RESEARCH REPORT

Access to Opportunity through Equitable Transportation

Lessons from Four Metropolitan Regions

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Access to Opportunity through Equitable Transportation

Transportation is key to accessing such opportunities as employment, education, and health care. But not everyone has equal access to high-quality, reliable, and safe transportation. For example, wealth differences between people of color and non-Hispanic whites make it easier for white residents to purchase a car, giving them increased access to jobs and subsequent higher employment rates (Gautier and Zenou 2010). Public transit that is inaccessible for the elderly and people with disabilities can leave transit-dependent residents stranded. And unreliable transit, particularly at off-peak work hours, means that people who work irregular schedules often have no safe or affordable way to get to work (Giuliano and Narayan 2005; Rast 2004; Sanchez, Shen, and Peng 2004). Improved access to high-quality, reliable, and accessible transportation could help connect people to resources, jobs, and services. These connections could help address disparities in the distribution of opportunities by race and income (Dawkins, Jeon, and Pendall 2015; Gautier and Zenou 2010; Pendall et al. 2014).

However, leaders making decisions about expanding or cutting transportation services often lack clear definitions and measures of equity with which to make these choices (Manaugh, Badama, and El-Geneidy 2015). Generally, social equity goals and objectives are not translated into clearly specified objectives, and plans often lack appropriate measures for meaningfully assessing their achievement (Manaugh, Badama, and El-Geneidy 2015). Because of this, metropolitan planning organizations often focus more on the local environment (and congestion reduction) than on social equity in their planning. Pedestrian and bicycle equity impacts also often go overlooked, resulting in an inequitable distribution of active transportation costs and benefits (Lee, Sener, and Jones 2017). A lack of clear definitions and metrics also makes it difficult for communities to hold leaders accountable to equitable outcomes.

In this report, we examine transportation equity and inclusion in different types of metropolitan regions and explore how these regions might track and improve transportation equity over time. We draw on case studies of four Metropolitan Statistical Areas (MSAs) facing different barriers to providing equitable transportation: the Seattle, Washington, MSA, a West Coast region that faces exponential growth and housing affordability issues; the Lansing, Michigan, MSA, a smaller Midwestern metro with a state capital and university; the Baltimore, Maryland, MSA, an East Coast metro with fiscal challenges

and a declining population; and the Nashville, Tennessee, MSA, a sprawling southern metro with population growth but low population density in many areas. We look holistically at transportation—including cars, public transportation, walking, biking, and new modes like e-scooters—to develop an understanding of equity that can apply across diverse metros with different transportation options. For the remainder of the report, we use "transportation" to include all these different modes.

We found that although these regions face very different barriers to providing equitable transportation, they share common challenges:

- Metropolitan regions lack a shared definition of transportation equity. This creates competing priorities between transportation leaders, planners, politicians, and advocates.

- Fragmented systems and overlapping jurisdictions impede regional transportation equity decisionmaking and implementation.

- A lack of coordination with local land use, zoning, and housing agencies can unintentionally exacerbate disparities through displacement, gentrification, or inadequate transit access in certain neighborhoods.

- Insufficient funding and a lack of dedicated funding from non-transportation related sources, can make it difficult for agencies to plan for the future and discourage innovative and equitable transit systems.

We also identified opportunities that all metro regions could take to further transportation equity:

- Transportation decisions should be made through deep and meaningful community engagement with low-income and other historically excluded residents.

- Regional leaders should partner with employers, new mobility services, and educational institutions to fill transportation gaps.

- Regions need better data to track transportation equity and tools to help them prioritize equity when making transportation decisions.

In this report, we first review the historic and current drivers of inequitable transportation, and then describe how transportation equity plays out in our four case-study metropolitan regions. We also identify key takeaways for building more equitable transportations. To demonstrate the importance of shared measures of transportation equity, we then highlight some proposed equity metrics for our case study regions and show how decisions can be made around these metrics.

BOX 1

What Is Transportation Equity?

For this report, we use the definition of transportation equity below that we created in collaboration with community representatives from our four case-study metropolitan regions. We suggest that each region come up with its own definition of transportation equity that matches its unique barriers and community needs.

Transportation equity means that transportation decisions are made with deep and meaningful community input that leads to transportation networks and land use structures that support health and well-being, environmental sustainability, and equitable access to resources and opportunities.

Historic and Current Drivers of Inequitable Transportation

Historic segregation and exclusion by race and income, combined with a car-centric culture and funding structures, function as systemic barriers to providing equitable transportation. Unique challenges stemming from a metropolitan area's socioeconomic characteristics also shape transportation needs.

Legacy of Exclusion

The contemporary transportation landscape in the US was shaped by the rise of automobile ownership and the federal funding and mass construction of interstate highways across the country beginning in the 1950s (Weber 2012). While white households were able to move to the suburbs and drive to the city, racially discriminative lending practices, such as redlining and racially restrictive covenants, and income disparities restricted home purchase choices for many African Americans (Turner and Skidmore 1999; Woods 2012). Highway construction and parking lots in downtown areas destroyed and displaced many African American neighborhoods, resulting in the crowding and clustering of communities of color (Karas 2015). These residential patterns defined by race and income are still prevalent today (Hendey 2017; Kijakazi et al. 2016; Theodos et al. 2019).

Car-centric culture and planning dominate funding decisions and transportation systems today, making it challenging to fund multimodal and equitable transit systems. In 2015, about 17 percent of the $32.2 billion federal expenditure went into railroads and highways, compared with 0.4 percent for

transit. For state and local governments, 69 percent of the total $297.3 billion expenditure went into highways, compared with 22 percent that went into transit (Bureau of Transportation Statistics 2018). As a result, the automobile is still the dominant mode of transportation in trips and miles traveled, leading to negative externalities such as pollution, congestion, and the exacerbation of health, income, and racial disparities (Parry, Walls, and Harrington 2007; Rachele et al. 2017; Zimmerman and Anderson 2019).

Gentrification, the Suburbanization of Poverty, and Spatial Mismatch

Since the early 2000s, some US cities have experienced an influx of younger, higher-income, and, in many cases, whiter residents who have increasingly chosen to live closer to downtown business districts (Baum-Snow and Hartley 2017; Couture and Handbury 2019; Edlund, Machado, and Sviatschi 2015; Richardson, Mitchell, and Franco 2019). This economic and demographic shift has led to gentrification of many neighborhoods, and subsequent displacement of low-income, Black, immigrant, and Latino families (Richardson, Mitchell, and Franco 2019). Although gentrification may boost economic activity in some neighborhoods, it may also pressure incumbent residents, especially low-income renters, to move elsewhere in search of affordable housing (Brummet and Reed 2018).

In some cities, increased density in the urban core by higher-income residents has led to the displacement of lower-income residents into the suburbs. While increased density near the urban core can create the population base needed for sustainable transit, the suburbanization of poverty has created challenges for providing equitable transportation. Growth of poverty in the nation's suburbs, which accounted for nearly half the total national increase in the poor population between 2000 and 2015 (Kneebone and Berube 2013), increased commute times for lower-income residents and created pressure on transportation agencies to expand services to less dense areas. These suburban areas are rarely served by frequent and reliable transit besides to downtown areas, leaving residents disconnected from many suburban job centers.

This spatial mismatch between where jobs are located and where job seekers live has caused high unemployment rates and longer spells of joblessness among lower-paid workers (Andersson, Klaesson, and Larsson 2014; Brueckner and Zenou 2003). Black residents, women, and older workers are more sensitive to job accessibility than other subpopulations (Andersson et al. 2018). Though increased investments in transportation could help reduce commute times for these workers, new transit investments can, absent proper anti-displacement efforts, lead to an increase in housing prices and a lack of affordable rental units for low-income renters, who are more likely to be people of color (Martin

and Beck 2018; NLIHC 2019). Transportation investments, and potential subsequent gentrification, may displace and increase inequitable outcomes for communities who could have benefited the most from transit access (Rayle 2015; Revington 2015).

Equitable and quality transportation systems can help address spatial mismatch and increase upward economic mobility. According to Raj Chetty's Equality of Opportunity project, shorter commute times are a significant predictor of upward economic mobility (Chetty et al. 2014). Reduced commute times and costs could decrease the unemployment rate among disadvantaged communities and increase equity in employment and income.

Legacy Cities and Population Decline

In legacy cities, a loss of the manufacturing industry and decades of population decline and suburban flight have led to the opposite problem: disinvestment in the urban core and the concentration of higher-income residents in the suburbs (Mallach 2012). Some cities have been able to harness assets to explore new economic opportunities, but the uneven distribution of resident socioeconomic characteristics, declining property values, and the physical environment in the urban core are still impeding revitalization in many places (Mallach and Brachman 2013). As a result, the central city—which often bears the burden of funding transit—lacks the tax base to support a robust and equitable transportation infrastructure.

Research has shown that generic regional growth policies and industry cluster-based economic development strategy do not address urban poverty without strategies targeted at specific economic outcomes and areas (Lynch and Kamins 2012). Many residents left in the urban core of such cities experience poverty and the loss of jobs. Absent adequate multimodal transportation choices that connect these residents to jobs and services, revitalization will likely concentrate in certain areas of the city while other parts remain in distress (Mallach and Brachman 2013).

In legacy cities, competition for limited resources constrains planners' ability to pursue additional transportation options (Ganning 2014). This constraint is compounded as decreasing population density limits the efficiency of public transportation (Schwanen and Mokhtarian 2005). Legacy cities are faced with difficult decisions that pit concerns about gentrification and displacement against efforts to improve transportation access for low-income households (Tighe and Ganning 2015).

Insufficient Funding

Insufficient funding for transit also creates challenges for providing equitable transportation. Although most metropolitan regions have their own public transit systems, the vast majority of these systems operate with a deficit. Of the more than 2,192 mass transit systems in the United States, only 4 percent had fare revenue that exceeded operating expenses in 2018.[1] Transit agencies with limited resources must therefore choose between providing transportation in less dense areas with more transit-dependent riders and in denser areas where most ridership take place.[2] When transit agencies have to scale back services, maintaining the more lucrative services for routes with higher ridership often leaves the transit-dependent riders with even fewer choices.[3]

The imbalance between capital and operating costs and revenues is not just a challenge for public transit systems. The Federal Highway Trust Fund, which funds roads and rail construction across the country and mostly relies on federal excise tax on gasoline and diesel fuel, has had difficulty keeping up with its obligations and is projected to have shortfalls by the end of 2021 (GAO 2019). Motor fuel taxes are also the primary way state and local governments pay their share for transportation projects. To keep up with inflation and costs, many states have proposed increasing their gas taxes. But total vehicle miles traveled and gasoline consumption has slowed since 2008, compared with 1990–2008 trends (Irwin 2019), resulting in less revenue from these politically unpopular taxes. Similarly, decisions about transportation investments that balance need and use could exacerbate inequities in accessing different modes of transportation across regions.

Environment and Climate

Transportation is also inextricably linked with the environment and climate. In 2018, the transportation sector accounted for 28 percent of the total greenhouse gas emissions in the US (EPA 2020).[4] In addition, passenger vehicles are a source of major air pollutants, including carbon monoxide, nitrogen oxides, particulate matter, and sulfur dioxide (EPA 2017). These pollutants can damage immune systems and cause respiratory and other health problems, especially in urban areas that have higher concentrations of emissions.

Pollution-imposed health risks disproportionally affect communities of color and lower-income populations. African Americans and Latinos disproportionately bear the burden from atmospheric fine -particulate-matter pollutions. Non-Hispanic whites experience 17 percent less air pollution than they create by their consumption, yet African Americans and Latinos experience 56 percent and 63 percent more pollution than they create (Tessum et al. 2019). This disparity can be partly explained by

communities of color, people born outside the US, and people who speak a language other than English at home living closer to highways and industrial facilities (Boehmer et al. 2013).

Decarbonization of the transportation sector—by changing individual behavior and developing more efficient transportation modes—would mitigate these disproportionate negative environmental impacts and improve air quality overall. Evidence-based strategies for accomplishing this goal include introducing carbon taxes (Marron and Toder 2014), mandating higher standards for energy efficiency of vehicles (Siskos, Capros, and De Vita 2015), subsidizing electric vehicles and clean energy (Holland et al. 2016), promoting and investing in public transit and nonmotorized transit options, and increasing urban density (Younger et al. 2008).

Emerging Mobility Technologies

New technologies such as ride hailing, bike sharing, and electric scooters have expanded transportation options for many US residents. However, these new mobility options may not always increase equity (Greene et al. 2019). Recent research has shown that passengers with Black-sounding names face longer wait times for shared rides than passengers with non-Hispanic white-sounding names (Ge et al. 2016). A study in Washington, DC, found that drivers are more likely to cancel rides for riders whose profiles indicate they are people of color or support for LGBT rights.[5]

For bike sharing and other nonmotorized mobility choices, the equitable distribution of infrastructure and services is also a challenge. Research on seven bike share systems in the US shows an inequitable distribution of physical access to stations by social and economic characteristics (Su and Wang 2019; Ursaki and Aultman-Hall 2015).[6] Most ride-sharing or ride-hailing mobility services require a smartphone to install the application, and many require a bank account or at minimum a prepaid card. This digital divide could also exacerbate inequities in access for lower-income people, users without bank accounts, and others who do not have smartphones (Shaheen and Cohen 2018).

