

Advancing Transportation Equity: Research and Practice

Leoma Van Dort, Andrew Guthrie, Yingling Fan*
Humphrey School of Public Affairs

Gina Baas
Center for Transportation Studies

University of Minnesota

Final Report 19-08
February 2019

** corresponding author; yingling@umn.edu*

Technical Report Documentation Page

1. Report No. CTS 19-08	2.	3. Recipients Accession No.	
4. Title and Subtitle Advancing Transportation Equity: Research and Practice		5. Report Date February 2019	
		6.	
7. Author(s) Leoma Van Dort, Andrew Guthrie, Yingling Fan, and Gina Baas		8. Performing Organization Report No.	
9. Performing Organization Name and Address Center for Transportation Studies University of Minnesota University Office Plaza 2221 University Ave. SE Minneapolis, MN 55414		10. Project/Task/Work Unit No. CTS#2018067	
		11. Contract (C) or Grant (G) No. (C) 1003325 (WO) 82	
12. Sponsoring Organization Name and Address Minnesota Department of Transportation Research Services & Library 395 John Ireland Boulevard, MS 330 St. Paul, Minnesota 55155-1899		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes http://www.cts.umn.edu/Publications/ResearchReports/			
16. Abstract (Limit: 250 words) Transportation contributes to many societal outcomes, including employment, health, and wealth. However, disparities and inequities in transportation systems, services, and decision-making processes disproportionately impact underserved and underrepresented communities. This study seeks to create a better understanding of current research and practice and recommend future research and practice that can advance transportation equity in Minnesota. To that end, the research team conducted a literature review that summarizes recent developments in the field of transportation equity, reviewed existing equity-focused programs within and beyond the transportation sector, and engaged multiple stakeholder groups, including a project advisory group with experts in addressing disparities and inequities, a group of transportation users and equity stakeholders, and community members. The study presents a working definition of transportation equity, recommends action steps for MnDOT and its partners to consider in advancing transportation equity, and identifies directions for future research and practice that can advance transportation equity in the state of Minnesota.			
17. Document Analysis/Descriptors multimodal transportation, equity, accessibility, community action programs		18. Availability Statement No restrictions. Document available from: National Technical Information Services, Alexandria, Virginia 22312	
19. Security Class (this report) Unclassified	20. Security Class (this page) Unclassified	21. No. of Pages 81	22. Price

ADVANCING TRANSPORTATION EQUITY: RESEARCH AND PRACTICE

FINAL REPORT

Prepared by:

Leoma Van Dort
Andrew Guthrie
Yingling Fan*
Humphrey School of Public Affairs
University of Minnesota

Gina Baas
Center for Transportation Studies
University of Minnesota

**corresponding author; yingling@umn.edu*

FEBRUARY 2019

Published by:

Center for Transportation Studies
University of Minnesota
University Office Plaza, Suite 440
2221 University Avenue SE
Minneapolis, MN 55414

This report represents the results of research conducted by the authors and does not necessarily represent the views or policies of the Minnesota Department of Transportation nor the University of Minnesota. This report does not contain a standard or specified technique.

The authors, the Minnesota Department of Transportation, and the University of Minnesota do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to this report.

ACKNOWLEDGMENTS

The authors would like to thank Minnesota Department of Transportation staff Katie Caskey, Keith Mensah, and Philip Schaffner who have been instrumental in providing guidance for this report. We also thank the project advisory group: Fernando Burga, Humphrey School of Public Affairs; Lars Christiansen, Augsburg University; Max Kaufman, Southwest Regional Development Commission; Lauren Martin, Robert J. Jones Urban Research and Outreach-Engagement Center; Kathleen Mayell, City of Minneapolis; Andrew Owen, Center for Transportation Studies; Ken Rodgers, Minnesota Department of Transportation; Heidi Schallberg, Metropolitan Council, Ted Schoenecker, Ramsey County, and Catherine Sullivan, St. Catherine University for providing valuable insight and feedback on drafts of this report. We are also indebted to Kaydee Kirk from the Center for Transportation Studies for her assistance in coordinating all efforts related to this project.

TABLE OF CONTENTS

CHAPTER 1: Introduction	1
CHAPTER 2: Literature Review	3
2.1 Definitions of transportation equity	3
2.1 Structural inequities and their transportation components	4
2.2 Specific transportation inequities and policies to address them	9
CHAPTER 3: State of the Practice Review	16
3.1 Approach	16
3.1.1 Programs	17
3.1 Results	20
1.1.1 Scale	20
3.1.1 Equity perspectives	22
3.1.2 Direction of Transportation Equity Approach	23
3.2 In-depth examination of selected programs	25
3.3 Examination of selected programs of Minnesota nonprofits	27
3.4 Discussion	29
CHAPTER 4: Stakeholder Engagement	31
4.1 Defining Transportation Equity	34
CHAPTER 5: Recommendations	36
5.1 Overarching themes	36
5.2 Recommendations	37
CHAPTER 6: Research Road Map	44
6.1 Under-researched areas	44
6.2 Potential research programs	47

REFERENCES	50
------------------	----

APPENDIX A: Complete Program List

APPENDIX B: Recommendations, target population(s), mode(s) impacted, and implementation

LIST OF FIGURES

Figure 4.1: Modes of transportation that are difficult to use to reach destinations.....	34
--	----

Figure 4.2: Transportation equity key words identified by stakeholders and community members	34
--	----

LIST OF TABLES

Table 3.1: Programs examined	17
------------------------------------	----

Table 3.2: Typology of transportation equity programs by primary activity and scale	21
---	----

Table 3.3: Typology of transportation equity programs by primary activity and equity perspective	23
--	----

Table 3.4: Typology of transportation equity programs by primary activity and equity approach.....	23
--	----

Table 4.1: Responses to focus group questions and number of responses	32
---	----

Table 4.2: Responses to survey questions: What needs to be improved	33
---	----

EXECUTIVE SUMMARY

Following the Statewide Multimodal Transportation Plan update in 2017, the Minnesota Department of Transportation (MnDOT) launched the Advancing Transportation Equity initiative to better understand how the transportation system, services, and decision-making processes help or hinder the lives of underserved and underrepresented communities in Minnesota. This report is part of the initiative's research component that aims to examine the current research and practice in the field and recommend future research and practice that can advance transportation equity in the state of Minnesota.

To this end, the researcher team conducted a literature review to summarize recent developments in the field of transportation equity and reviewed existing equity-focused programs within and beyond the transportation sector. The research team engaged an advisory group that included MnDOT staff, other government agency staff, university researchers, and external community partners who have expertise in addressing disparities and inequities. Researchers also sought direct input from local communities by hosting gatherings in the form of focus group discussion and from intercept surveys used at existing community events. These community engagement activities provided insights into the transportation-related barriers that have negatively affected underserved and underrepresented communities and what transportation equity means to these communities. Based on the community input we received, we developed the following working definition of equitable transportation:

- *Transportation systems* that support multi-modal options that are affordable, sustainable, reliable, efficient, safe, and easy to use;
- *Quality transportation services* that are accessible to all populations for reaching destinations independently if needed; and
- *Transportation decision-making processes* that incorporate inclusive public engagement to reduce the longstanding socioeconomic disparities experienced by underserved and underrepresented communities.

A review of the literature found that transportation equity can be defined in a variety of ways. The broader societal-level structural inequities have made specific population groups face disproportionate transportation barriers. Popular transportation equity concepts focus on the notion of being “compensatory”—compensating for specific inequities by providing more resources to those specific population groups who have greater and more complex transportation needs. However, recent developments in the literature suggest that efforts to advance transportation equity need to focus on (1) the structural inequities built into our communities, such as segregation and discrimination, automobile dependency, and user-pay transportation finance practices as well as (2) the specific transportation inequities that affect neighborhoods, individuals, and groups of individuals due to their racial/ethnic identity, income, ability, gender, age, and where they live.

A review of current practices highlighted twenty-four programs from across the country that aimed to improve transportation equity. To better understand what these programs do, who is involved, and

what they hope to accomplish, the researchers categorized the programs in terms of the scale at which they are organized (federal and state agencies, local governments, metropolitan planning organizations, nonprofits, and transportation agencies); the dimension of primary activities (coordination, evaluation, implementation, mapping, planning, and Title VI compliance); the equity perspective (compensatory, geographic, or procedural equity), and the direction of approach (addressing inequities of transportation system and/or addressing social inequities via transportation).

