medical/health transportation broker with Uber/Lyft to get low-income and women of color to their prenatal appointments.

Pittsburgh and Detroit "Mobility" program

This program incentivizes a system built around low-income communities and tests smart mobility pilots with people of color. The program partnered a car sharing service with a trusted neighborhood-based organization serving people of color, which received a contract to oversee the service and meet the community's stated needs (amenities, technical needs). The program is supported by the Boston Consulting Group.[27]

ANNEX 3 — METHODOLOGY

The analysis in the report is derived from the following data sources:

1. American Community Survey (ACS) 5-Year Estimates, 2013-2017

2. American Community Survey (ACS), 5-Year Public Use Microdata Sample (PUMS), 2013-2017

3. AllTransitTM Database

4. Housing & Transportation (H+T®) Affordability Index

5. U.S. Census Bureau, American Housing Survey, 2013

6. Uber & Lyft API

7. Federal Deposit Insurance Corporation National Survey of Unbanked and Underbanked Households, 2018

Calculation of Metrics:

Race & Ethnicity – Data from the 2017 American Community Survey (ACS) was used to calculate population by race & ethnicity. The ACS reports data by race in the following categories; white, black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race alone, and two or more races. The ACS also reports data on people of Hispanic, Latino, or Spanish origin, separate from race. For this report, we look at four racial/ethnic cohorts; non-Hispanic white, Hispanic/Latino of any race, non-Hispanic African American, and non-Hispanic other people of color (all other races above, including two or more races).

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27   https://www.bcg.com/en-us/industries/automotive/center-mobility-innovation/detroits-mobility-project.aspx

Poverty – The ACS data is available for various metrics at a percent of the poverty level. The poverty threshold income is used to categorize the above four race breakouts into three bins; below poverty level (under 100% of poverty income), 101-200% of poverty level income and 201% or higher of poverty level income.

Data aggregation – The data is weighted by the percent of the cohort population living in a block group (neighborhood), and summed up for the study areas, within the central city and outside the central city.

Geography – The central city is the largest city within the county and outside central city is the county/counties boundary minus the central city.

Supplemental data on transit quality and built environmental characteristics were gathered from CNT's AllTransit™ & H+T Index. Transit quality data trips per week, frequency of routes and jobs accessible in a 30-minute transit trip. The data is calculated at the census block group level and aggregated to the study areas. The built environment data encompasses annual transportation costs modeled for the local household.

Uber and Lyft data were gathered by querying their APIs from a random location in every Census block group (Lyft) or Census tract (Uber, due to their API request limits) every hour for a nine-day period – two weekends and one full week. The wait time for each ride request was recorded and the average wait time was aggregated for neighborhoods. The data was further aggregated to the study areas, weighted by cohort population.

Interviews with the following community and transportation advocates, transportation professionals, and industry leaders were conducted.

Table 18: Interviewees

Interviewee Name	Designation	Organization
Anita Cozart	Managing Director	PolicyLink
Ann Cheng	Research and Consulting Director	Shared Use Mobility Center
Don MacKenzie	Assistant Professor, Civil & Environmental Engineering	University of Washington
Emiko Altherton	Director, National Complete Streets Coalition	Smart Growth America
Gloria Jeff	Project Director, Rethinking I-94	Minnesota DOT
Jason Barron	Executive Director	Cincinnati Red Bike Share
Josh Fairchild	President	Transit Matters (Boston)
Lilly Shoup	Senior Director of Policy and Partnerships	Lyft
Mandy Bishop	Program Manager	Columbus Smart Cities program
Petra Falcon	Executive Director	Promise Arizona
Scott Goldstein	Policy Director	T4 America