Although ride-hailing services provide additional choice for populations and communities with limited public transportation options, the research is mixed on whether these services increase or reduce the use of public transit and traffic congestion. One study found that ride hailing actually increased public transit ridership by 5 percent on average after two years (Hall, Palsson, and Price 2018), but another found that ride-hailing contributed to growing traffic congestion (Erhardt et al. 2019). A survey of ride-hailing passengers in Boston found that more than two in five passengers would have otherwise taken transit, biked, or walked (Gehrke, Felix, and Reardon 2019). These additional car trips can create more pollution than the transportation choices they displace.[7] Ride-hailing, ride sharing,

or carpooling, which can put multiple passengers in the same ride, appears to reduce congestion and be more environmentally friendly (Li, Hong, and Zhang 2016). Nevertheless, ride-hailing is a small fraction of the services provided by major transportation network companies; and, under the most optimistic shared ride adoption, the services on net generate more traffic (Schaller 2018).

A recent report by the Urban Institute on new mobility technology and equity in cities highlighted that while many cities and transit agencies are using requests for proposals and permits to try to regulate and incentivize equitable practices, many transportation agencies have not directly addressed the role of new mobility in equitable transit provision in recent transportation plans (Fedorowicz et al. 2020). Box 2 lists key next steps and considerations for addressing equity in new mobility technologies.

Transportation as a Solution

Transportation is key to addressing and reducing disparities in income, health, and well-being. Metropolitan planning organizations (MPOs) and others have definitions and measures of equity, but reviews have found their efforts particularly lacking (Golub and Martens 2014; Manaugh, Badami, and El-Geneidy 2015; Martens, Golub, and Robinson 2012). While previous research has identified the need

for equitable transportation and the common barriers faced across cities, it has focused less on the unique barriers different types of metropolitan regions face. Two regions may face inequitable access to transportation for different reasons. For instance, the transportation equity challenges in a dense downtown area may differ from those in a rural suburb. Prior research also lacks information on the exact measures and tools that would help leaders make equity a core part of transportation decisions.

Case Studies of Four Metropolitan Regions

To better understand how different types of regions understand and measure transportation equity and the barriers they face to providing equitable transportation, we studied four representative places: the Seattle-Tacoma-Bellevue, Washington, MSA; the Baltimore-Columbia-Towson, Maryland, MSA; the Lansing-East Lansing, Michigan, MSA; and the Nashville-Davidson-Murfreesboro-Franklin, Tennessee, MSA.

To select these four regions, we used five criteria: population, unemployment rate, sprawl, racial segregation, and census-defined statistical region (table 1). These criteria helped us select a diverse group of areas with different contexts for addressing access to opportunity through transportation. We prioritized including at least one sprawling metro, one smaller city that has rural areas, one high-cost city, and one large legacy city. We also wanted one MSA from each Census-defined statistical region of the country (Northeast, South, Midwest, and West).

TABLE 1
Case Study Metro Areas

MSA	Population	Unemployment rate	Sprawl	Racial segregation	Census region
Seattle-Tacoma-Bellevue, WA	Large	Low	Fairly dense	Low	West
Baltimore-Columbia-Towson, MD	Large	High	Fairly dense	High	Northeast
Lansing-East Lansing, MI	Small	High	Middle	High	Midwest
Nashville-Davidson-Murfreesboro-Franklin, TN	Large	Low	Sprawling	Low	South

Source: Author's calculations from 2013–2017 American Community Survey data and Reid Ewing and Shima Hamidi, *Measuring Sprawl 2014* (Washington, DC: Smart Growth America, 2014).
Notes: Population = people ages 16 years or older, above or below 500,000; unemployment rate = unemployment rate compared with average of all MSAs; Sprawl = based on designations by Smart Growth America's sprawl ranking; Racial segregation = author's calculation of MSA Black-white dissimilarity index; Region = based on four census-defined regions.

We interviewed key transportation leaders and decisionmakers from each case study metro region, including government officials, transit authorities, planners, and community organizers or advocates. We also held a convening with representatives from these regions to discuss differences and similarities across the regions. For a full description of the methodology, see appendix A.

Though these regions face very different barriers to providing equitable transportation, they also face some common challenges. Below, we briefly describe the key themes for each region.

Seattle

The Seattle-Tacoma-Bellevue Metropolitan Statistical Area includes the three most populous counties in Washington State: King, Snohomish, and Pierce (figure 1). The region has seen a surge in its high-income population and is facing challenges from increased income disparities, gentrification, and a lack of housing affordability near transit-rich areas.

The Seattle metro region has one of the largest public transit systems in the country. Its four major public transportation agencies—King County Metro, Sound Transit, Pierce Transit, and Community Transit—offer commuter buses, rail, regional express buses, water taxi, and paratransit services within and across counties. In 2019, total annual ridership exceeded 180 million.

The Seattle metro region also has several programs and frameworks for transportation equity. The King County Metro Mobility Framework, developed by King County Metro (Metro) and the Metro Transportation Equity Cabinet, helps guide Metro's strategic plan to provide equitable and sustainable transportation. And, the Seattle DOT has transportation equity programs that address affordability and broader transportation equity goals. Major programs include Low-Income Transit Access, the Youth ORCA (One Regional Card for All) contactless smart card system for public transit in the Puget Sound region, the vehicle license rebate programs and community conversation, and the ambassador program. These programs aim to help the transportation system serve both historically excluded communities, such as low-income communities and people of color, and the unmet transportation needs of people with disabilities and limited-English-speaking communities.

FIGURE 1
Seattle Metro Region Major Public Transit Lines
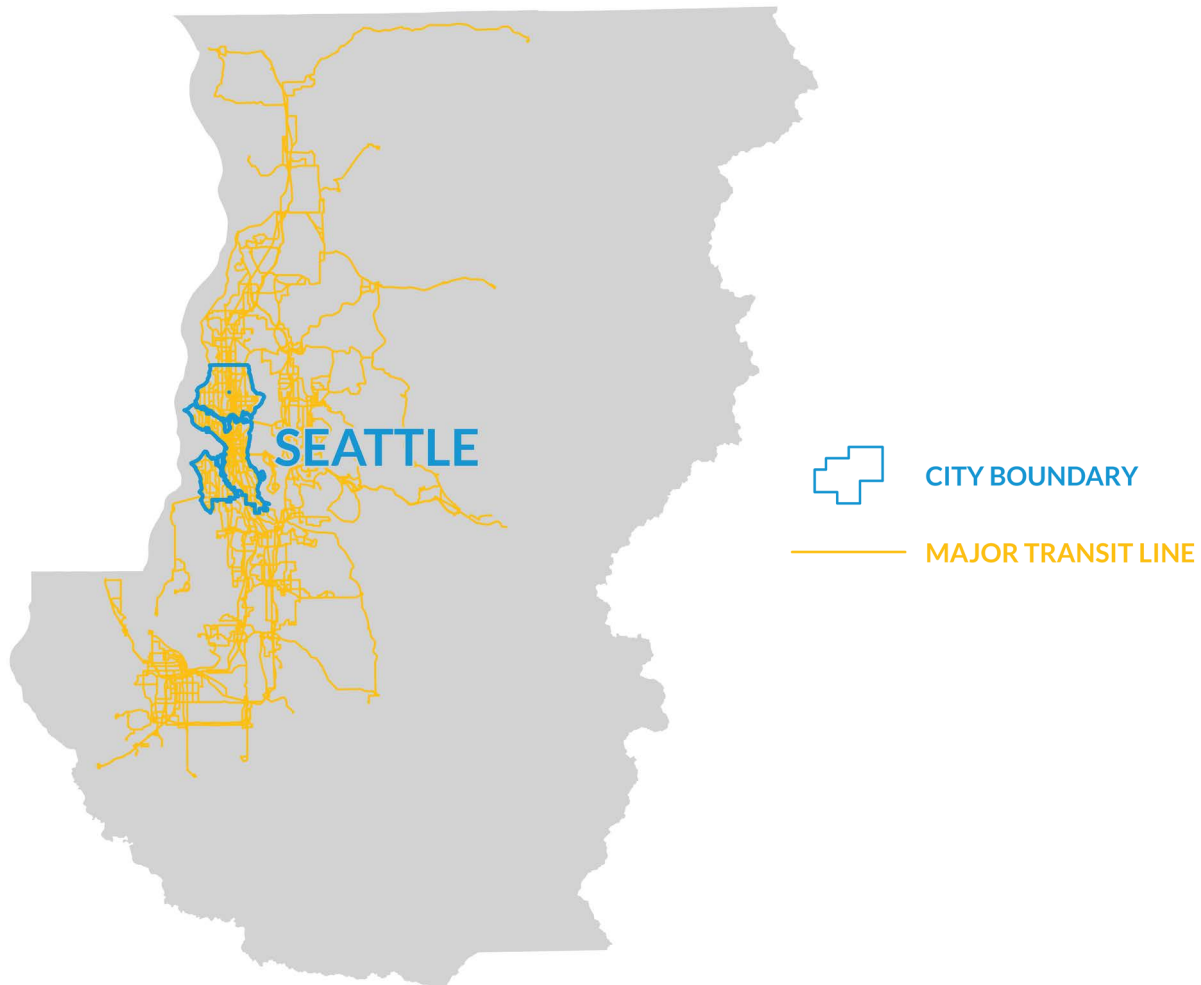
Sources: US Census Bureau 2018 TIGER/Line Shapefiles; transit lines from King County Metro, Community Transit, Pierce Transit accessed via Transitland (https://transit.land/feed-registry/).
Note: Displayed transit lines are from public transit agencies that publish General Transit Feed Specification feeds.

Our housing market in the past eight or so years has shot up. In the city, transit actually reaches a lot of people, but with gentrification and displacement a lot of people in the rest of the county don't have nearly as good transit service.—Katie Wilson, campaign coordinator at Transit Riders Union in Seattle

Yet the region still faces many challenges coordinating among several transit systems, providing and promoting safe pedestrian and bike routes, and continuing to serve underserved communities while weathering budget cuts. Washington State's passage of Initiative 976 cut vehicle license fees to a flat rate of $30 in most cases and barred local communities from passing their own vehicle fees. These cuts are projected to cause a loss of $1.9 billion in state revenue and $2.3 billion in local government revenue over six years (Washington State Office of Financial Management 2019),[8] which would lead to funding and service cuts in state and local transportation programs.[9]

Lansing

The Lansing-East Lansing Metropolitan Statistical Area is a three-county region in central Michigan (figure 2). It includes the City of Lansing, which houses the state capital, and East Lansing, which includes Michigan State University. It is the third-largest MSA in the state.

The Capital Area Transportation Authority (CATA) offers bus routes and paratransit throughout the urban and rural areas of the metro region. CATA also provides special bus service for MSU and other education institutions such as Lansing Community College and Coolly Law School. Total annual ridership exceeds 11 million. Lansing was also the first city in Michigan to pass a Complete Street Ordinance and the first to adopt a nonmotorized plan for the city. Yet a car-centric culture dominates because of the automotive industry in the state and the lower density of the region compared with the other metropolitan regions we study in this report. More than 90 percent of households in 2018 own at least one car, according to census data.

Lansing is more affordable to live in that the other case-study metro regions, so it is less concerned about gentrification and displacement. However, the region faces similar challenges as the other regions with coordinating transit investment and service decisions across jurisdictions.

Different cities have different issues, and Lansing may be different than other cities. Lansing is proud to be the most affordable city in the nation. As such, we focus on growth, and this is boosting all parts of our city while not creating displacement or gentrification.
—Andy Schor, mayor of Lansing

FIGURE 2
Lansing Metro Region Major Public Transit Lines

CITY BOUNDARY

MAJOR TRANSIT LINE

LANSING
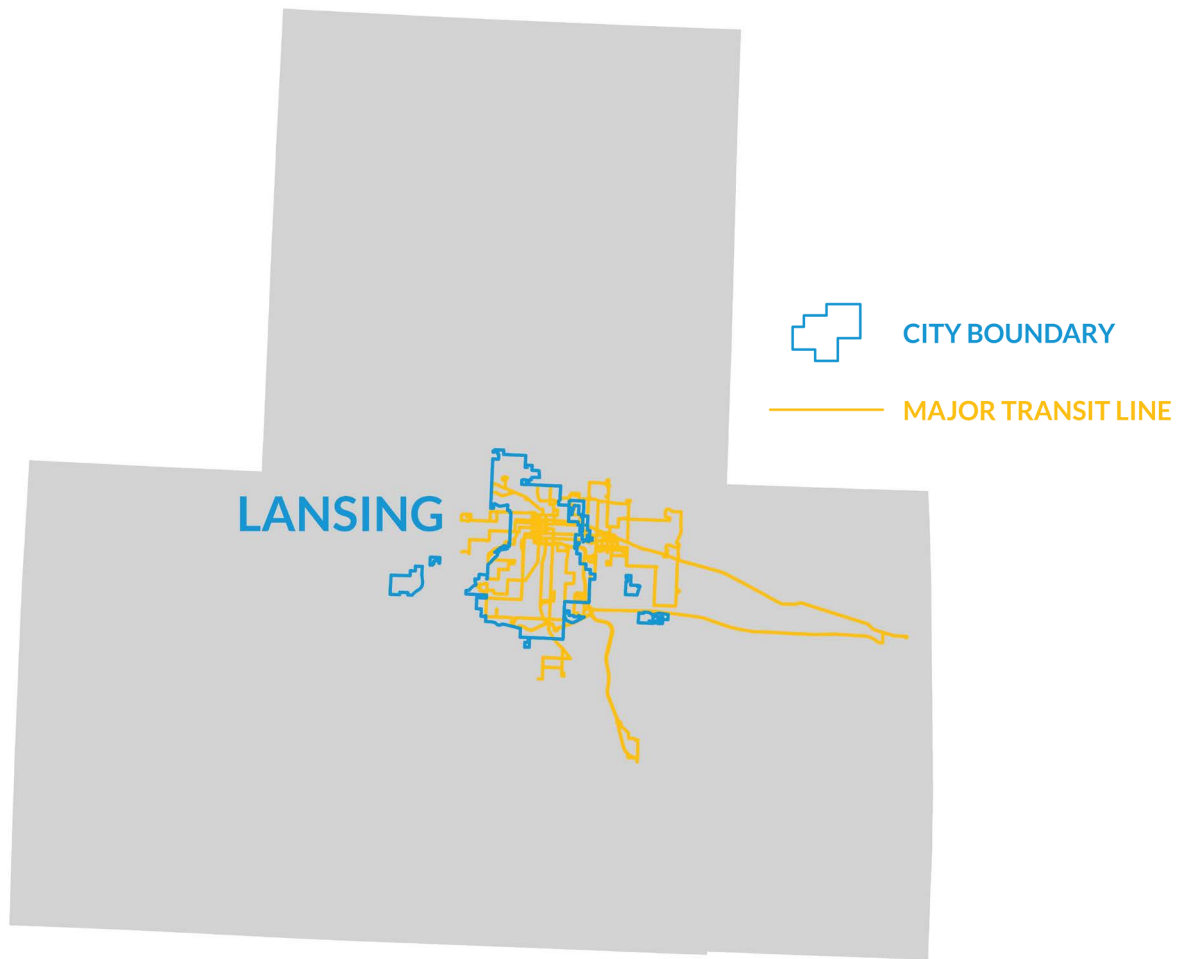
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Sources: US Census Bureau 2018 TIGER/Line Shapefiles; transit lines from Capital Area Transportation Authority, accessed via Transitland (https://transit.land/feed-registry/).
Note: Displayed transit lines are from public transit agencies that publish General Transit Feed Specification feeds.