Based on the literature and practice review as well as community feedback from engagement events, the research team proposed recommendations for MnDOT and other transportation partners to consider in advancing transportation equity. The recommendations were categorized under six overarching themes:

1. Designing engagement processes that facilitate community leadership and the inclusive participation of traditionally underserved and underrepresented communities, where community members drive conversations around their transportation needs and strategies for implementing solutions;
2. Supporting programs and policies that increase access to social and economic opportunities, such as jobs, affordable housing, healthy food, education, health care, and recreation, particularly for underserved and underrepresented communities;
3. Creating policies and programs that support active transportation and provide safe, smart, and affordable transportation alternatives that minimize automobile dependency to create healthier, more sustainable communities;
4. Integrating equity promotion as a standardized practice at the agency and program level, particularly in prioritizing spending across the system and distributing infrastructure projects;
5. Collaborating and coordinating across transportation and non-transportation agencies, institutions, and organizations, including academic institutions, to improve considerations of equity while leveraging existing programs and policies that advance transportation equity; and
6. Incorporating both quantitative and qualitative metrics for evaluating transportation programs and projects as well as their impacts on underserved and underrepresented populations.

The recommendations are directed toward addressing social inequities via transportation as well as inequities of the transportation system. To help MnDOT and other transportation stakeholders prioritize among the recommendations, the report identifies for each recommendation which underserved and underrepresented populations are most likely to benefit and what mode(s) of transportation it impacts. The final section of the report includes research problem statements for under-researched areas and identifies future research directions. The under-researched areas identified for future research include (1) implementation strategies and outcomes of existing transportation equity efforts, (2) outcome evaluation metrics related to equity that include both quantitative and qualitative measures, (3) disparities faced by older adults, people with sensory and/or cognitive disabilities, single-parent households, and tribal communities, (4) effective community engagement methods that lead to ongoing long-term relationships, (5) strategies for making new mobility options, including automated vehicles

more equitable, (6) equity considerations in freight planning, (7) impacts of racial bias in traffic enforcement and transit policing, and (8) specific opportunities for advancing transportation equity in rural Minnesota.

While great challenges remain in identifying and addressing transportation inequities in Minnesota, MnDOT's Advancing Transportation Equity initiative presents a unique opportunity to lay the groundwork for a new, collaborative approach. This report proposes new strategies and activities for MnDOT and its partners to consider in making meaningful change and reducing longstanding disparities experienced by underserved and underrepresented communities.

CHAPTER 1: INTRODUCTION

In Minnesota, we face several inequities related to transportation as a result of societal structures that are built into the very fabric of our cities. Racialized spatial segregation, including policies that support sprawling development patterns and highway construction, have led to automobile dependency and increasing transportation costs (Bullard et al., 2004; Fan, 2012; Giuliano, 2011; Rubin, 2009). The user-pay principle that governs the current transportation finance system also places a cost burden on individual travelers (Zhao, Vardhan Das, & Becker, 2010). Additionally, there are specific transportation inequities that affect neighborhoods, individuals, and groups of individuals due to their racial/ethnic identity, income, ability, gender, age, and geographical location (Bullard et al., 2004; Fan & Huang, 2011; Katzmann, 2010; Levy, 2013; Nutley, 1996; Sullivan, et al., 2009). Research also shows that transportation inequities disproportionately impact underserved and underrepresented communities. According to the Minnesota Department of Employment and Economic Development, in 2017 transportation was the second highest household cost in Minnesota, where a family of three spent an average of \$869 per month on transportation for basic living needs. High transportation costs are particularly burdensome for low-income households because increasing transportation costs prevent households from spending adequately on other needs such as housing, food, health care, and education. Transportation disparities and inequities also limit people's ability to access positive societal outcomes including health, education, employment, and wealth.

Having recognized that the incorporation of strategies that advance equity can reduce disparities among different segments of the population and lead to a transportation network that better serves all residents, the Minnesota Department of Transportation (MnDOT) launched the Advancing Transportation Equity initiative. The primary goal of the initiative is to better understand how the transportation system, services, and decision-making processes help or hinder the lives of people in underserved and underrepresented communities in Minnesota. Specifically, the project aims to identify key actions that transportation agencies like MnDOT and their partners can take to make meaningful change. The initiative, in general, focuses on the following underserved and underrepresented communities:

- Communities underrepresented in transportation processes;
- Communities experiencing known inequities in access or outcomes; and
- Communities with unique transportation needs not well served by a business-as-usual approach.

Recent developments in the literature suggest that efforts to advance transportation equity need to focus on (1) the structural inequities built into our communities, such as segregation and discrimination, automobile dependency, and user-pay transportation finance practices, as well as (2) the specific transportation inequities that affect neighborhoods, individuals, and groups of individuals due to racial/ethnic identity, income, ability, gender, age, and geography. Following the literature review and multiple community engagement activities seeking community input, we identify specific underserved and underrepresented communities in the state of Minnesota, including low-income communities,

communities of color, indigenous communities, older adults, people with disabilities, women and youth, rural residents, and people with limited car access.

We further identify transportation-related barriers that have negatively affected underserved and underrepresented communities and the meaning of transportation equity as it relates to these communities. Transportation equity, however, is a broad concept that can be defined in multiple ways. Considering the local community input we received, we define equitable transportation as the following:

- *Transportation systems* that support multi-modal options that are affordable, sustainable, reliable, efficient, safe, and easy to use;
- *Quality transportation services* that are accessible to all populations for reaching destinations independently if needed; and
- *Transportation decision-making processes* that incorporate inclusive public engagement to reduce the longstanding socioeconomic disparities experienced by underserved and underrepresented communities.

The following report reviews existing literature and equity-focused programs to summarize recent developments in the field of transportation equity within and beyond the transportation sector. Based on the current research and practice in the field as well as community input, the project recommends action steps for MnDOT and its partners to consider in advancing transportation equity and identifies directions for future research and practice that can advance transportation equity in the state of Minnesota.

CHAPTER 2: LITERATURE REVIEW

Equity is a prominent concept in transportation scholarship. It is also a concept that can be defined in a variety of ways. Policymakers who are interested in promoting transportation equity often need to clarify and define what constitutes “equity”. This chapter begins by exploring various definitions and ways of realizing equitable transportation policy, examines structural inequities in society that relate to transportation, then considers specific transportation equity planning issues and practices.

2.1 DEFINITIONS OF TRANSPORTATION EQUITY

In the broadest sense, equity can be defined as how fair the distribution of costs and benefits is for a given action (Litman, 2018). More specifically, equity in the transportation field is frequently broken down into *horizontal equity*—the equal distribution of costs and benefits between people with equal abilities and equal needs—and *vertical equity*—which seeks to compensate for the inequalities between groups by imposing greater costs on those of greater abilities and providing greater benefits to those with greater needs (Thoebald, 2001). Litman (2018) further divides vertical equity into subcategories focused on income and social class versus mobility need and ability in recognition that members of the same race and class may have very different needs to travel and/or abilities to use different modes.

Equity is not necessarily synonymous with equality, though substantive equality—in which everyone experiences equal distribution of resources—is one theoretical formulation of equity (Vardigan, Heus, & Thomas, 2008). Another such theoretical formulation—compensatory equity—does not refer to all individuals experiencing the same overall outcome (Thomas & Bertolini, 2015; Vardigan et al., 2008). Rather, compensatory equity considers how much and in what direction a given social structure, decision or policy affects those overall outcomes (Taylor, S., 1970) with the intent of providing resources to all commensurate with individual need. This understanding of equity focuses specifically on the fairness of actions that affect the distribution of power and resources more than on the fairness of that distribution in an absolute sense. Talen (1998) also puts forward two additional conceptions of equity relevant to planning. One conceives of equity as distribution of specific resources commensurate with local demand for them. (Under this framework, neighborhoods with higher density and lower automobile ownership should have more transit service, for example.) The other considers equity in terms of willingness to pay for access to a given resource, on the theory that willingness to pay for something corresponds to how strongly it is needed or desired. (This conception of equity would be served by tolled express lanes on freeways, where motorists willing to pay a nominal fee for a less-congested road have access to one.)

In other words, substantive equality describes a state, whereas the other three concepts of equity discussed here describe processes which produce that state. This focus on actions and persistent structures in evaluating equity also allows for the consideration not only of individuals’ and groups’ differing access to resources, but also their relationships to social, state and economic power (Jacques, Manaugh, & El-Geneidy, 2013).

Historically, the consideration of equity at the societal level in transportation planning first came to prominence in its modern form in the time of the civil rights movement and the freeway revolts of the 1960s and 70s (Tilahun, N. & Levinson, 2009). Growing out of a recognition that principles of recently-enacted civil rights law required a redress of racially and economically disparate impacts and benefits of previous transportation policies, direct consideration of equity in transportation planning processes marked a departure from an earlier narrow focus on individual-level procedural fairness, as in eminent domain proceedings, etc. (Tilahun, N., Levinson, & Krizek, 2007). Planning for equity requires a recognition that procedures which are individually fair can be socially inequitable depending on what groups of people they affect. For example, a heavy focus on horizontal equity might lead to equal per-capita spending on suburbs and inner-city neighborhoods. In one sense, this scenario would be equitable in that all individuals would experience an equal level of investment. However, in the context of exclusionary suburbs benefitting from historically disproportionate infrastructure investment and formerly redlined neighborhoods suffering from historic disinvestment, equal per-capita resources would not support compensatory equity at the community level. Compensatory equity might require the disproportionate direction of resources to historically disinvested communities if historic disinvestment continues to negatively affect current residents.