Baltimore

The Baltimore-Columbia-Towson Metropolitan Statistical Area includes Baltimore City, Baltimore County, and five other Maryland counties (figure 3). The area is a leader in medicine and biosciences and is home to Johns Hopkins University and the University of Maryland Medical Center. Higher education; federal, state, and local government; information technology; and defense contracting are also major industries. The area has high levels of residential racial and income segregation and related inequities in transportation access by different modes and neighborhoods. Safety concerns and high crime rate are another inhibitor to access to transit.

One of the things that affects access in Baltimore is safety—safety is a big issue.
—Public employee, MTA Maryland

The current system moves people in and out of the downtown area efficiently, but the increased suburbanization of poverty (Kneebone and Garr 2010) and the shift of job centers from the downtown area to the suburbs makes connecting residents to amenities and opportunity points a challenge. The Red Line light rail proposal, which was cancelled in 2015, would have created the first large-scale east-west light rail to help address disparities in access for African American residents to job centers. Instead, the governor prioritized funding additional highway initiatives. In response, the NAACP Legal Defense Fund filed a Title VI complaint against the state of Maryland in 2018. The complaint stated that the switch from the light rail to highway funding would cost African American residents $19 million in user benefits by 2030 while giving white residents $35 million in user benefits.[10]

Baltimore has a segregationist history in transportation and dramatic absence of equity in transportation and land use planning… It's important in Baltimore to fight against racism in transportation infrastructure investment.—Samuel Jordan, president of the Baltimore Transit Equity Coalition

FIGURE 3
Baltimore Metro Region Public Transit Lines

BALTIMORE

CITY BOUNDARY

MAJOR TRANSIT LINE

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Sources: US Census Bureau 2018 TIGER/Line Shapefiles; transit lines from Baltimore MTA, City of Baltimore Department of Transportation, Charm City Circulator, Harbor Connector accessed via Transitland (https://transit.land/feed-registry/).
Note: Displayed transit lines are from public transit agencies that publish General Transit Feed Specification feeds.

Nashville

The Nashville-Davidson-Murfreesboro-Franklin Metropolitan Statistical Area (MSA) makes up a large portion of central Tennessee, encompassing 13 counties, including the principal cities of Nashville, Murfreesboro, and Franklin (figure 4). The MSA is home to about two million residents. Rapid population growth in the region has brought increased traffic congestion to the area (Greater Nashville Regional Council 2019), prompting calls for new investment in public transportation.

A car-centric culture and the belief that public transportation is unsafe and low-quality also makes it challenging to raise funding for investments in transit. Interviewees stated that many residents do not see themselves benefiting from the system.

FIGURE 4
Nashville Metro Region Major Public Transit Lines

NASHVILLE

CITY BOUNDARY

MAJOR TRANSIT LINE

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Sources: US Census Bureau 2018 TIGER/Line Shapefiles; transit lines from Nashville MTA, WeGo Public Transit, RTA, Franklin Transit Authority, Clarksville Transit System accessed via Transitland (https://transit.land/feed-registry/).
Note: Displayed transit lines are from public transit agencies that publish General Transit Feed Specification feeds.
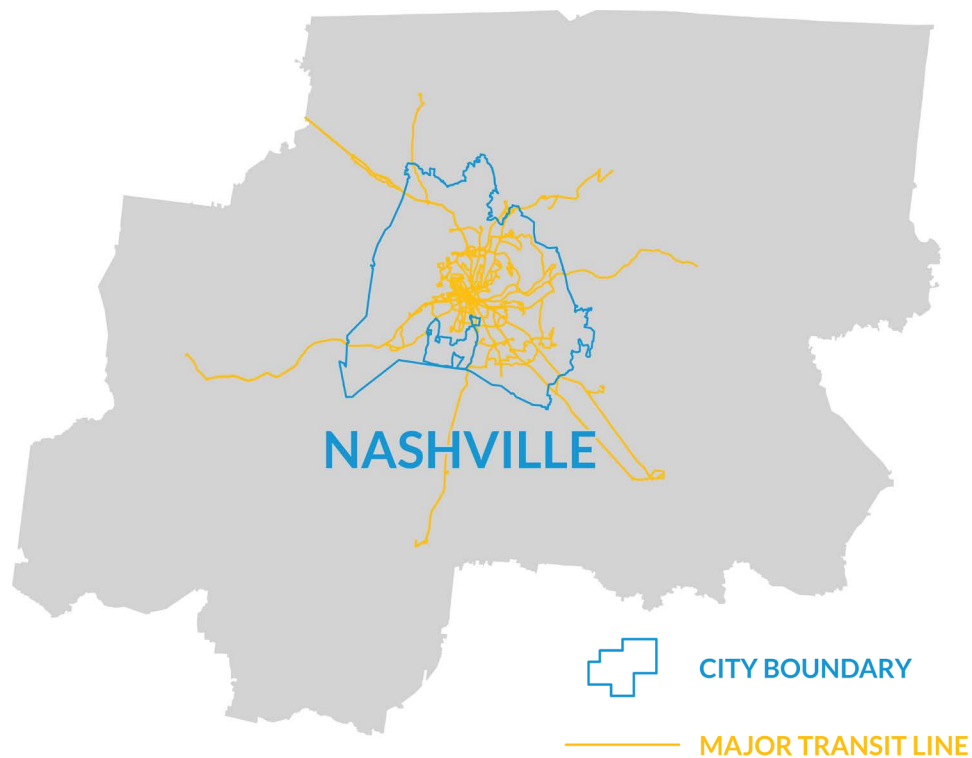
Our region is growing so fast... It's a car culture so there's a reluctance to pay more in taxes even though we are one of the lowest taxed areas, for our population, in the country.
—Transportation advocate, Nashville

Key Challenges across Metro Regions

In our more than 20 interviews with stakeholders across the four case-study metro regions, the conversations focused on identifying barriers to equitable access to opportunity. We heard that because the transportation sector is fast paced, innovative, and solutions oriented, leaders often

overlook the complex and interconnected nature of barriers to equitable service provision. Respondents told us that while many decisionmakers in their regions are aware of the connections between transportation and access to opportunity, equity is not always at the forefront of planning and decisionmaking. When equity is incorporated into planning or policy, a shared understanding of equity goals can lead to increased collaboration among transportation stakeholder groups.

Metro Regions Lack a Shared Definition of Transportation Equity

All stakeholders said inequitable access to opportunity was a key concern, but they prioritized different areas. Stakeholder groups identified varying needs faced by individuals, communities, and organizations within the same metro region (table 2; see also box 3).

TABLE 2

Most Frequently Cited Barriers to Ensuring Equitable Access to Transportation

Top challenges cited within the case study regions varied by stakeholder group

Government officials and MPOs	Planners	Advocates and nonprofits
▪ Political and geographic fragmentation ▪ Lack of political will by others to prioritize transportation ▪ Dominant car-centric infrastructure	▪ Lack of coordination with housing and land use agencies ▪ Increased commute times for low-wage workers ▪ Legacy of racist planning practices without meaningful community engagement	▪ Lack of dedicated funding ▪ Car-centric infrastructure and culture ▪ Not prioritizing access disparities in race, income, gender, and ability ▪ Structural racism

Each region has multiple barriers to creating an equitable transportation system. Further, transportation decisions frequently happen at many different political scales. From MPO regional transportation plans to neighborhood-level engagement, varied understandings of the importance of equity—or what it takes to create an equitable transit system—can produce competing agendas. Shared, large-scale equity goals are key to supporting leaders making difficult decisions across groups.

In regions like Nashville with a strong history of car-centric transportation planning and policy, creating shared goals about investing in public transit is difficult. When politicians and citizens defeated a proposed measure to increase taxation for public transit expansion in 2018 advocates realized they needed to build a stronger and larger coalition with explicit shared priorities. For future bills to pass, advocates, politicians, and planners needed to be able to articulate why funding public transportation is a top equity issue.

BOX 3
Defining Transportation Equity

The community and city leaders we consulted agreed that definitions of equity should be metro specific to guide the creation of accurate transportation metrics that address varied regional needs. This should be done in collaboration with the communities most disadvantaged by segregation and a lack of transit, such as low-income residents, people of color, and people with varying accessibility needs such as those in wheelchairs or those with visual impairments.

Though transportation equity definitions will vary, leaders across all four metro regions emphasized five common challenges:

- **Equity across modes:** It is important that every citizen can access a mode of transportation that fits their needs and that the costs (both in time and money) are equitable across modes. Significantly higher travel times for people without access to a car and transportation costs that are prohibitive for low-income populations indicate inequitable transportation systems.

- **Quality transportation infrastructure and experience across mode:** It does not matter if networks provide many options for riders if all the options are low-quality. Important dimensions of quality include reliability (whether transit comes at its scheduled time), safety, time of day available for different transit options (particularly for third-shift workers), cost (both in time and money), and number of transfers needed.

- **Acknowledging varied need across the region:** Options are important, but recognizing constraints can help transportation decisionmakers create realistic, flexible, and equitable solutions that work for residents across the region. For example, large-scale public transit infrastructure expansion is not feasible for very low-density or rural areas. People living in high-density urban areas should recognize that access to public transit will be prioritized over accommodating individual car-use.

- **Disparities in residents' health outcomes:** The lack of quality transportation infrastructure in low-income and majority–people of color neighborhoods can prevent active transportation modes like biking and walking and increase collision rates.[a] Inadequate transportation access to quality jobs can also impact resident income and subsequent health outcomes (Lynch and Kaplan 1997).

- **Environmental sustainability:** MPOs and transit authorities should incorporate long-term emission and waste reduction as equity goals. Transportation is the largest carbon emitter in the US, and the neighborhoods where low-income households and people of color live are disproportionately exposed to the subsequent air pollution (Clark, Millet, and Marshall 2017).

[a] "Equity: Relationship to Public Health," US Department of Transportation, accessed September 23, 2020, https://www.transportation.gov/mission/health/equity.

Fragmented Systems and Overlapping Jurisdictions Impede Transportation Equity

Many political entities fund, plan, create, and maintain transportation systems, and the geographic reach of transportation networks often extends across political boundaries. These fragmented layers of governance and service make addressing inequities a slow and bureaucratic process with agencies unsure who should take full responsibility. Though coordination has increased in recent years, MPOs frequently cited fragmented transportation agencies as a large barrier in addressing equity concerns.

In the Baltimore metro region, fragmentation has made it difficult to promptly address Americans with Disabilities Act (ADA) concerns. The Baltimore City Department of Transportation is responsible for ensuring that private homeowners keep the sidewalks on their property ADA compliant, while the Maryland Transit Authority is responsible for making bus stops ADA compliant. In a metro region where over 10 percent of the workforce is transit dependent and 12 percent of the population has a disability, ensuring that sidewalks and bus stops are accessible is a necessity.[11]

Seattle's King County, on the other hand, is coordinating large-scale integrated transportation and housing and land use goals. The different transportation infrastructure and land use goals of the multiple cities served by the county bus service has made providing equal public transit service across cities difficult. In order to meet bus service mobility goals, King County's transportation agency realized it needed to coordinate supportive roadway, right-of-way, housing affordability, and land use goals across all cities receiving bus service. This was pushed by a recent 2018 regional transportation plan from the Puget Sound Regional Council that emphasized the need to improve transportation access between and within cities across the region as part of the regional growth strategy. Large regional planning bodies can help address inconsistencies in transportation priorities among cities to ensure equal access across jurisdictions.