2.2 STRUCTURAL INEQUITIES AND THEIR TRANSPORTATION COMPONENTS

Applying the concept of equity to planning and policy decisions also calls for a focus on societal structures which reliably produce unfair (or less fair) outcomes. These structures are built into the very fabric of American cities, and transportation figures prominently in many of them.

Segregation and its consequences

Particularly in metropolitan areas, racialized spatial segregation stands out among structural inequities related to transportation. *De facto* spatial segregation arose primarily out of two practices of the real estate sector. The first, redlining, aimed to protect property values in white neighborhoods and extract exorbitant rents from Black neighborhoods by restricting housing available to Black residents to isolated ghettos through unfair mortgage lending, exploitive contract-for-deed sales, discriminatory rental approval practices, and refusals to even show housing units in other areas to prospective Black residents. The second, block busting, aimed to reap windfall profits from white flight by stoking racial (and property value) anxiety. A common strategy was to deliberately rent a home in a white neighborhood to an unknowing Black family often below market rate, then buy other homes in the neighborhood well below market value when white households sold at a loss as former geographic color lines became permeable. Finally, those homes could be rented or sold at a significant profit to Black families moving in. While these practices deployed racism in very different ways, both had the effect of producing racially segregated neighborhoods and extracting wealth from inner city residents (Kuhnimhof et al., 2012; Taylor, B., Miller, Iseki, & Fink, 2009), metropolitan spatial segregation was strongly enabled by massive investments in freeways connecting cities with exclusionary suburbs (Tilahun, Nebiyu, Thakuria, Li, & Keita, 2016; Tomer, 2012).

It is important to note that the process of white flight occurred during a broader trend of suburbanization driven by a variety of factors including population growth, technological change enabling higher travel speeds and particularly federal housing and fiscal policy encouraging home ownership and suburban development (Winters, 2014; Wohlwill, 1996). These metropolitan form changes, partly enabled by automotive transportation, broadened the availability of both home ownership and single-family homes in general. While racially discriminatory policies and practices effectively restricted most new suburban housing to white families (Kuhnimhof et al., 2012), Black homeownership grew as well, due to falling property values in central cities (Woldeamanuel & Kent, 2015). These differing paths to homeownership for Black and white families, however, led to a much more robust cycle of inter-generational wealth building for the latter than for the former (Kuhnimhof et al., 2012).

Though no longer present, *de jure* racial segregation of public transportation in Southern states contributed to transportation inequality as well. Given the continuous indignity Black riders were subjected to, transit, along with other public accommodations, naturally became a focus of the civil rights movement and a contributor to racial tension. In addition to pushing Black transit users to buy cars as soon as possible as a way to opt out of segregated public transit (Venner & Ecola, 2007), the end of *de jure* segregation would eventually contribute to *de facto* spatial segregation as well.

Though white migration to suburbs designed for exclusivity and around the automobile began as early as the 1920s (partly in response to the Great Migration of southern Blacks moving north to escape racial violence and pursue greater economic opportunities) (Venter & Behrens, 2005), it accelerated following the end of legal segregation in the South, and in response to active programs of school desegregation nationwide (Vigdor, Massey, & Rivlin, 2002). (Earlier, streetcar-driven suburbanization, the dominant form through the 1920s, mostly preceded the Great Migration (Chen, Rufolo, & Dueker, 1998; Cherlow, 1981), before which the Black populations of northern cities were generally small. Southern cities at the time relied primarily on *de jure* segregation to maintain white supremacy (Kuhnimhof et al., 2012).) This radical change in the spatial distribution of race, wealth, and political power in metropolitan regions directly contributed to a heavy planning (and public funding) focus on exclusionary, automobile-dependent suburbs. This planning focus further disadvantaged Black residents, due to low automobile ownership rates (Kain, 1968; Kain, 2004) and deepened the spatial segregation of the American metropolis.

This pattern of spatial segregation (Bullard, R., Johnson, & Torres, 2004) and suburban automobility, when combined with a long-term trend of employment suburbanization, produces the phenomenon of spatial mismatch. Housing segregation, comparatively low automobile ownership among marginalized inner-city residents, job sprawl and poor or non-existent suburban transit service disconnects many Black workers from the living wage jobs they are most likely to be qualified for (Kain, 1968; Kain, 2004). Despite the Fair Housing Act of 1968 and decades passing since the end of formal redlining, spatial mismatch remains a persistent problem even in the face of a wide variety of planning efforts to mitigate it (Blumenberg & Schweitzer, 2006; Fan, 2012; Guthrie, Fan, & Burga, 2018; Rubin, 2009).

Spatial mismatch leads to long-term unemployment, longer periods of temporary unemployment and less resilience in the face of employer relocations (Andersson, Haltiwanger, Kutzbach, Pollakowski, & Weinberg, 2014) and can effectively prevent disadvantaged workers from reaching even the first rung of a career ladder, so to speak. The impacts of spatial mismatch are now understood to be more complex than the Black-white racial framework it grew out of, as well. For example, the effects of spatial mismatch can be compounded for women due to complex travel patterns and caregiving obligations (Blumenberg, 2004). Though also driven by patterns of land use and economic development, spatial mismatch is specifically connected to transportation inequity in two ways: First, by constraining the income of workers who would need a car to access improved economic opportunity, it makes it difficult for them to afford that car. Second, by constraining the income of car-less inner-city workers, spatial mismatch limits their economic ability to live anywhere but the inner city and enables the exclusivity of automobile-dependent suburbs, thus deepening spatial segregation.

Spatial mismatch highlights two broad social structures that contribute to inequity as well: the uneven distribution of accessibility between different locales and the fact that regardless of geography, functional accessibility is generally contingent upon a significant individual contribution to the cost of providing it. Specifically, in the U. S. context, access to an automobile is a prerequisite for high accessibility in the overwhelming majority of places. While automobile infrastructure receives significant public subsidy, any accounting of the full cost of automotive transportation must include the automobile itself, as well as its operation and maintenance. This fact imposes significant costs on individual users regardless of their ability to pay (Fan & Huang, 2011).

Spatial segregation also leads to an inequitable distribution of the negative externalities of transportation, particularly freight transportation. Ports, truck transfer facilities, and truck routes are often sited in low-income, minority neighborhoods. While the location of freight facilities in low-income communities of color can partly be explained by depressed rents and property values attracting residents who cannot afford to live elsewhere, there is clear empirical evidence of the disproportionate siting of new facilities in such communities due to political disempowerment and desperation for economic development (Pastor, Sadd, & Hipp, 2001). Residents living in close proximity to truck transfer facilities and truck routes are disproportionately exposed to environmental hazards, in the form of diesel emissions from heavy trucks, leading to a wide variety of health problems and contributing to premature deaths (Houston, Krudysz, & Winer, 2008). Though freight railroading produces very low overall emissions due to large economies of scale, those emissions are highly concentrated around yards and heavily-used mainlines, both of which are disproportionately located in marginalized communities (Gould & Niemeier, 2009). Patterns of heavy industry co-locating with freight transportation infrastructure also increase low-income people of color's exposure to other environmental hazards and toxins, including air, water and soil pollution (Bullard, Robert D. & Lewis, 1996; Morello-Frosch, Pastor, & Sadd, 2001).

Inequities of automobile dependency

In the United States, automobile ownership has become crucial to full participation in society due to decades of mobility-focused transportation planning. Mobility-focused planning, which focuses on travel

speeds and congestion relief rather than destinations reachable, tends to prioritize high-speed modes such as the automobile, which requires low-density development—and thus poor accessibility by other modes—to achieve its maximum mobility. Accessibility-focused planning, in contrast, focuses on the number of destinations one can reach in a given amount of time by a variety of modes (Levinson & Krizek, 2005). To be sure, mobility is a crucial component of accessibility. All else equal, higher mobility will increase accessibility; however, high mobility areas tend towards lower densities, thus lowering accessibility. Accessibility-focused planning can also account for the benefits of dense urban forms which are more easily served by non-automotive modes (Levine, Grengs, Shen, & Shen, 2012).

As a result of this planning focus on the automobile in ways that seriously disadvantage other modes, many households can be seen as experiencing forced car ownership (Preston, 2009). This view represents something of a departure from traditional conceptions of transportation disadvantage. In particular, transit dependency is frequently employed as a benchmark measure of disadvantage—with the implication that automobile ownership can be considered a net advantage. Recent research on the full costs of owning and using a car, however, casts doubt on this understanding, holding that in many circumstances, captive drivers experience significant disadvantages along with captive transit riders (Johnson, Currie, & Stanley, 2010).