A Lack of Housing and Land Use Coordination Can Exacerbate Disparities

Another key theme is the inextricable link among transportation, housing, and land use. Decisions by housing and land use planners to incentivize density can lead to increased public transit use, often referred to as transit-oriented development. Decisions to expand transportation networks and increase housing density can unintentionally lead to gentrification and the displacement of the most transit-dependent residents. Better coordination between transit and housing agencies can help prevent these negative consequences and create the population base to help public transit thrive.

We heard that transportation agencies in metro regions with gentrifying neighborhoods face difficulties planning for increased access to opportunities. In these cases, the suburbanization of poverty has left the most transit-dependent residents in areas without active transportation infrastructure and sufficient public transit access. However, in other cities, transit dependent residents live in the urban core, while higher income residents reside in the suburbs. In these types of regions, some transit agencies have faced organized racist backlash when attempting to expand public transportation to increase access to amenities in white suburban neighborhoods. These agencies emphasized the importance of access to disaggregated and timely data showing population shifts, coordinating with housing agencies to create appropriate anti-displacement policies, and countering misinformed stigma with large-scale regional planning goals and data.

A lot of suburban areas electorally don't support transit service.
—Anna Zivarts, community organizer in Seattle

The transportation needs of residents in rural areas have often been overlooked. We heard that these residents are often forced to solely rely on car-ownership to access necessities. While expanding public transit service to extremely low-density residential areas is not a viable model for transit agencies attempting to serve rural communities, there are promising new models. New first- and last-mile alternatives like Lansing's on-demand rural service shuttles that connects rural residents to other transit lines, as well as subsidized private partnerships with ride-hailing companies, are expanding the reach of transit networks.

We also heard that a lack of available funding for transportation projects across housing and land use agencies have stymied holistic planning efforts. For example, Baltimore County surrounds the city of Baltimore, but the county government does not receive any transportation funding. This has led to a lack of incentive for transportation planning, which often becomes low priority for the county government, making coordinated housing, land use, and transportation decisionmaking difficult. This has also made partnerships and planning difficult when decisionmakers try to increase transportation access to new housing developments.

MPOs and large-scale decisionmakers also stated that commonly used metrics in decisionmaking overlook the interconnectedness of housing and transportation. For instance, regional planning

documents often prioritize income and housing burden metrics when looking at resident disparities and priority areas. These metrics overlook the additional cost burdens of car ownership, long commutes, and high transit fares. Ignoring these transit costs can obscure the additional cost burdens of spatial mismatch.

To some communities, particularly those who have been historically victimized by the transportation planning and decisionmaking process, the transportation system can be viewed as a weapon pointed directly at them.—Anthony Foxx, former US secretary of transportation

Insufficient Funding Impedes Equitable and Innovative Transportation Solutions

A lack of dedicated funding for transportation was one of the most frequently mentioned barriers by all stakeholders. Federal grants to state and local governments have declined drastically since 2007, and without dedicated funding sources, transit projects are at the whim of fluctuating government budgets and annual appropriations. This lack of stable funding makes long-term shifts difficult and incentivizes approaching changes project by project rather than addressing network gaps.

All the metro regions also stated that uncertainty around transportation budgets was a top concern:

- The motor vehicle excise tax in Seattle, also known as car tabs, has recently been contested in the State Supreme Court. This could result in Seattle's public transit system losing billions of dollars.

- State legislation across regions often caps taxation rates and does not provide dedicated funding sources, meaning additional strains on transit systems are not met with proportional increases in funding or new funding streams. This often correlates with how "car-centric" a metro region is (i.e., Nashville has a harder time taxing for public transit than Seattle)

- In Michigan, the governor's proposed gas tax was rejected by both parties in the state house. This would have drastically increased dedicated funding for Lansing's transportation agency.

- Maryland has a dedicated gas tax, but the Maryland Transit Authority has faced large public budget cuts that have left the system with extensive capital and accessibility needs and a $2 billion funding shortfall

Opportunities across Regions

While leaders from our four case-study regions noted different barriers to providing equitable transportation, key opportunities across the regions also emerged. The rapidly changing transportation landscape has led to many new opportunities for innovative, forward-thinking solutions. Representatives from the case-study regions believe that transportation leaders are more willing than ever to implement equitable and data-driven decisions in collaboration with communities. To do so, stakeholders emphasized the need for community engagement, innovative partnerships, and timely equity-focused data to guide decisionmaking.

Decisions through Deep and Meaningful Community Engagement

As described above, transportation planning has historically overlooked communities of color, immigrants, and poor households. Policymakers often request feedback on new proposals rather than engaging with community members to understand their concerns and co-create solutions.

Lessons learned are door knocking, going to community meetings, going to neighbors instead of expecting them to come to you.—Colleen Synk, transit advocate and operations coordinator at Safe Routes to School in Lansing, Michigan

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We also heard that while citizens are consulted about transportation decisions more frequently than they have been, the frequently overlooked communities still often lack decisionmaking power. In Nashville, Baltimore, and Seattle, this led advocates, community organizations, and nonprofits to create their own planning, report development, and engagement to articulate their communities' needs. For example, Nashville's Envision Nolensville Pike Collaborative convened community leaders and surveyed residents to understand the street-level transportation possibilities for creating a safe and economically thriving commercial corridor in a majority–Kurdish and Latino neighborhood. In Baltimore, the Transportation Alliance created its own transportation report card to emphasize often-overlooked economic disparities, lack of mode choice, and health outcomes. These community-led data collections and analyses have pushed some transportation agencies to recognize the importance of engaging directly with historically underrepresented residents and riders.

Stakeholders in the case-study metro regions mentioned transportation leadership positions needed socioeconomic and racial diversity for innovative and equitable decisionmaking. MPOs, planners, and politicians stated that the makeup of their organizations does not reflect the socioeconomic and racial demographics of the users they are serving. Some metro regions have prioritized creating career pipelines and opportunities for upward job mobility as a long-term goal. Others have focused on short-term efforts, such as ensuring that boards or committees with decisionmaking power include members with diverse lived experiences, community representatives, and people with varied transportation needs. This is a first step in building long-lasting community partnerships.

Creating Partnerships

If I were a mayor right now, I would bring my transportation director in and say, "How can we bring public and private options together?"—Anthony Foxx, former US secretary of transportation

While all our case-study regions mentioned the need for funding to create an inclusive network, many are filling transportation gaps through innovative partnerships. Coordination with educational institutions, employers, and emerging micromobility and ride hailing companies have made transit systems increasingly interconnected across geographic boundaries, multimodal, and better equipped to create quick and flexible solutions to transit needs.

For metro regions with rural areas, suburban neighborhoods, small towns, disconnected employment destinations, or historically under-connected neighborhoods, transit agencies have found success partnering with employers or subsidizing private first mile/last mile trips. In the beginning of 2020, the City of Baltimore created a six-month pilot partnership with Lyft that provides up to eight rides a month for residents living in areas classified as food deserts. For a flat rate of $2.50, residents are able to hail a private ride to grocery stores. This program has yet to be evaluated and continued funding is not guaranteed, but it has laid the groundwork for future partnerships to address a lack of transportation access for transit-dependent riders in various other scenarios. Though there are equity concerns about the future of ride-hailing and micromobility solutions (as discussed in box 4), this

program was quickly implemented to meet a specific resident need—unlike many public transit pilot programs, which often take years of planning.

Lansing successfully expanded its regional transit network by partnering with a long-standing educational institution. In 2018, Michigan State University gave integral support to Lansing's transit authority in an agreement that provided free service to all students, staff, and faculty on campus; the agreement also subsidized student public transportation travel throughout the region. Unlike many metro regions where private university transportation systems compete with public transit, the high level of student ridership has continuously supported Lansing's strong bus network.

Baltimore's MPO, on the other hand, faced difficulties when large-scale employers used commuter shuttles and parking subsidies, which unintentionally disincentivized public transit use. Private employers were frustrated with the quality of Baltimore's public transit service, but the MPO seemed open to future partnerships that addressed the mismatch in service provision and access to jobs. Increasing access to real-time, disaggregated commuter data would help transit authorities partner,

rather than compete, with employers and use the subsequent high ridership levels to support their strong bus networks.

While many of these partnerships with transit agencies produced innovative new transportation equity approaches, large systemic changes require strong transportation equity leaders and collaborations across federal, state, and local governments, the private sector, public transit agencies, institutions, nonprofits, and grassroots organizers. The Transit Alliance of Middle Tennessee, a nonprofit in Nashville, has attempted to educate and convene local community leaders to advance regional transit funding. The alliance has engaged local elected officials, the Nashville Area chamber of commerce, Vanderbilt University, businesses, faith groups, and private funders around a shared understanding of the necessity of high-quality and equitable transportation. Yet, the alliance was unable to convince the county to increase mass transit funding in the Let's Move Nashville plan or to remove tax caps at the state level. Local housing and tenant's rights groups also opposed the Let's Move Nashville plan, stating that it did not center equity for low-income Nashville residents and could result in gentrification. Assessing the landscape of potential coalition partners and strategies is greatly dependent on funding sources, local and state political climates, and the most pressing transportation needs. Similar to the priorities laid out in our stakeholder definition of transportation equity, these coalitions should also center the voices of historically excluded groups, incorporate housing and land use into their advocacy platform, and prioritize equity.

Accurate and Timely Equity Metrics

Transportation leaders emphasized that equitable decisions should use data that incorporate a metro region's specific needs and questions. We heard from all metro regions that quality equity data are most needed when quick and difficult service provision decisions have to be made. When transit agencies in our case-study regions faced large public transit budget cuts, keeping routes with high ridership was often prioritized over ensuring that the network served all neighborhoods and rider groups fairly. In these cases, new data on disparate impacts of route or service cuts by rider group or geography would have helped transit agencies incorporate equity into these difficult decisions.

Transit authority leaders also noted that equity metrics should focus on equity in internal processes as well as on equitable transportation access for residents. When Seattle's regional transit authority decided to collect data on equitable processes, it was surprised by what it found. After creating an internally focused equity dashboard, the transit authority realized that it lost nearly 300 employees yearly. This put a strain on their HR department's ability to hire a large and diverse staff and called in

question the agency's working conditions and pathways for upward mobility. Internal equity–focused data helped create actionable priorities for increasing staff diversity at every level.

Leaders stated that equity is often not at the forefront of decisionmaking; when it is, there is a lack of data to support arguments that challenge the status quo. We heard that metro regions needed quality data to fill the following knowledge gaps:

- how transportation needs and access to opportunity varies within a metro region

- the impact of population shifts and housing shifts on transportation access

- how access varies by mode of transportation

Metrics to Help Guide Equitable Transportation Decisions

To help make equity a core part of all transportation decisions, we create a set of metrics so our case-study regions can identify inequities by neighborhood and better target transportation and other investments.

To create these measures, we generate a matrix of transportation times from every block group to every other block group in each metro region. We then overlay opportunity points—such as jobs, schools, libraries, and hospitals—to calculate a competition-adjusted measure of job accessibility, and from that a measure of spatial mismatch between low-wage workers. In this report, we highlight disparities in access to jobs.

Spatial Mismatch

To identify neighborhoods in need of transportation investments, we first use a gravity model building off Shen (2001) to calculate job accessibility for low-wage workers in each block group, divided by the number of other low-wage job seekers competing for each job that is accessible to that block group (see the methods appendix for the details of this model). We calculate the number of job opportunities within a 30-minute commute using a weighted combination of the traffic-adjusted drive time (for the share of people in the block group who commute via car) and the public transit time (for the share of people in the block group who commute via public transit).

Using this job accessibility measure, we create a measure of spatial mismatch between low-wage workers and jobs to identify neighborhoods in need of transportation and other investments. To do so, we standardize the job accessibility measure, subtract it from 1 so a higher value signifies worse access, and multiply it by a standardized measure of the low-wage labor force.

Figures 5 through 8 show spatial mismatch in our four MSAs, where darker colors represent higher levels of mismatch for low-wage job seekers, meaning that those neighborhoods have higher numbers of low-wage workers and worse access to jobs than other neighborhoods in our analysis.

In Seattle and Nashville, cities with high population growth, spatial mismatch for low-wage workers is most prevalent in the suburbs. These types of high-growth cities have seen an influx of relatively high-income earners (Baum-Snow and Hartley 2019) that has led to a residential and employment resurgence (Couture and Handbury 2019) and the gentrification of many historically low-income neighborhoods in the central city (Edlund, Machado, and Sviatschi 2019). This has pushed incumbent residents, especially low-income renters, to move elsewhere in search of affordable housing (Brummet and Reed 2019), increasing typical commute times for low-income workers.

In legacy cities, such as Baltimore and Lansing, a loss of the manufacturing industry and decades of population decline and suburban flight have led to the opposite problem: disinvestment in the urban core and the concentration of higher-income residents in the suburbs (Mallach 2012). This economic segregation, plus declining property values and construction obstacles, have impeded revitalization in these cities (Mallach and Brachman 2013). As a result, the central city—which often bears the burden of funding transit—lacks the tax base to support an equitable transportation infrastructure.

In these cities, we see similar rates of job accessibility in the central city as in the suburbs, as opposed to in Nashville and Seattle where we observe much higher rates of job access in the central cities. We also see higher numbers of low wage workers in the suburbs than in the cities. Because of these two factors, the suburbs still have higher rates of mismatch than the urban core. Figures B.1 through B.4 in appendix B shows job accessibility for low wage workers and the number of workers in the low wage labor force, the two inputs into our spatial mismatch measures, zoomed in to the central cities of the four case study regions.