Car ownership is essentially forced on large numbers of individuals due to the current scarcity of areas that are highly accessible by other modes (Fan, Guthrie, & Levinson, 2011; Levinson & Krizek, 2005). This problem is compounded by the fact that the industries which create most of the living wage jobs for which disadvantaged workers are likely to be qualified produce built forms which are inherently difficult to serve with public transit (Grengs, 2010; Karner, 2018). In addition, a heavy focus on commute trips in transit planning and on automobility in residential area land use planning means that people without access to an automobile often experience even lower accessibility to important non-work destinations, essentially excluding them from full participation in society (Grengs, 2015).

These inequities are compounded for individuals who are unable to drive due to physical disability, visual impairment or other reasons. Not only are these individuals unable to take advantage of private transportation, they were also historically excluded from public transportation, due to vehicle, stop and station designs which assumed able-bodied passengers and made no access provisions for those who were not. Even pedestrian infrastructure commonly failed to accommodate people in wheelchairs or with other mobility limitations. Social provision for independent mobility was and is a key demand of activists among the disabled community, leading to the passage of the Americans With Disabilities Act of 1990. The ADA mandates wheelchair-accessible pedestrian infrastructure, as well as accessible vehicles and facilities for transit agencies and other organizations providing transportation services, as well as demand-responsive paratransit providing door-to-door service for trips made by people with disabilities to and from locations within $\frac{3}{4}$ mile of fixed-route transit stops (Mayerson, 1992). Though the ADA has been law nearly three decades, the realization of its promise of equal access to transportation services continues to require activism due to inconsistent compliance and large backlogs of infrastructure dating from before its passage (del Pilar Rodriguez & Rowangould, 2017).

The current planning focus on high automotive mobility for those who can afford it and a considerably lesser degree of transit mobility for those who cannot also fails to consider the differing transportation needs of different users. For example, a downtown commuter who either has no children or whose partner assumes primary caregiving responsibilities may be very well served by rapid transit. A single mother's travel pattern, for example, is often quite poorly served by transit, however, due to a need to visit large numbers of destinations (daycares, schools, stores, etc.) transit systems are not generally well-designed to serve (Fan & Huang, 2011). In other words, numerous cases exist of middle-class individuals who would be best served by investment in public transportation, and of disadvantaged individuals who would be best served by assistance with private transportation.

Governance structures, transportation finance and structural inequities

Governance structures and current approaches to transportation finance play a significant role in producing inequities in the transportation system. The user-pay principle—that individual travelers should bear the cost of the transportation they consume through fuel taxes, user fees, etc.—is a central theme of U. S. transportation scholarship and practice (Zhao, Vardhan Das, & Becker, 2010). The user pay principle performs quite well in terms of horizontal equity, but in imposing costs on users without regard to either their individual mobility needs or their ability to pay, its relationship to vertical equity is at best ambivalent. A vertical equity argument in favor of user pay was reasonable in the second half of the twentieth century, given a common metropolitan form of poor inner cities and suburbs increasing in affluence with their distance from the core, as use of transportation generally increased predictably with income (Wachs, 2003). More recently, however, the suburbanization of poverty and the gentrification of many high-accessibility areas in central cities have combined to render this argument problematic (Ehrenhalt, 2012; Lees, 2008).

These trends are occurring in the context of increasing interest in highly accessible urban locations on the part of wealthy individuals and the real estate sector, combined with a decades-long trend of retrenchment in federal funding to cities. This situation can cause transit improvements—which might generally be expected to increase social equity—to serve the economic interests of developers and finance more than the mobility needs of transportation-disadvantaged residents (Farmer, 2011; Grengs, 2005). Mobility gains provided by transit improvements to one group do not necessarily mean fewer benefits for another group, as long as service is maintained to the remainder of the system. Even so, the desirability of access to high-quality transit can lead to gentrification-induced displacement of poor residents from station areas, while the importance of the real estate sector to 21st century urban economies and municipal budgets complicates policy initiatives to minimize this pattern (Guthrie, 2018).

In part, this tension between transportation policy and equity goals stems from an underlying tension between transportation conceptualized as an individual good and transportation conceptualized as a public good, though relationships between efficiency- and equity-focused transportation policy are complex, particularly in the total context of public policies and budgets. Efficiency-focused policies such as road pricing take the former view and seek to compensate society for individuals' use of the transportation system. A transportation finance system more focused on equity would depend on some

degree of shift towards the latter perspective, with the aim that society would smooth out the differences between individuals' mobility needs and abilities to pay (Altshuler, 2010).

2.3 SPECIFIC TRANSPORTATION INEQUITIES AND POLICIES TO ADDRESS THEM

This section explores specific transportation inequities that affect particular groups of individuals due to identity, geography or ability. In many cases, these specific inequities compound the effects of broader, transportation system-level inequities as well.

Systemic racism and the transportation system

In addition to broad structural dynamics with racially discriminatory outcomes such as spatial mismatch, racism plays a direct role in creating inequities at smaller geographic scales, as well as at the individual scale. Historically, freeway infrastructure was frequently planned to isolate Black and immigrant neighborhoods from nearby white areas (or to remove them entirely), yet often primarily planned to serve the travel needs of white suburbanites (Bullard, R. et al., 2004; Mohl, 2004).

More recently, a significant body of literature points to disparities in functional accessibility experienced by people of color. Not only are people of color more likely to rely on slower, less ubiquitous modes of transportation, such as public transit, they tend to experience longer commutes than whites even controlling for mode, in part due to persistent links between race and income (Williams, Pollack, & Billingham, 2014). Equity planning practice also tends to rely heavily on broadly articulated principles, without connections to clear, discrete objectives. Active promotion of racial and social equity in general also tends to take a back seat to regional economic competitiveness and environmental goals. Put simply, more effective transportation planning for racial equity would require more deliberate prioritization of racial equity (Manaugh, Badami, & El-Geneidy, 2015).

In addition, people of color experience inadequate transportation accessibility not only because of where they live and what modes they have access to, but also because of travel behavior differences due to unequal employment and educational opportunities as well as family and informal community commitments. Transportation equity planning practices focused on residential locations fail to take such important travel behavior patterns into account. More equitable practices would directly consider both geography and travel behavior (Karner & Niemeier, 2013).

Racial bias in policing and disproportionate enforcement of minor traffic violations in minority areas also affect people of color's ability to benefit from the transportation system (Lundman & Kaufman, 2003). Use of traffic fines to supplement municipal and county budgets also means that over-policing of minor infractions perpetuates cycles of poverty and exposes people of color to police violence (Makowsky & Stratmann, 2009). Though spurred more directly by high profile police shootings, policing reform efforts may also have an important role to play in transportation equity.

Racial equity promotion in the transportation sector also extends into the realm of contracting for transportation infrastructure construction and maintenance. Contracting goals for Disadvantaged

Business Enterprises (DBEs), or contractors owned by people of color and/or women, are a common strategy for allowing public investments in transportation to support wealth building in communities of color. Such goals, however, are often not met, reducing the effectiveness of such programs (Keen Independent Research, 2017).

Gender disparities in transportation

Gender represents another crucial dimension of inequity to consider in transportation. Standard transportation planning practices were mostly developed during the heyday of the male breadwinner, female homemaker model of economic, social and domestic relations. While such rigid gender roles are no longer a major feature of society today, women are still likely to perform more domestic and caregiving labor, and women with children at home frequently constrain their job searches to shorter distances from their homes for these reasons. As a result, women's travel patterns and men's travel patterns differ in significant ways, while most transportation planning practice is designed around the latter (Crane & Takahashi, 2009; Meloni, Bez, & Spissu, 2009).

Such disparities have impacts beyond commute times and convenience. Transportation provides individuals with access to destinations, services and social participation. In a very real sense, gender disparities in transportation prevent women from fully realizing their right to the city (Levy, 2013).

Gender disparities are also particularly pronounced in use of some alternative modes, most notably bicycling. Women are considerably less likely to commute by bicycle than men overall and tend to report greater sensitivity to road safety conditions and bicycle infrastructure (Emond, Tang, & Handy, 2009).

Income disparities in transportation

While racial and gender disparities in transportation frequently have economic components, people with low incomes face transportation disadvantages regardless of their race and gender as well. Due to the high costs of automobile ownership (vehicle purchase, insurance, maintenance, fuel, etc.), the lower an individual's income, the less likely they are to have access to a motor vehicle. Low automobile ownership rates reduce low-income people's mobility, a disadvantage compounded by travel patterns better served by automobiles than transit, due to non-traditional work schedules, multiple jobs and suburbanized entry-level employment (Fan & Huang, 2011).

While many low-income individuals do own automobiles, automobile ownership can put a significant strain on their household budgets. While owning a car unquestionably increases a low-income person's mobility, the degree of mobility it enables is often necessary for accomplishing basic, necessary activities due to automobile-oriented built environments and the increasing suburbanization of poverty into low-accessibility neighborhoods. Such forced car ownership can essentially be considered a private tax the poor must pay due to inadequate public investment in more affordable transportation and accessible communities (Fletcher, Garasky, & Nielsen, 2005).

Low-income individuals who use transit also experience financial and mobility disadvantages. Not only do transit fares represent a larger proportion of poor riders' incomes, the common practice of system-wide flat fares leads to poor riders (who most commonly make short trips on urban local routes)

effectively cross-subsidizing affluent downtown commuters (who are more likely to make long trips on express routes). Distance-based fares can address this inequity if a viable coalition in support of them can be assembled (Farber, Bartholomew, Li, Páez, & Habib, 2014).

The increasing desirability of access to high-quality transit—as well as walkable urban neighborhoods in general—has also led to an increasing pattern of gentrification-induced displacement of low-income residents from highly transit-accessible areas. This pattern can push the people most dependent on transit into areas with poor transit accessibility (Guthrie, 2018).

Youth access to transportation

Safety concerns surrounding non-motorized modes also place significant constraints on the mobility of youth, as well. For children and adolescents younger than 16, this constraint is not merely one on mode choice, but in many cases on independent mobility of any kind due to automobile dominated built forms (Frank, Saelens, Powell, & Chapman, 2007). This situation can also place greater demands on parents—particularly mothers—who frequently spend significant time transporting children by car.

Lack of safe walking and bicycling conditions lock some young people out of participation in community and social activities, and also represent an obstacle to adequate physical activity (Bedell et al., 2013; Forman et al., 2008). Suburban youths are particularly affected due to infrastructure and built forms designed around the automobile (Frank et al., 2007).

Design for all users: complete streets

Some of these gender and age mobility disparities (among others) can be addressed through the design practice of complete streets. Complete streets expands transportation planning to deliberately consider provisions for safe, convenient walking, cycling and transit in addition to driving as standard elements of the street design process, rather than special features considered through a separate process from “normal” (automotive) transportation planning in most circumstances (Bedell et al., 2013).

Complete streets policies—requiring at least some form of provision for all modes in new street construction and major reconstruction projects—have proliferated rapidly in recent years. Such policies are not confined to central cities or even metropolitan areas, with suburbs, small towns, counties and even entire states (including Minnesota) represented (Moreland-Russell, Eyler, Barbero, Hipp, & Walsh, 2013).

Equitable implementation of complete streets policies, however, hinges upon considering not only all modes, but also all user groups within modes. For one example, bicycle infrastructure implemented in a low-income, predominantly people of color neighborhood may confer significant community benefits if it connects the neighborhood with destinations important to its current car-less residents but may serve as a catalyst for gentrification and displacement if it primarily serves destinations frequented by whites with greater means than current residents. For another example, pedestrian infrastructure cannot genuinely be considered complete unless it maintains a high standard of serving people with disabilities (Clifton, Bronstein, & Morrissey, 2014).

Transportation for people with disabilities

Much of the history of transportation planning and policy focused on people with disabilities has focused on retrofitting transportation infrastructure and services designed assuming able-bodied users to accommodate people with physical disabilities, particularly in response to the requirements of the Americans with Disabilities Act. Until relatively recently, however, transportation policy has approached inclusion of people with disabilities in large part from a somewhat reactive anti-discrimination legal perspective, rather than a pro-active planning perspective (Katzmann, 2010). Expanding consideration of people with disabilities in transportation planning also requires consideration of able-bodied people with neurological or cognitive disabilities as well. Such individuals may not experience physical restrictions on their mobility, use of stairs, boarding and alighting from vehicles, etc., but still may face difficulties conceptualizing transportation networks, interacting with employees and other users or processing navigational aids designed with neurotypical users in mind (Feeley, 2010).

Under such an approach, a transportation link or service is considered “accessible” if it meets minimum legal standards and is otherwise evaluated as if it were to be used only by able-bodied individuals. For example, transit services are considered accessible if they meet certain standards of physical access to vehicles and agency-owned facilities. While this practice ensures it is physically possible for a person in a wheelchair to board a bus, for instance, it fails to consider the entirety of that person’s trip, which may require travel over poorly maintained or absent sidewalks, or through other barriers unconnected to vehicle and stop design. In addition, transfers—a common feature of many transit trips—can multiply this problem, as each requires alighting from one vehicle then moving to and boarding another. This is particularly the case for transfers which require some amount of travel on the street network between stops, as the accessibility of neither transit vehicle provides much benefit if the sidewalks in between are inaccessible. Transfers can also create serious difficulties for users with cognitive disabilities by significantly increasing the complexity of transit trips. The complete trip concept advanced by the Federal Transit Administration and the Intelligent Transportation Systems Joint Program Office seeks to address these issues, considering transit trips as door-to-door multimodal trips and using technology to facilitate coordinating connections and accessing demand-responsive transit (Puckett, Bucci, & Biernbaum, 2016; Yousuf, Spencer, Sheehan, & Armendariz, 2016).

MSP International Airport has attained some recognition for leadership in implementing a more holistic approach to accommodating travelers with disabilities beyond the explicit requirements of the ADA as well. Growing in large part from a Travelers with Disabilities Advisory Committee implemented by the Metropolitan Airports Commission in 2014, the airport’s planning for passengers with disabilities considers every stage a traveler goes through from arriving at the airport to boarding their flight and vice-versa from the perspectives of travelers with a wide variety of physical, sensory and/or cognitive disabilities. Actions arising from the committee’s work include a centralized system to streamline the provision of wheelchairs requested by travelers, the implementation of service animal relief areas and the installation of telecoils, which improve connectivity between public address system announcements and hearing aids (Burke & Welbes, 2018).

Conventional approaches to providing transportation that is accessible to people with disabilities also do not necessarily consider usability factors that can significantly affect transportation's functional usefulness beyond physical access. One example is wayfinding, which largely currently depends on providing visual information to users, leaving people with visual impairments at a severe disadvantage. Strategies to address this issue range from providing accurate, clear audible announcements in terminals and on public transportation vehicles to mobile device apps which provide audible wayfinding information in a wider variety of environments (Beyerle & Dupree, 2016).

Paratransit—demand-responsive, door-to-door service provided for riders with disabilities—offers one crucial mobility alternative. It is not, however, universally available, leaving people with disabilities who live in and/or need to travel to locations not in its service area unserved (Turler, 2016). Paratransit can also incur significant travel time penalties due to the need to arrange trips some time in advance and the fact that it is generally a shared-ride service, leading to circuitous routes. While some paratransit users might be better served in this sense with quality fixed-route service, they may have no choice other than to rely on paratransit due to inaccessible pedestrian infrastructure between their homes or destinations and stops (Lubin & Deka, 2012).

Patterns of inconsistent accessibility are particularly noteworthy in the pedestrian system, which generally depends on physical activity on the part of users. As one example, common Pedestrian Level of Service (PLOS) metrics implicitly consider pedestrian infrastructure from the perspective of an able-bodied pedestrian. More effective planning for disabled users may be made possible by systematically evaluating *how* accessible a given link in the pedestrian system is, rather than considering accessibility as a minimum compliance-focused binary state (Asadi-Shekari, Moeinaddini, & Zaly Shah, 2012).

Senior Citizens' access to transportation

Senior citizens often face similar barriers in access to transportation to what people with disabilities face, and people are more likely to become disabled as they age. However, there are some mobility barriers specifically faced by older individuals. For one thing, a person who is able-bodied most of their life but who becomes disabled later in life may experience a given disability differently than a person born with a broadly similar disability. The change in ability many older individuals experience may cause difficulties of its own. People generally learn to navigate the world a certain way in their youth and early adulthood and undergo a funnel effect around age 35, after which changes in travel behavior become more difficult (Franke, 2004). In addition, the ways people travel in their youth and early adulthood even determine things as basic as how they think about and understand transportation systems. For example, a person used to driving most places who becomes unable to drive later in life may face significant difficulty adapting to other modes of transportation even if they are available and appropriate (Golledge & Gärling, 2004). This difficulty can be compounded by automobile-dependent environments for seniors who hope to age in place in suburban and rural communities.

Qualitative research on seniors' experiences of aging shows a strong link between seniors' quality of life and ability to get around. Access to transportation is necessary for full participation in society, as well as for accomplishing daily needs. As a result, maintaining seniors' mobility is critical for allowing them to

remain a functional part of their communities as well as physically present in them (Levasseur et al., 2015). On the other hand, a lack of viable transportation alternatives can lead to social exclusion (McDonagh, 2006). Seniors without access to a car may face difficulties accessing transit due to distances to stops, and an inability to use park-and-ride service in areas where transit agencies depend on it, as well as difficulty getting on and off transit vehicles, concerns about personal security and inconvenient scheduling. Transit schedules tend to be designed around travel to and from workplaces and provide the best service to riders with very different travel patterns from many retired people (Moniruzzaman, Páez, Scott, & Morency, 2015). The cost of transportation can also be burdensome for people on fixed incomes, especially if they have no alternative but to use taxis for regular trips (Foreman, Tucker, Flynn, & West, 2003).

While seniors who continue to drive have fewer limits on their mobility than those who do not, they may face other disadvantages as well. These include the cost of maintaining a motor vehicle on a fixed income, as well as potentially increasing risk of accidents (Dickerson et al., 2007).