FIGURE 5
Spatial Mismatch between Low-Wage Workers and Jobs in the Seattle-Tacoma-Bellevue Metropolitan Statistical Area
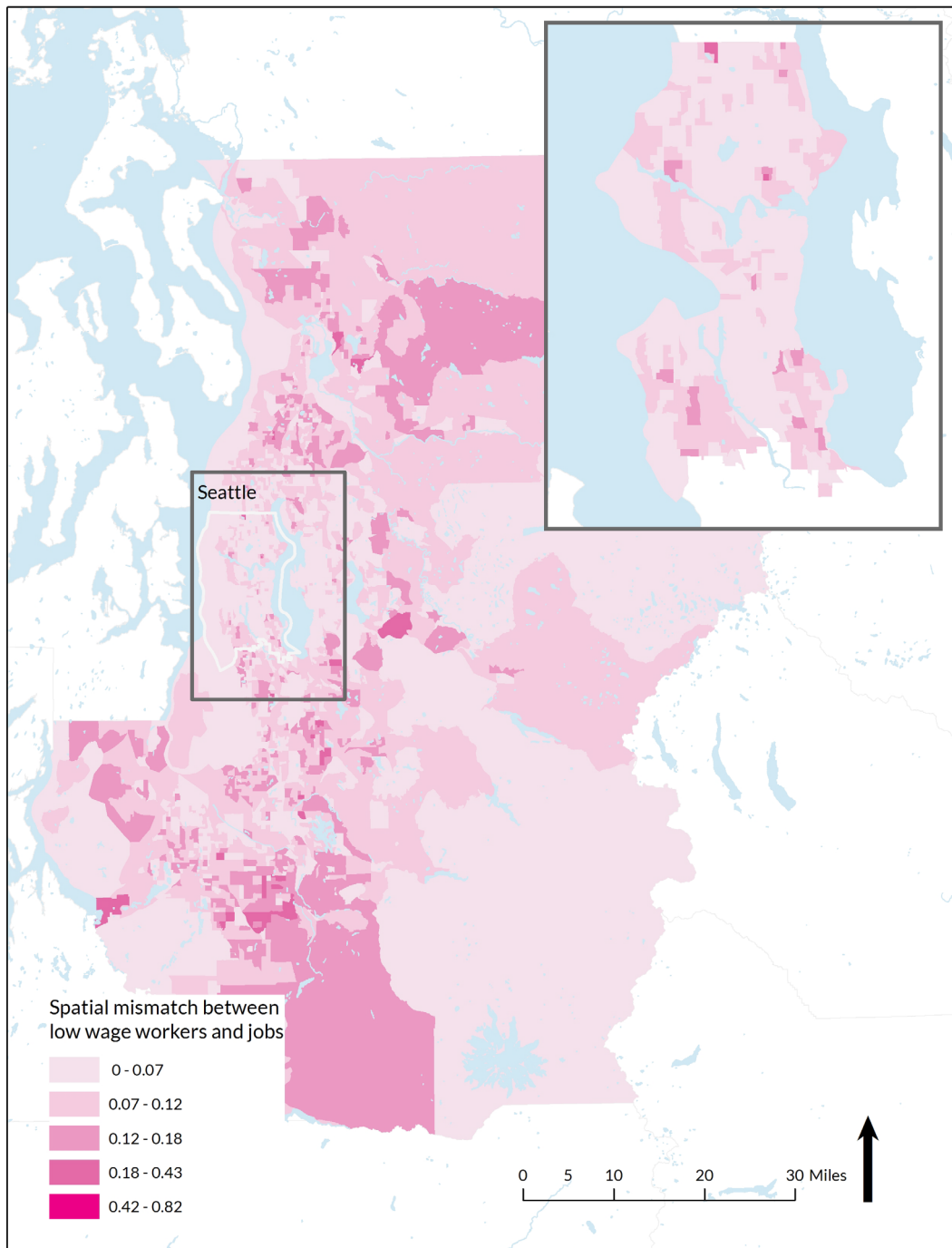
Spatial mismatch between low wage workers and jobs

- 0 - 0.07
- 0.07 - 0.12
- 0.12 - 0.18
- 0.18 - 0.43
- 0.42 - 0.82

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Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers and worse access to jobs than other neighborhoods in our analysis.

FIGURE 6

Spatial Mismatch between Low-Wage Workers and Jobs in the Lansing-East Lansing Metropolitan Statistical Area

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers and worse access to jobs than other neighborhoods in our analysis.

FIGURE 7

Spatial Mismatch between Low-Wage Workers and Jobs in the Baltimore-Columbia-Towson Metropolitan Statistical Area

Spatial mismatch between low wage workers and jobs

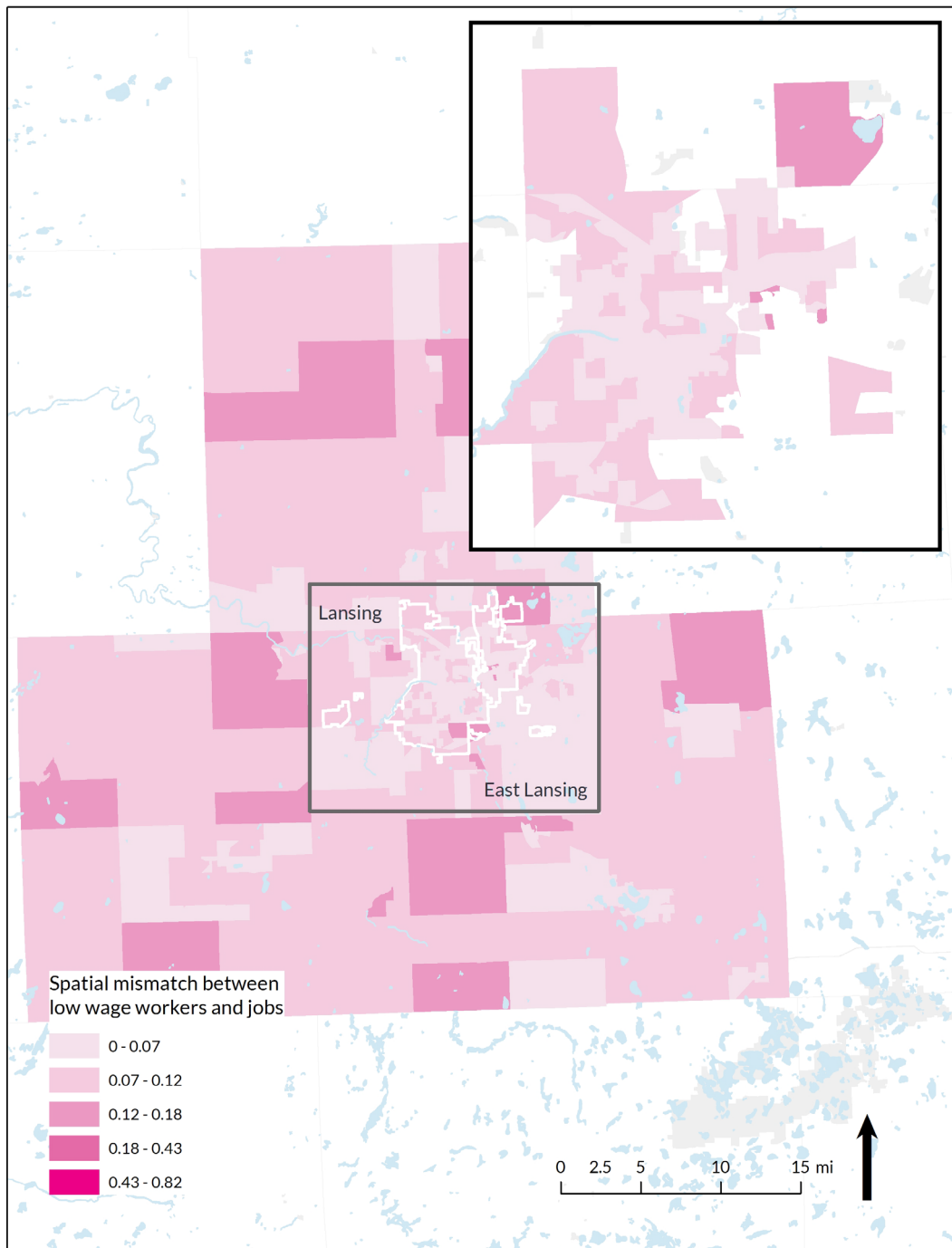- 0 - 0.07
- 0.07 - 0.12
- 0.12 - 0.18
- 0.18 - 0.43
- 0.43 - 0.82

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers and worse access to jobs than other neighborhoods in our analysis.

FIGURE 8

Spatial Mismatch between Low Wage Workers and Jobs in the Nashville-Davidson-Murfreesboro-Franklin Metropolitan Statistical Area

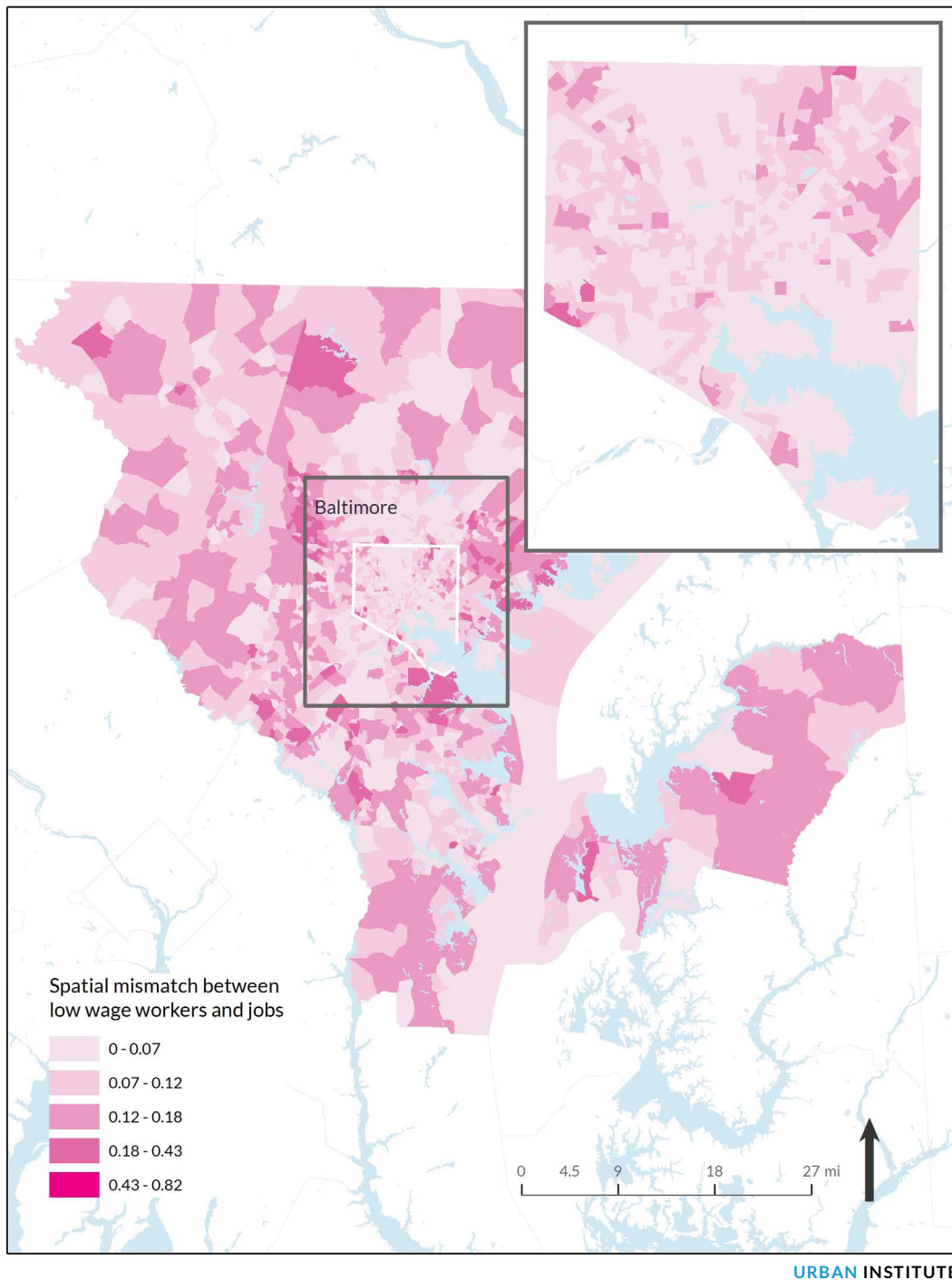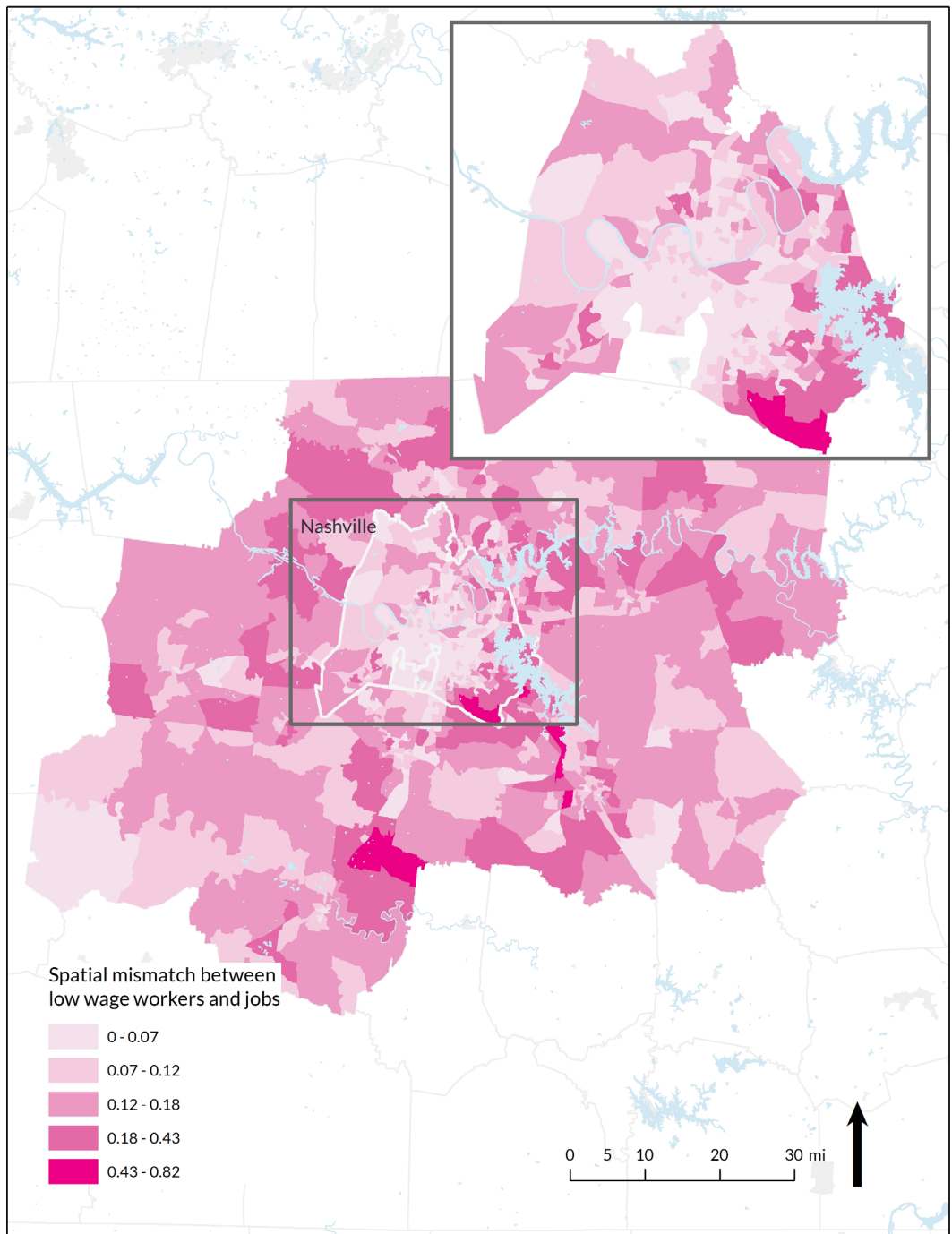**Source:** Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers and worse access to jobs than other neighborhoods in our analysis.

Though average mismatch rates are lower in the central city than in the suburbs in Baltimore, significant disparities within the city exist. These patterns follow those of the "black butterfly", [12] or the shape of segregated black communities in Baltimore that take the shape of a butterfly across the eastern and western part of the city. These patterns mirror many of the capital flow patterns still seen in the city,[13] which could be partly to blame for the high rates of mismatch in these neighborhoods. Aggregate measures can conceal these neighborhood-level disparities, illustrating the importance of localized data for decision-making.

Equitable and high quality transportation systems can help address these spatial disparities and increase residents' upward economic mobility, since shorter commute times are a significant predictor of upward economic mobility (Chetty et al. 2014). But transportation planners must also consider that investments in transportation can sometimes cause increases in housing prices and gentrification (Rayle 2015), which can displace low-income communities (Revington 2015). As such, leaders should enact land use and housing policies in tandem with transportation investments that ensure that residents are able to remain in place after new or enhanced train lines and bus stops are put in.

Housing and land use planners can use the job accessibility measures (figures B.1 through B.4 in appendix B) to identify areas with high job accessibility to locate new affordable housing developments. They can use the spatial mismatch measures to identify areas with low job accessibility and a high number of low wage workers to target transportation and economic development investments to connect people to jobs.

Access to Jobs via Public Transit for Day and Night Shift Workers

Since many Americans rely on public transit to get to work or other services, and since average commute times for late-shift workers who take public transit (who are disproportionately low-income people of color) are twice as long as those for workers with car access (APTA 2019), we also created metrics of access to jobs via public transit for both day and night shift workers. Figures 9 through 12 show access to jobs via public transit at peak commuting time and the middle of the night for our four case study metros, zoomed in to the central city.

FIGURE 9

Access to Jobs via Public Transit at Peak and Late-Shift Hours in Seattle
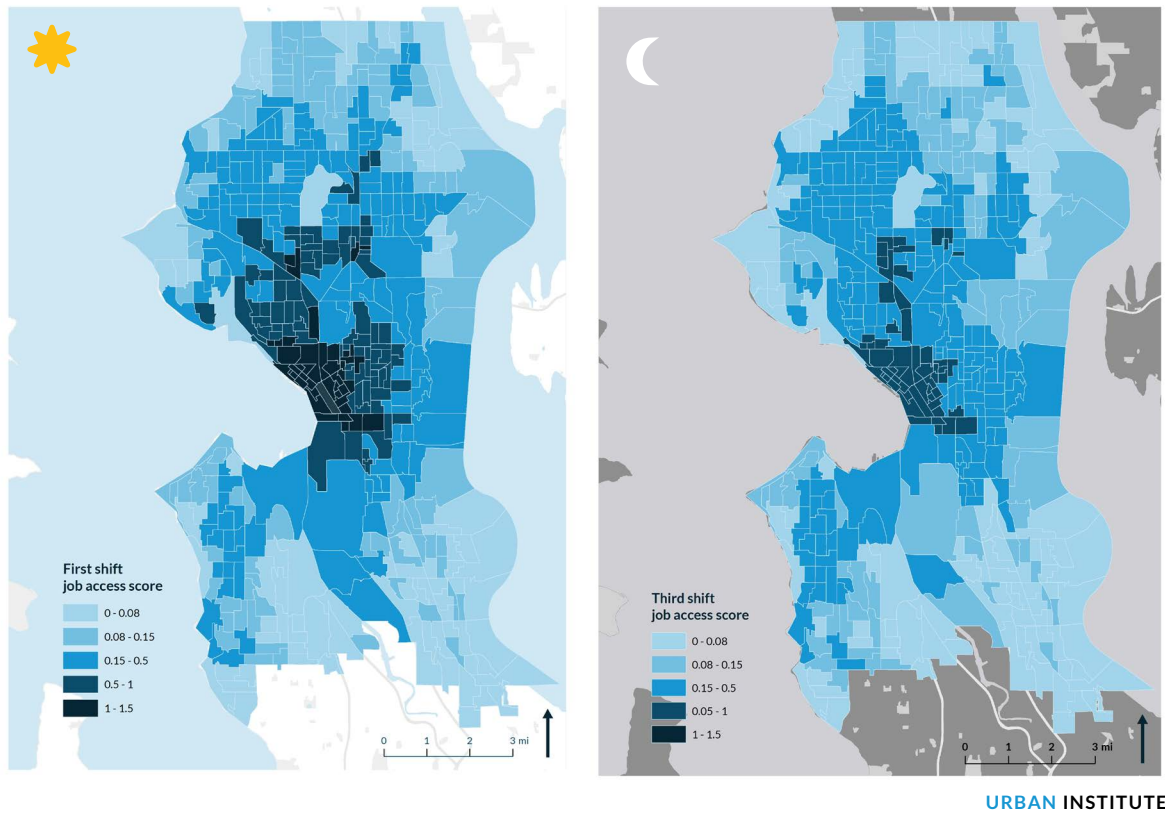
**First shift
job access score**
- 0 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.5 - 1
- 1 - 1.5

**Third shift
job access score**
- 0 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.05 - 1
- 1 - 1.5

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Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with greater access to jobs via public transit than other neighborhoods in our analysis.

FIGURE 10

Access to Jobs via Public Transit at Peak and Late-Shift Hours in Lansing and East Lansing

**First shift
job access score**
- 0 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.5 - 1
- 1 - 1.5
- No transit access

0   1   2   3 mi

**Third shift
job access score**
- 0 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.05 - 1
- 1 - 1.5

0   1   2   3 mi

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Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.

Note: Darker colors denote neighborhoods with greater access to jobs via public transit than other neighborhoods in our analysis.

FIGURE 11
Access to Jobs via Public Transit at Peak and Late-Shift Hours in Baltimore

First shift job access score
- 0.01 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.5 - 1
- 1 - 1.5

0 0.5 1 2 3 mi

Third shift job access score
- 0 - 0.08
- 0.08 - 0.15
- 0.15 - 0.5
- 0.5 - 1
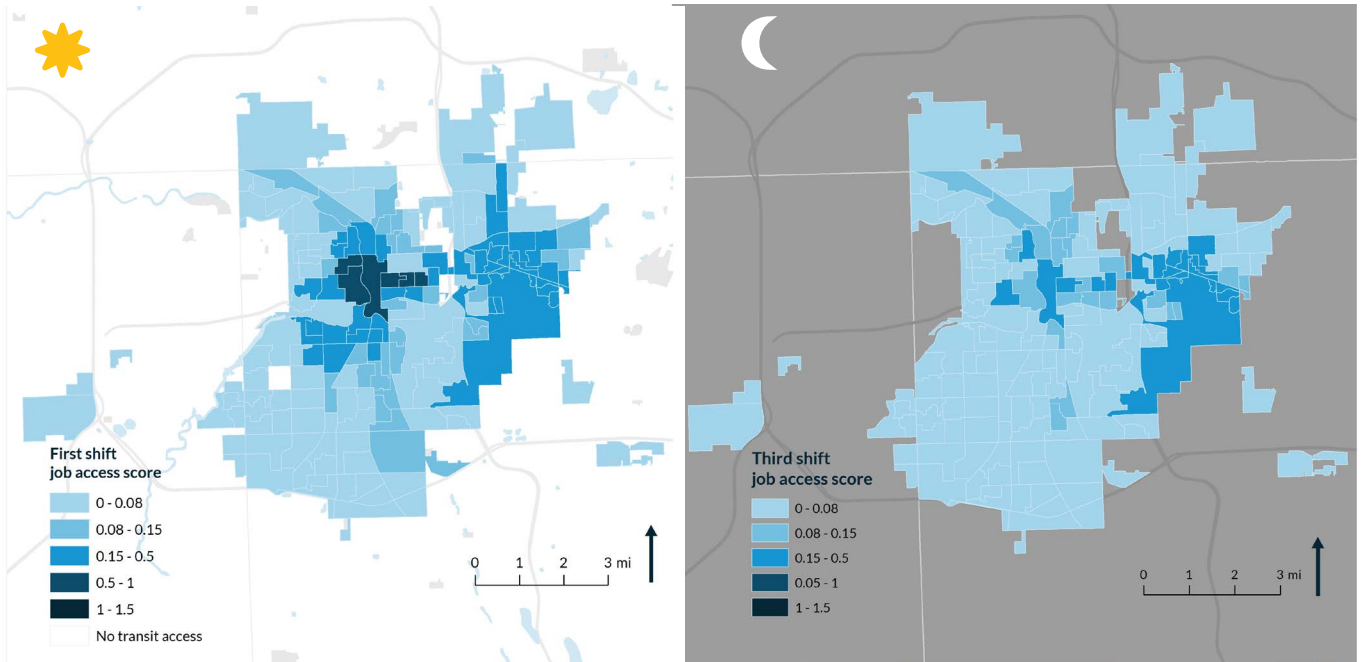- 1 - 1.5

0 0.5 1 2 3 mi

URBAN INSTITUTE

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.

Note: Darker colors denote neighborhoods with greater access to jobs via public transit than other neighborhoods in our analysis.