Rural transportation equity

Anyone, disabled or not, who lacks access to a personal vehicle in a rural area faces serious transportation disadvantages. Lack of personal mobility in rural areas can lead to isolation and social exclusion (Gray, Shaw, & Farrington, 2006) as well as negative health outcomes due to difficulties accessing care (Bull, Krout, Rathbone-McCuan, & Shreffler, 2001).

Equity concerns in transportation planning may get short shrift in rural areas due to a common belief that car ownership is essentially universal. To be sure, car ownership rates in the rural United States are quite high, especially in terms of how many households have cars. Significant numbers of low-income rural households have more licensed drivers than cars and/or members who cannot drive because of age or disability. Similar households exist in urban areas too, but the disadvantages they face are magnified in rural areas due to long distances and lack of transit options. Household members with cars who give others rides face heavier burdens in rural areas as well, again due to long distances (Nutley, 1996). In spite of low congestion, accessibility tends to be relatively low in rural areas as well due to long distances and concentration of economic and commercial activity into larger centers. For example, many small towns are losing employment and basic services, forcing residents to travel even longer distances to larger towns.

Equity planning in rural transportation is a somewhat underexplored field compared with its metropolitan counterpart—in large part because equity planning practice largely remains in its infancy in rural areas. Systematizing equity and environmental justice-focused planning in rural areas, applying more rigorous methods than proximity and map-based qualitative analyses, and incorporating equity analysis into the process of deciding between alternatives could lead to more equitable rural transportation systems (Karner & London, 2014; Karner, 2016).

Tribal transportation equity

Rural transportation equity must also consider transportation on tribal lands. Tribal members face barriers to transportation due to high poverty rates, racial discrimination and low accessibility. Tribal governments also face specific difficulties in planning transportation systems to serve their members due to limited resources and power in relationships with other governments (Sullivan, John, & Martin, 2009). Safety issues are a particular equity concern in tribal transportation due to a mix of poverty (leading to reliance on older, less safe vehicles and lack of access to child safety restraints), behaviors leading to deaths of despair (such as intoxication) (Iragavarapu, Carlson, & Schertz, 2015), as well as high per-mile death rates common on rural highways combined with lack of resources for traffic engineering interventions.

Tribal Road Safety Audits (RSAs) represent one alternative for empowering tribal governments in their efforts to improve transportation safety for their members. Conducted as partnerships between the Federal Highway Administration and tribal governments, RSAs can identify problem roads and intersections, allowing the direction of resources where they are most needed and can also aid in designing safe new facilities (Raynault, Crowe, & Ngo, 2010).

CHAPTER 3: STATE OF THE PRACTICE REVIEW

The literature review in Chapter 2 introduces basic concepts of equity, applies those concepts to the transportation field, and explores specific inequities caused by or related to transportation systems. This chapter builds on the literature review by exploring twenty-four specific programs aiming to improve transportation equity.

“Programs aiming to improve transportation equity” is admittedly a broad description. While accurate for all the programs considered, it tells us very little about what these programs actually *do*, and less still about *who* is involved in them and *what* they hope to accomplish. Indeed, beyond the basic requirements of compliance with Title VI of the Civil Rights Act, transportation equity promotion at the program level is a non-standardized practice about which relatively little structured knowledge exists. Despite this fact, the intent of this research is not to identify a single program to emulate directly, but rather to produce structured, generalizable knowledge about the current state of the practice of intentionally promoting transportation equity.

To facilitate this goal, we categorize the programs considered in this chapter using an explanatory typology, as articulated by Elman (1995). Specifically, to address the basic question of what the work of transportation equity programs entails, we categorize the programs based on the primary activities they undertake and three other dimensions considering their scale, the specific equity perspectives they address, and the practical approaches they take to promoting equity. We conclude by discussing what general lessons about the practice of promoting transportation equity can be synthesized from our typologies. This synthesis will inform the formulation of specific recommendations for MnDOT in Chapter 5 and the creation of a further research agenda in Chapter 6.

3.1 APPROACH

An explanatory typology is a means of identifying complex relationships between individual cases in the interest of producing a systematic, qualitative understanding of them by dividing them into types. A typology is more than a simple categorization in that it generates information about the types it creates and describes, as opposed to simply conveying information about cases. This generative aspect of a typology arises out of the creation of types out of the cases themselves, as opposed to fitting cases into predetermined categories, as well as out of the relationships between cases, types, and dimensions of the typology.

By organically fitting cases into descriptive dimensions—such as “primary activities” or “scale” for example—and representing how those dimensions intersect each other, an explanatory typology makes apparent relationships which may be difficult to see by comparing individual cases. Though a typology is not a quantitative research technique, it is commonly represented as a matrix, allowing the researcher to visualize the multiple aspects of relationships between cases, types, and dimensions. Cases are frequently not evenly distributed between cells in such a matrix. This is not necessarily problematic for interpretation. While types into which many cases fit provide useful information, hypothetical types

with no actual cases in them are useful information as well in that they identify ways in which two dimensions do not intersect in the group of cases considered (Elman, 1995).

3.1.1 Programs

Table 1 lists the programs considered in this chapter, along with reference numbers used throughout the typologies described in Section 3.1. Reference numbers are used in typology tables in place of full program names in the interest of space. Each program is presented by official name and a general description.

Table 3.1: Programs examined

Reference #	Program	Description
1	Atlanta Regional Commission Equitable Target Area Index	Evaluation of broad regional equity planning initiative
2	Baltimore City Department of Planning Equity in Planning Committee	Coordinating body for municipal equity planning
3	Boston Region Metropolitan Planning Organization Transportation Equity Program	Internal anti-discrimination program for regional transportation planning
4	Center for Rural Policy	Nonprofit organization dedicated to producing policy solutions for issues specific to rural communities in Minnesota. Includes rural transit evaluation and planning.
5	City of Minneapolis 20 Year Streets Funding Plan	Long term strategy for municipal street renewal/improvement with an equity component
6	City of Oakland Department of Transportation's Strategic Plan	Strategic plan of a newly-created transportation department with a strong equity focus
7	Delaware Valley Regional Planning Commission Indicators of Potential Disadvantage	Equity mapping initiative guiding regional transportation planning

Reference #	Program	Description
8	EPA Creating Equitable, Healthy, and Sustainable Communities	Model policies to assist state and local equity planning
9	Equity principles incorporated into the Metropolitan Council's Regional Solicitation	Equity-focused evaluation criteria for bottom-up allocation of federal formula funds to local transportation projects
10	Hennepin County Address Disparities Program	Employment-focused racial disparity remediation program; includes transportation planning component to connect served populations with opportunity
11	LACMTA Consent Decree (in force 1996-2010)	Racial-equity focused civil rights litigation settlement requiring balance between maintaining and improving local transit service quality and expanding regional transit
12	Metro Transit Everyday Equity Initiatives	A variety of equity promotion initiatives from a "set of questions that helps a person view a decision from an equity perspective" to Spanish language training for operators, to a program of improving bus stops in areas of concentrated poverty
13	Metropolitan Council Equity Advisory Committee	Coordinating body for incorporating equity promotion in regional planning
14	Metropolitan Council Joint Disparities Study	Detailed study of equity in public procurement focused on POC- and women-owned firms
15	Metropolitan Council Metro Stats program	Evaluation initiative focused on identifying demographic and economic factors that intersect with racial disparities while validating race a key factor in explaining those disparities
16	Metropolitan Washington Council of Governments Equity Emphasis Areas	Equity mapping initiative guiding regional transportation planning

Reference #	Program	Description
17	Minnesota Compass program, Wilder Research	Equity-focused social data resource
18	Minnesota Department of Health “Advancing Health Equity in Minnesota” implementation process	Health-focused equity research initiative with transportation component
19	North Central Texas Council of Governments Transportation and Environmental Justice Program	Regional program to actively enforce Title VI compliance in transportation projects
20	Policy Link National Equity Atlas	National-scale equity-focused mapping initiative for social data
21	Polk County, Florida Neighborhood Mobility Audits	Multi-destination accessibility analysis for underserved communities. Focuses on multi-modal mobility solutions to accessibility problems
22	Pratt Center for Community Development Transportation Equity Project	Community-led equity mapping and bus rapid transit planning initiative in New York. Pratt Center is a nonprofit corporation that coordinates activities of community organizations.
23	San Francisco Metropolitan Transportation Commission/Association of Bay Area Governments Regional Equity Working Group	Coordinating body for incorporating equity promotion in regional planning
24	Seattle Department of Transportation – Transportation Equity Program	Provides discounted transit passes and vehicle access to low-income Seattle residents, and conducts outreach to community organizations in racially and economically marginalized areas.

The programs primarily include federal, state, regional and municipal government programs in the interest of applicability to the work of a government agency such as MnDOT. However, programs from nonprofit organizations are also included as deemed appropriate, to broaden the universe of possibilities for organizing such work under consideration. Descriptions are included at the beginning of the process of typologizing these programs by defining descriptive dimensions intended to both

maximize internal similarity and external difference. Specifically, we simplify the description by drawing out sets of specific characteristics shared between programs. These sets of characteristics form the dimensions used to produce our typologies. Please see Appendix A for the complete program list with descriptions, shared characteristics, and program web addresses.

3.2 RESULTS

This section presents our typologies of transportation equity promotion programs. Each typology is presented in tabular form and described in the text. After this, we discuss the typologies in dialogue with each other. While this approach does not necessarily present an empirical picture of the programs studied, it offers valuable insight into what the people shaping their work consider important (Schwartz-Shea & Yanow, 2012).

3.2.1 Scale

Table 2 presents our first typology of transportation equity programs. As in all subsequent typologies, the dimension of primary activities (what each program actually *does* to improve transportation equity) is presented on the vertical axis. These primary activities include:

- **Coordination**—Leading or assisting with collaboration between other agencies and/or organizations in efforts to promote equity;
- **Evaluation**—Assessing the state of equity in a jurisdiction or the equity implications of plans and policies;
- **Implementation**—Directly implementing projects or services intended to improve equity;
- **Mapping**—Producing maps showing the spatial dimensions and implications of equity in a jurisdiction (While this activity could fit under the “evaluation” dimension, a specific focus on equity-focused mapping is common among a large enough number of programs to merit its own dimension.);
- **Planning**—Producing plans intended to improve equity or building equity considerations into broader planning efforts; and
- **Title VI Compliance**—Ensuring compliance with Title VI of the Civil Rights Act for projects receiving federal funds. (While this dimension is somewhat more specific than the others and could also fit under the “evaluation” dimension, a specific focus on Title VI compliance is common among a large enough number of programs to merit its own dimension.

Table 2 also categorizes transportation equity programs by the dimension of the scale at which they are organized. These scales include:

- **Federal and State Agencies;**
- **Local Governments**—Agencies of county and municipal governments;

- **Metropolitan Planning Organizations**—Regional transportation planning bodies recognized by the Federal Highway Administration;
- **Nonprofits**—Private, nonprofit organizations involved in transportation equity promotion; and
- **Transportation Agencies**—Local transportation departments or transit agencies. (While these cases could have been fit into other dimensions, the work of agencies which directly provide transportation services is sufficiently different from the work of the other cases to merit their own dimension.)

Table 3.2: Typology of transportation equity programs by primary activity and scale

	Federal/ State Agency	Local Government	MPO	Nonprofit	Transportation Agency
Coordination		2	13, 23	22	
Evaluation	18	21	1, 14, 15	17	
Implementation			9		11, 24
Mapping		10	7, 16	20, 22	
Planning	8	5, 6		22	
Title VI Compliance			3, 19		12

MPOs immediately show prominence as the most common scale at which the programs considered are organized. In addition, MPO-level programs span the largest number of primary activities, with multiple programs involved in Coordination, Evaluation, Mapping and Title VI compliance.

Beyond the prominence of MPOs in transportation equity promotion, several interesting themes appear regarding programs' primary activities. First is that the number of programs involved in either evaluation in general or equity mapping in particular is nearly half the programs studied. In several instances, evaluation activities are the flagship equity planning initiatives in a given region. This state of affairs suggests a dearth of public data on equity issues—or at least of well-organized data in a convenient form for practicing planners.

It is interesting to note the relatively minor role the direct implementation of equity-focused projects and services plays in the work of the programs considered. While Title VI compliance might in some ways be considered part of the implementation phase of a project, it more specifically deals with

considering and potentially modifying projects being implemented anyway, as opposed to implementing projects or services which exist specifically for equity reasons. The direct creation of equity-focused plans is also a relatively small part of the total body of work performed by the programs studied. In addition to being few in number, most programs focused on equity planning have more narrowly-defined areas of focus than, for example, most programs focused on coordination, evaluation or mapping.

3.2.2 Equity perspectives

Table 3 presents another typology of transportation equity promotion programs, this time employing the dimensions of primary activities and the perspectives on equity each program's work advances. These perspectives include:

- **Compensatory Equity**—Equity initiatives whose work aims to redress or mitigate preexisting or continuous inequities;
- **Geographic Equity**—Equity initiatives with an explicitly spatial perspective. These include a mix of horizontal and vertical spatial equity perspectives (While much less common than the other two perspectives, Geographic Equity takes a sufficiently different approach to equity promotion to merit its own dimension.); and
- **Procedural Equity**—Equity initiatives focused primarily on procedural fairness, i.e. the equal adherence to prescribed processes for all groups.

Overall, compensatory equity is the most common perspective, particularly for programs engaged in Coordination, Evaluation, Mapping and Planning as their primary activities. Procedural equity stands out as well for Coordination, Evaluation, Planning and Title VI compliance. (The prominence of coordination-, evaluation- and mapping-focused programs is underscored here by their prevalence in both of the most popular equity perspectives among the group of programs considered. Geographic equity is a much less common perspective, appearing most commonly (not surprisingly) for mapping.

Table 3.3: Typology of transportation equity programs by primary activity and equity perspective

	Compensatory	Geographic	Procedural
Coordination	2, 13, 22, 23		2, 13, 23
Evaluation	1, 15, 17, 18, 21	1, 4	1, 4, 14
Implementation	9, 11, 24		24
Mapping	7, 16, 20, 22	7, 16, 20	4
Planning	5, 8, 10, 22	4	4, 6, 8
Title VI Compliance	12		3, 12, 19

Several other interesting findings present themselves. First, in all but one instance, more programs take a compensatory perspective than a procedural perspective within each dimension of primary activities. In addition, while several programs take both a compensatory and procedural perspective, yet considerably fewer take only a procedural perspective than only a compensatory perspective. The only exception is for programs focused on Title VI compliance. All of these programs focus on procedural equity, though one also includes a compensatory equity focus.

One interesting finding from this typology is that several programs approach equity from multiple perspectives. All but one of those who do, however, focus on multiple aspects of equity along one dimension only, appearing either in multiple rows but only one column or multiple columns but only one row.

3.2.3 Direction of Transportation Equity Approach

Table 4 presents our final typology, considering transportation equity programs along the dimensions of primary activities and the “direction,” so to speak, of their approach to promoting equity. By that, we refer to two general approaches to putting transportation equity principles into practice: first, the promotion of equity by redressing inequities in the transportation system itself, and second, the promotion of social equity in general through the means of improved transportation.

This was neither an expected nor an unexpected finding; it was simply one we had not considered at a level of importance it appears to take. While the two approaches are by no means mutually exclusive, they offer interesting context to the primary activities that programs undertake.

Table 3.4: Typology of transportation equity programs by primary activity and equity approach

	Addressing Inequities of Transportation System	Addressing Social Inequities via Transportation
Coordination	2, 22, 23	2, 22, 13, 23
Evaluation	4, 14, 21	1, 15, 17, 18, 21
Implementation	9, 24	9, 11
Mapping	7, 20	7, 16, 20
Planning	4, 5, 6	6, 8, 10
Title VI Compliance	3, 12, 19	

Among the most common primary activities, more programs focus on addressing broad social inequities by means of improvements to the transportation system than on redressing inequities directly created by the transportation system itself. Once again, these programs tend to be broader in scope, as well. It is also worth noting that many of these programs are neither housed in transportation agencies nor specifically charged with improving transportation equity, but rather pursue transportation equity as a strategy for achieving other social goals. Though an unexpected finding, this pattern fits with the common understanding of transportation as a derived demand—a means to an end, as opposed to an end in and of itself. This pattern is so pronounced, in fact, that only five programs appear only in the transportation system column, as opposed to either the broad social inequities column or both, and three of those are Title VI compliance programs which are designed to deal specifically with federally funded transportation projects.

It is also interesting to note that the predominance of evaluation and mapping programs is much weaker on the transportation system side than on the broad social inequity side. This may in part demonstrate the inherent complexity of using transportation improvements to achieve social equity goals, requiring both the coordination of organizations involved in multiple planning and policy sub-disciplines and the information needed to guide their efforts. It may also reflect a common practice in the transportation field of implementing and/or justifying projects and services primarily for efficiency reasons, with the mitigation of (often assumed to be) negative equity impacts expected as an implicit consequence of that focus (Guthrie & Fan, 2016; Guthrie, 2018). This pattern is more interesting still in that many of the broad social inequity programs taking the social approach seek to remedy, such as lack of access to employment opportunities, racially concentrated poverty and central city disinvestment, were produced and are reproduced in part by the form and focus taken by the transportation system. This fact puts the

smaller number and narrower focus of programs taking a direct transportation system approach to equity in a less-than-flattering light.

3.3 IN-DEPTH EXAMINATION OF SELECTED PROGRAMS

To provide greater depth about particularly interesting, relevant programs, this section examines three of the programs included in the typology of transportation equity programs in depth. Included are programs at the regional and county-levels that offer useful lessons for the work of a state agency.