FIGURE 12

Access to Jobs via Public Transit at Peak and Late-Shift Hours in Nashville

First shift
job access score

0 - 0.08
0.08 - 0.15
0.15 - 0.5
0.5 - 1
1 - 1.5
No transit access

0   4   8   12 mi

Third shift
job access score

0 - 0.08
0.08 - 0.15
0.15 - 0.5
0.05 - 1
1 - 1.5
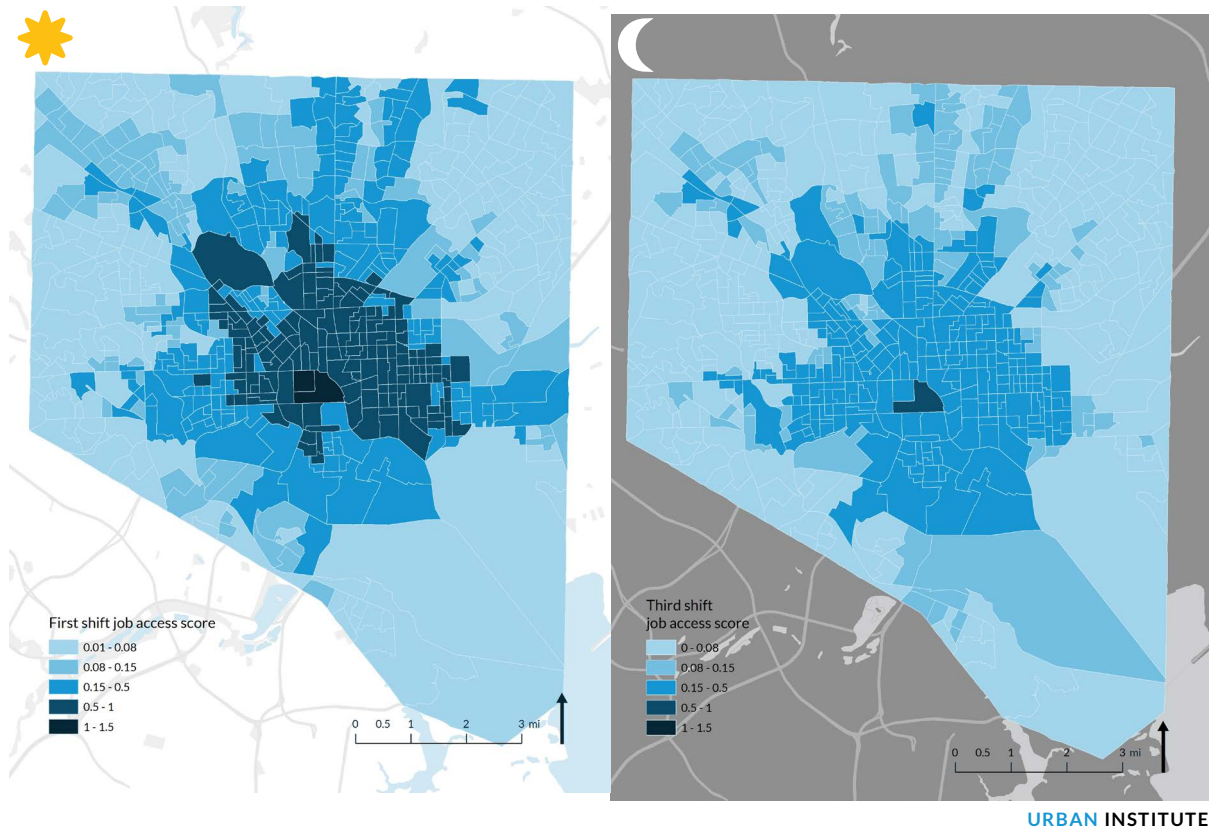No transit access
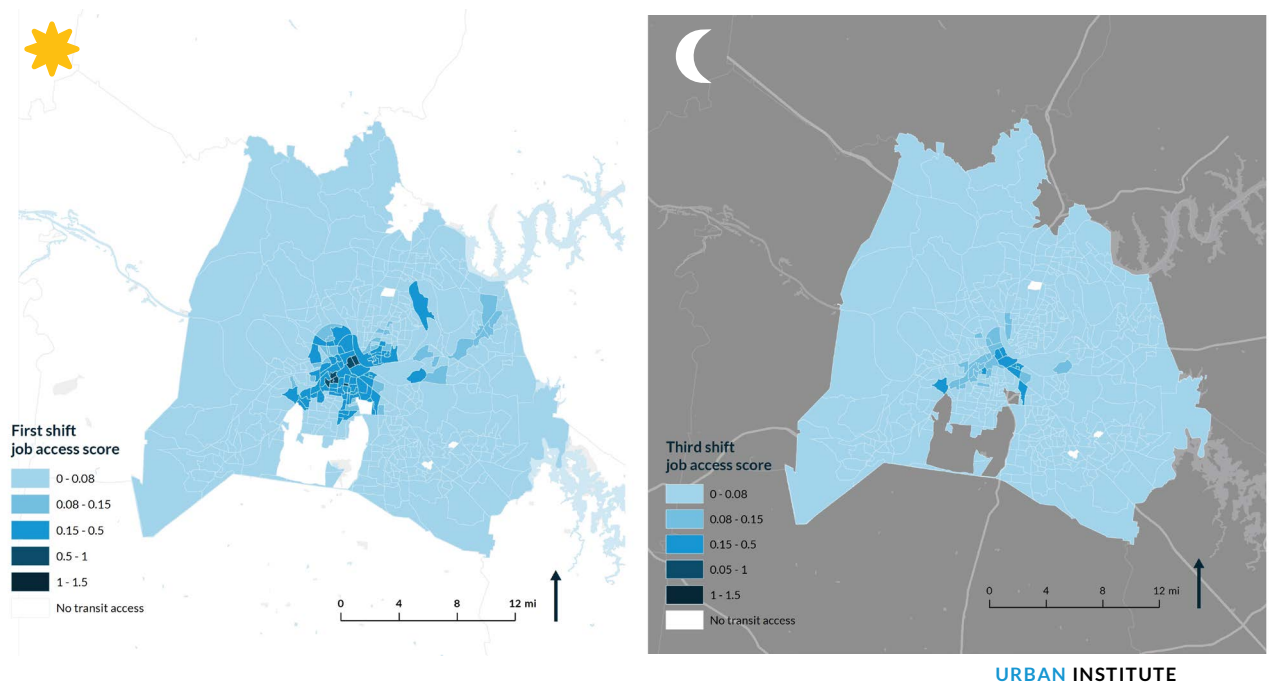
0   4   8   12 mi

URBAN INSTITUTE

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with greater access to jobs via public transit than other neighborhoods in our analysis.

For workers in Lansing and Nashville, car-centric cultures have helped limit job accessibility. Even though the Capital Area Transportation Authority (CATA) in Lansing offers bus routes and paratransit throughout the urban and rural areas of the metro region and the city was the first to adopt a non-motorized plan,[14] suburban low-wage workers without a car still lack access to jobs concentrated in the central city. In Nashville, rapid population growth has increase traffic congestion, but a local belief that public transportation is unsafe has made new investments challenging.

Transit-dependent workers in Seattle and Baltimore have relatively high access to jobs via public transit. The Seattle region has one of the largest public transit systems in the country and therefore has relatively high access to jobs for low wage workers via transit both during the day and at night, but region-specific challenges still pose issues for low-wage workers. In Seattle, a surge in its high-income population has created a lack of housing affordability near transit-rich areas, and in Baltimore, residential racial and income segregation makes connecting residents to amenities and opportunity points a challenge.

Some municipalities are considering new mobility technologies like ride sharing for flexible transportation services to serve low-income, transit dependent late-shift workers (Fedorowicz et al.

2020). Others have expanded existing routes to serve late night and early morning workers, like King County and Seattle who partnered to create the "Night Owl bus service." Although each region's individual characteristics will define what improvements are needed, more services like these can ensure that late shift workers have a safe, reliable way to get to work.

Increasing access to public transit is also important for people with disabilities, who are often transit dependent. Adults with disabilities are twice as likely to have inadequate transportation as adults without disabilities, and transportation challenges cause over half a million people with disabilities to never leave their homes.[15]

Across our four metro regions, very few transit agencies reported any information on wheelchair accessibility, and planners in each region reported that paratransit users felt restricted by the prescheduled pickups and wait times. More data is needed on the accessibility of transit systems because without it, local stakeholders will struggle to identify where investments are most needed.

How Do We Move toward a More Inclusive Transportation Network?

Metro regions across the country face pressing challenges in ensuring equitable access to opportunity for all citizens. Transportation can play a key role in addressing access disparities. However, metro regions face very different barriers to ensuring transportation equity. To create and implement solutions that increase opportunity, leaders need to understand the varying needs of individuals, neighborhoods, networks, and regions.

Additionally, although equity is increasingly part of transportation discussions, it is often undefined and understood differently among stakeholder groups. This can result in competing community priorities and unintentionally exacerbate disparities.

Although our case study regions face different needs and barriers, we found that transportation leaders and decisionmakers faced the common challenges of understanding what transportation equity means, giving weight to the voices of historically excluded and underserved groups, addressing the interconnectedness of housing and transportation, and lacking adequate funding and data.

Based on these findings, we identified six steps that cities can take to achieve equitable transportation goals:

1. Metro regions need to **define transportation equity in partnership with historically excluded residents**.

2. Transportation departments need **dedicated funding sources** to allow for equitable and innovative transportation decisions.

3. Transportation decisions need to **include meaningful community engagement** with low-income and other historically excluded residents.

4. Local land use, zoning, and housing agencies **must coordinate to ensure that transportation investments increase equity** rather than exacerbate disparities.

5. Land use planning (particularly relating to housing) **must keep equity as a guiding principle** to make equitable transportation feasible.

6. Cities should **collect better data to track transportation equity and work with partners to create tools to help them make transportation decisions** with equity as a key consideration.

While our study can help us understand the common barriers to providing transportation equity faced by four archetypical metro regions, as well overarching opportunities for increasing transportation equity, there are limitations. By prioritizing a deep dive into four places, we may have lacked the capacity or scope to identify challenges faced by other metro regions. By focusing on barriers to transportation equity, we also do not fully cover the innovative efforts by transportation leaders to address inequity. From activists in Nashville organizing for increased citywide funding to planners in Baltimore putting the needs of riders with disabilities first in the planning process, many changemakers are addressing the most pressing transportation challenges head on.

While this research offers a starting point and framework for improving transportation equity that can help cities increase equity in access to opportunity, cities could further benefit from better data and a toolkit of policy solutions to help them achieve increased equity. Too often, transportation decisions are made quickly and with limited resources, resulting in disparate access impacts. Readily available and relevant data that account for varied needs within metro regions can help push decisionmakers to put equity first.

Appendix A. Methodology

Interview Protocol Development

We created an interview protocol based on the following research questions:

- What are the unique challenges and barriers metropolitan regions face in providing equitable transportation to its residents?

- How are decisions made about transportation system planning?

- What's the most useful way to measure transportation equity to support decision making?

Identifying Interviewees

To fully capture the diverse voices and perspectives in the transportation space across our four selected metropolitan regions, we used a purposive sampling strategy that prioritized interviews with four key stakeholder groups: government officials, city planners, advocates, and other transit-related groups such as transit workers or riders. To identify and reach out to those stakeholder groups, we conducted a basic online scan of relevant organizations and employees in each metro region. We reached out to interviewees through multiple channels including email, phone, Twitter, LinkedIn, and Facebook.

We also used snowball sampling by following up with additional regional transportation stakeholders suggested by interviewees.

We offered a $100 Amazon gift card compensation for each advocate and nonprofit worker that participated in the interviews. We gave out nine gift cards in total.

Conducting Interviews

The interviews were confidential, and at the beginning of each interview, we asked for the person's permission to record the interview for note-taking purpose. The interviews took about 30–60 minutes depending on how much people want to share.

Recordings were then transcribed by Landmark Associates for analysis.

Analysis

We conducted 20 interviews. Transcripts were then coded and analyzed in Nvivo, based on the interview protocol. Nodes and subnodes were adjusted based on the major themes across all interviews.

Key themes were then summarized to help understand the project's three research questions.

Interviews by Region and Type

Region	Total	Government	Planner	Advocate	Transit worker/other
Baltimore	5	3	0	2	0
Nashville	5	0	1	4	0
Seattle	5	1	1	2	1
Lansing	4	1	1	1	1
DC/MISC	1	0	0	1	0

Convening

For additional input and insights, we invited at least one interviewee from each region to our convening in February, along with additional stakeholders that were not interviewed. We plan to incorporate suggestions and key takeaways from the convening to the report.

Appendix B. Supplemental Tables and Figures

Case Study Metropolitan Region Demographics

	Baltimore, MD		Lansing, MI		Nashville, TN		Seattle, WA	
	MSA	**City**	**MSA**	**City**	**MSA**	**City**	**MSA**	**City**
2018 population	2,802,789	620,961	481,893	115,222	1,932,099	654,187	3,939,363	688,245
Poverty rate (%)	10.10	22.40	14.50	27.10	11.60	17.20	8.70	12.50
MSA unemploy-ment rate (Dec. 2019) (%)	2.90	3.30	3.5	3.6	2.40	2.60	2.70	3.30
Median house-hold income ($)	80,469	46,641	59,494	38,642	34,879	52,858	87,910	79,565
Demographic information (%)								
White	56.00	27.60	76.00	55.10	72.00	55.60	62.00	65.30
Black	28.80	62.30	9	21	15.00	27.70	6	7
Hispanic or Latino (any race)	6	5	7.00	12.20	7.00	10.40	10.00	6.50
American Indian/ Alaska Native	0.20	0.20	0.00	0.30	0.00	0.30	1.00	0.50
Asian	5.60	2.60	5.00	3.70	3.00	3.60	14.00	14.40
Native Hawaiian and other Pacific Islander	0	0	0.00	0.00	0.00	0.10	1.00	0.40
Other	0.40	0.30	0.00	0.20	0.00	2.20	0.00	0.30
Two or more races (excluding Hispanic/Latino)	3.00	2.10	3.00	7.50	2.00	2.20	6.00	5.80

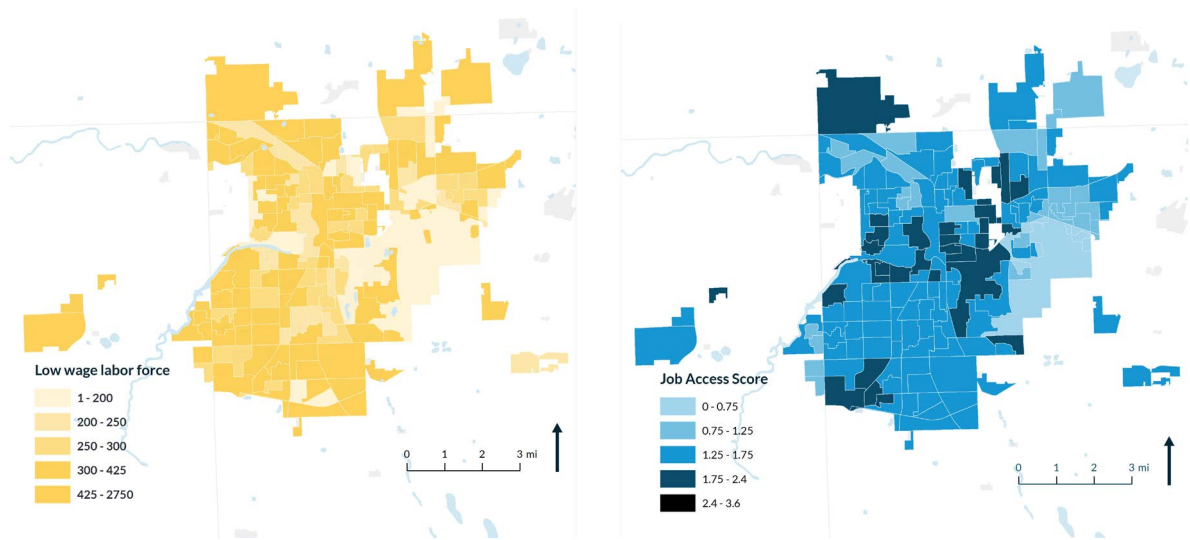**Job Accessibility and the Low-Wage Labor Force in Seattle**
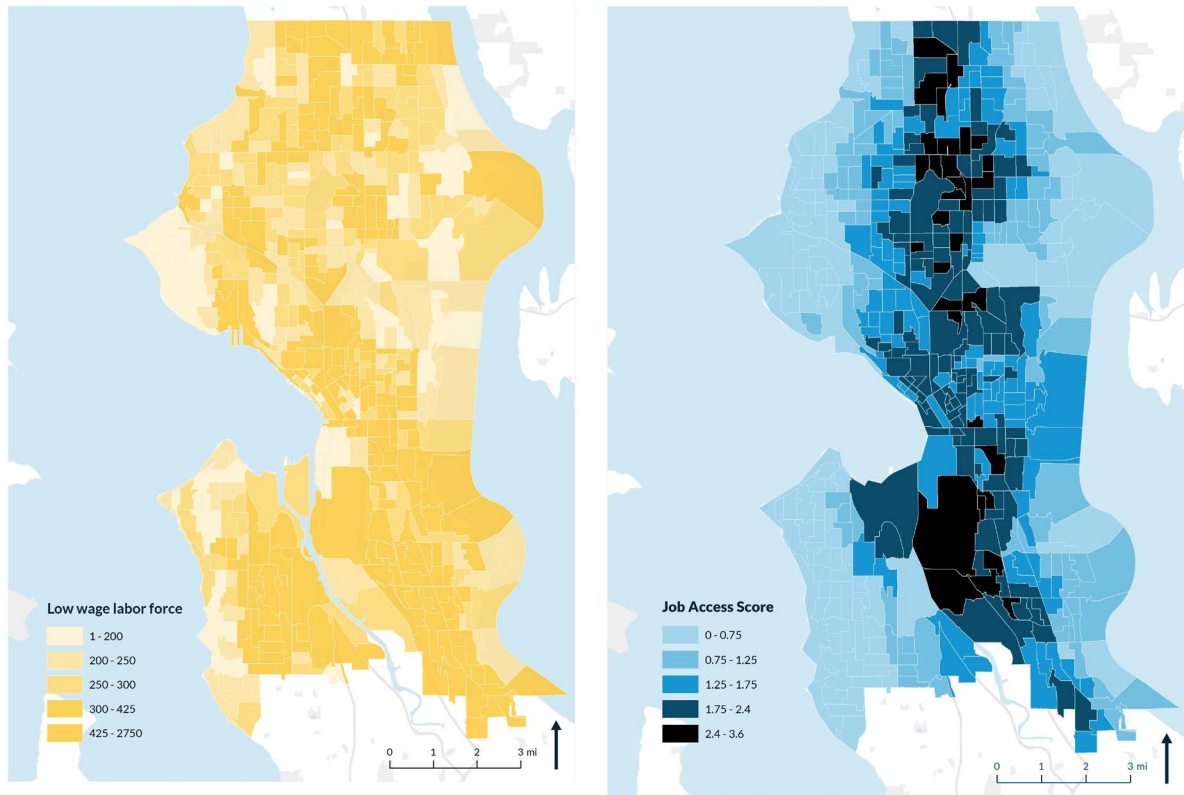
Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.

Note: Darker colors denote neighborhoods with a larger number of low-wage workers (left map) and better access to jobs (right map) than other neighborhoods in our analysis.

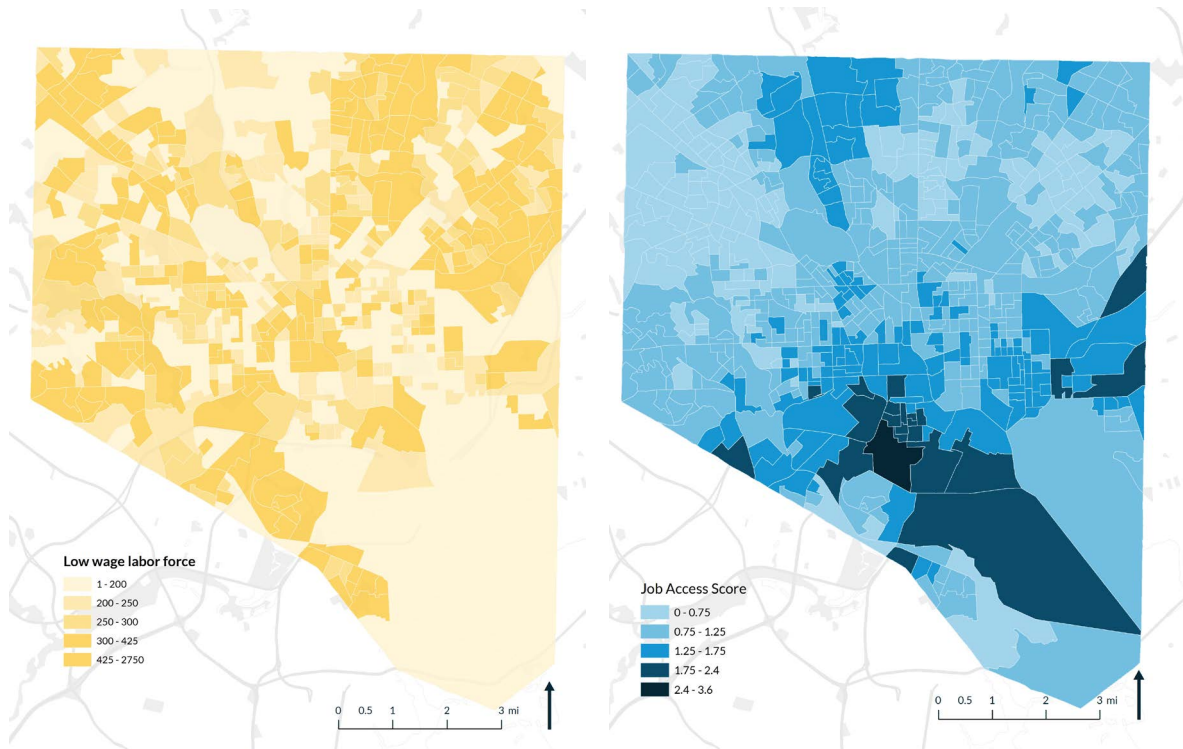**Job Accessibility and the Low-Wage Labor Force in Lansing and East Lansing**

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers (left map) and better access to jobs (right map) than other neighborhoods in our analysis.

Job Accessibility and the Low-Wage Labor Force in Baltimore

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers (left map) and better access to jobs (right map) than other neighborhoods in our analysis.

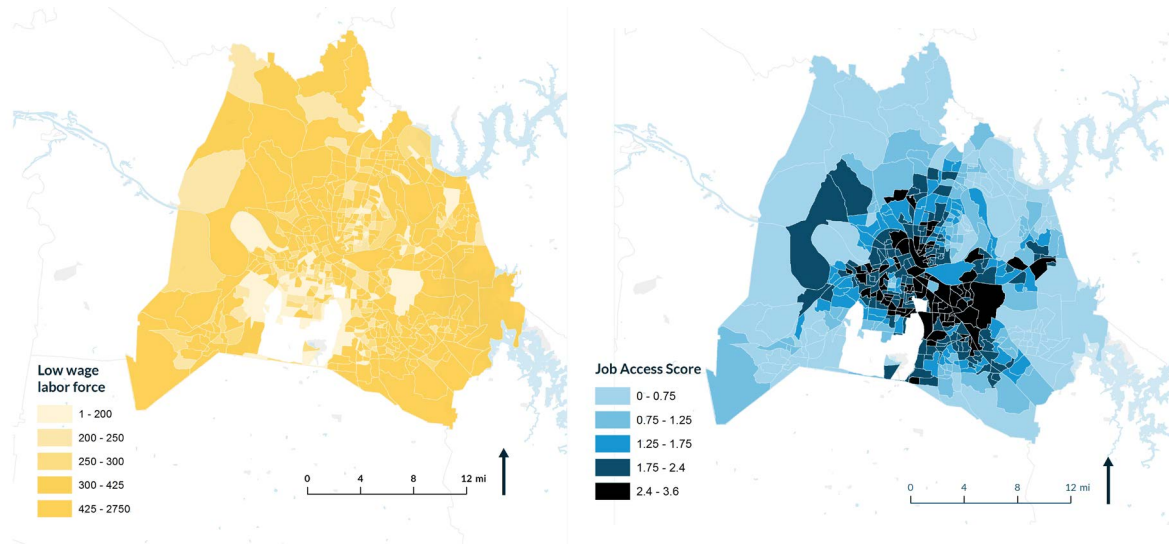**Job Accessibility and the Low-Wage Labor Force in in Nashville**

Source: Authors' analysis of LEHD data, decennial census data, American Community Survey data, and GTFS data.
Note: Darker colors denote neighborhoods with a larger number of low-wage workers (left map) and better access to jobs (right map) than other neighborhoods in our analysis.

Notes

1   Authors' calculation based on 2018 fare revenue data and operating expenses data from "The National Transit Database (NTD)," Federal Transit Administration, https://www.transit.dot.gov/ntd/ntd-data.

2   "Recommendation: Make Transit More Competitive," Chicago Metropolitan Agency for Planning, accessed May 18, 2020, https://www.cmap.illinois.gov/2050/mobility/transit.

3   Juan Pablo Garnham, "To Fight Huge Drop in Bus Riders, North Texas Transit Agency Faces Hard Choices about Who Gets Service," *Texas Tribune*, February 25, 2020, https://www.texastribune.org/2020/02/25/dallas-bus-ridership-plummeting-so-dart-wants-redraw-bus-routes-2020/.

4   The rise in global temperature from climate change is likely to reach 1.5 degrees Celsius (2.7 degrees Fahrenheit) between 2030 and 2052 if greenhouse gas (GHG) emissions continue to increase at the current rate (IPCC 2018). Light-duty vehicles, including passenger cars and small trucks, are the largest source of transportation emissions, with 59 percent of GHG emissions; rail and other modes make up 6 percent. In addition, GHG emissions in the transportation sector increased more in absolute terms than any other sector between 1990 and 2017 (EPA 2017).

5   Jorge Mejia and Chris Parker, "The Persistence of Driver Bias on Ride-Sharing Platforms," *LSE Business Review* (blog), London School of Economics and Political Science, July 31, 2018, https://blogs.lse.ac.uk/businessreview/2018/07/31/the-persistence-of-driver-bias-on-ride-sharing-platforms/.

6   See also Yipeng Su and Robin Wang, "Three Ways Bikeshare Can Counteract, Not Reinforce, DC's Disparities," *Urban Wire* (blog), Urban Institute, February 11, 2019, https://www.urban.org/urban-wire/three-ways-bikeshare-can-counteract-not-reinforce-dcs-disparities.

7   Don Anair, "Electrifying Ride-Hailing: Part 1 – Six Reasons Why Uber and Lyft Must Go Electric", Union of Concerned Scientists blog, January 17, 2020, https://blog.ucsusa.org/don-anair/electrifying-ride-hailing-part-1-six-reasons-why-uber-and-lyft-must-go-electric.

8   "Fiscal Impact Statement for Initiative 976," Washington State Office of Financial Management, undated document, retrieved from https://ofm.wa.gov/sites/default/files/public/budget/ballot/2019/FiscalImpactStatementInitiative976-093019.pdf.

9   King County Executive Dow Constantine, "I-976 Impacts to Seattle and King County: If No Replacement Funds, Major Cuts to Metro Service," news release, November 6, 2019, https://kingcounty.gov/elected/executive/constantine/news/release/2019/November/06-976-metro.aspx.

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11 ACS five-year 2013–18 data.

12 Lawrence Brown, "Two Baltimores: The White L versus the Black Butterfly," *Baltimore City Paper,* June 28, 2016, https://www.citypaper.com/bcpnews-two-baltimores-the-white-l-vs-the-black-butterfly-20160628-htmlstory.html.

13 Brett Theodos, Eric Hangen, and Brady Meixell, "'The Black Butterfly': Racial Segregation and Investment Patterns in Baltimore," Urban Institute, February 5, 2019, https://apps.urban.org/features/baltimore-investment-flows/.

14 "Non-Motorized Plan," City of Lansing, Michigan, accessed September 24, 2020, https://www.lansingmi.gov/2045/Non-Motorized-Plan.

15 "Equity in Transportation for People with Disabilities," Leadership Conference Education Fund, undated document, http://www.civilrightsdocs.info/pdf/transportation/final-transportation-equity-disability.pdf.

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