Atlanta Regional Commission Equitable Target Area Index

The Atlanta Regional Commission (ARC, metropolitan Atlanta's MPO) developed their Equitable Target Area Index to aid in identifying areas of concern for environmental justice. Though broadly similar to the Metropolitan Council's areas of concentrated poverty, the Equitable Target Area Index includes a wider set of factors, specifically senior population, educational attainment, home values, poverty, and minority population. As such, in addition to poverty and race, the Equitable Target Area Index includes at least proxy data on workforce participation, service needs, employment prospects and household wealth.

Despite its development for general environmental justice purposes, the Equitable Target Area Index has applications for transportation equity work in that all its components predict both travel behavior in general and types of destinations in particular. In addition, the ARC has demonstrated that Equitable Target Areas (ETAs) spatially correlate quite strongly with high percentages of carless households. The ARC also uses ETAs as the origin points to compute transit travel sheds to schools, grocery store, higher education, hospitals, libraries and parks. These travel sheds demonstrate the lack of access to community services and amenities faced by ETA residents and are used to help direct resources to areas they are most needed (Atlanta Regional Commission, 2017).

While applied at the metropolitan scale, the ETA framework contains valuable lessons for state-level transportation equity work as well. By measuring common indicators of general social disadvantage that predict transportation disadvantage (even beyond the severe level of carless households), such a framework has applications in both metro and greater Minnesota. A statewide application of a similar approach to measuring and mapping disadvantage might be especially useful in making the case that transportation equity is not only a "metro issue", so to speak, that it affects communities throughout the state.

San Francisco Metropolitan Transportation Commission/Association of Bay Area Governments Regional Equity Working Group

The Regional Equity Working Group formed by the San Francisco Metropolitan Transportation Commission and the Association of Bay Area Governments is partly a response to the fact that social equity concerns in general and transportation equity concerns in particular often cross boundaries between traditional sub-disciplines within the planning field. The Regional Equity Working Group is organized as a sub-group of the larger Regional Advisory Working Group, which serves as a central point of contact between the large number of stakeholders in the process of developing a 2040 regional plan for the Bay Area.

Employing a fluid membership, the working group is able to include representatives from regional agencies, local governments, transit agencies, transportation management organizations, community advocacy organizations and Bay Area residents. This structure gives the development process for the 2040 plan direct access to the goals and concerns of a broad group of stakeholders in both government and civil society. It also allows for deeper, more long-term engagement with and between those stakeholders than would be possible in either one-on-one meetings or public meetings.

Though once again a regional-scale program, the Regional Equity Working Group offers important lessons for state-level equity planning efforts as well. The Bay Area is a large, highly diverse region with a variety of community types and planning goals and concerns analogous to the diversity more commonly seen at the state level. In addition, the flat, non-hierarchical structure of such a working group provides the ability to build relationships not only between state agencies and local stakeholders but also peer-to-peer relationships between local stakeholders unused to collaborating due either to jurisdiction or area of focus.

Seattle Department of Transportation – Transportation Equity Program

The Seattle Department of Transportation's Transportation Equity Program takes a different approach to promoting transportation equity than most of the other programs considered in this report in that it focuses largely on direct support and service provision for disadvantaged Seattle residents and workers. Specifically, its activities include:

- Providing reduced fare transit passes to low-income individuals living or working in Seattle;
- Providing free transit passes to all high school and certain middle school students in Seattle Public Schools;
- Providing low-income residents with rebates on motor vehicle registration;
- Providing low-income residents with discounted access to car sharing; and
- Engaging with marginalized communities to continually evaluate and improve service delivery.

The Transportation Equity Program is funded through a transportation-focused local sales tax which provides up to \$2 million annually to advance transportation equity goals. The program is specifically

targeted to alleviate the transportation disadvantages faced by low-income Seattle residents of color, while also serving low-income Seattle residents in general (Seattle Department of Transportation, 2018).

The program takes an innovative approach to providing transportation to low-income users in that it offers discounted access to both transit and automotive transportation. The discounted car sharing program in particular gives low-income Seattle residents access to a car when needed without subjecting users to the large recurring costs of automobile ownership.

The diversity of approaches to easing the financial burden of transportation for the people it serves offer valuable lessons for state-level equity work in terms of the need to offer mobility options that serve people making a wide variety of trips in a wide variety of environments. While the specific mix of services offered is tailored to a major city, the basic structure of assisting with access to both public and private transportation through a holistic program focused on transportation equity regardless of mode or travel pattern seems particularly valuable in designing a similar program at the state level. The integrated community outreach efforts appear especially worth emulating at the state level as well, due to the diverse nature of the communities, circumstances and needs to be served.

3.4 EXAMINATION OF SELECTED PROGRAMS OF MINNESOTA NONPROFITS

The main analysis of this chapter focuses on programs housed in public agencies. This focus intends to maximize the relevance of types of programs to the work of a state agency such as MnDOT. Public agencies and private actors such as nonprofits have different sets of abilities and constraints, making direct comparisons of program structures difficult. To provide greater context on transportation equity programs in Minnesota, however, this section examines the work of three Minnesota nonprofit organizations engaged in promoting transportation equity.

ISIAH

ISIAH is a faith-based social justice and sustainability initiative based in Saint Paul, but focused on eliminating inequality and improving quality of life throughout the state. Organized around member congregations, ISIAH coordinates member advocacy activities around several campaigns, including the promotion of transportation equity (ISIAH, 2018). Their transportation equity activities include advocacy for:

- Transit improvements in the metro, including the buildout of the transitway system in a form that expands opportunity for poor people and people of color;
- A guiding set of transportation equity principles to be used in evaluating the racial equity implications of transit funding; and
- Stable funding streams for transit in greater Minnesota to address the serious disadvantage carless households outside the metro experience.

Specific examples of ISAIH's advocacy include demonstrations and lobbying in support of the Green Line Extension with bus connections to disadvantaged neighborhoods in North and South Minneapolis to enhance access to suburban job opportunities and extensive participation in the community organizing which led to Metro Transit's Better Bus Stops campaign. Their work involves a mix of grass-roots organizing and lobbying legislators and public officials. The former puts pressure on the public sector to address transportation equity issues, the latter seeks to direct their responses in positive directions from the perspectives of the communities ISAIH represents. ISAIH's organizing model is not one that can be adapted easily to the public sector, which generally does not lobby itself. However, their activities show a group of natural allies in public transportation equity work among communities often overlooked as major stakeholders in the transportation planning process.

Growth and Justice

Growth & Justice engages in policy advocacy, but as a professionalized organization focused specifically on detailed policy development. In keeping with this focus, Growth & Justice also supports policy research. Their work broadly focuses on the twin goals of promoting sustainable economic growth and quality of life while using rising prosperity to enhance social equity. Their general priorities include strong, stable economic growth, declining economic and racial inequality, consistently good schools across the state, improved access to destinations including jobs, a healthy environment and sustainable communities.

Growth & Justice's signature transportation initiative, entitled *Smart Investments in Transportation for Minnesota*, focuses on improving accessibility state-wide, reducing the energy use and negative environmental impacts of the transportation sector in Minnesota, broadening Minnesotans' travel choices and improving freight transportation in support of the state's economy. They recommend a focus on maintaining and improving Minnesota's system of inter-regional corridors which connect the Twin Cities, Duluth, Rochester, Moorhead and other important regional centers across the state, as well as on improving transit options and supporting car access for low-income Minnesotans where automotive transportation represents the best available option (Growth & Justice, 2018).

Growth & Justice shows the value of an integrated approach to promoting transportation equity as a tool to support the healthy, sustainable, equitable economy and society transportation equity seeks to help create. Such an integrated approach suggests potential benefits for ongoing, collaborative work between agencies such as MnDOT, Department of Employment and Economic Development and Minnesota Pollution Control Agency.

Central Corridor Funders Collaborative

Though no longer in operation due to a limited-time mandate centered around the implementation of the Metro Green Line, the Central Corridor Funders Collaborative offers valuable lessons for transportation equity promotion in Minnesota as well. Though focused on a single, specific transportation project, the Funders Collaborative took an innovative, holistic approach to promoting equity throughout the communities affected by light rail implementation. As suggested by their "Alive, Survive, Thrive" small business initiative, this community equity focus went beyond mitigating expected

negative effects of light rail implementation to creating the conditions for existing communities to directly benefit from the project (Central Corridor Funders Collaborative, 2016).

Named for its role in organizing and coordinating the work of a variety of more narrowly focused nonprofits, philanthropic partners and public grants, the work of the Funders Collaborative actually focused relatively little on transportation in and of itself and much more so on helping the broader community remain intact through the implementation of the Green Line and the neighborhood social and economic changes it was (correctly) expected to bring. This work included supporting the production and preservation of affordable housing in the corridor, providing services to small businesses both to help them survive the disruptions caused by construction and take advantage of improved connectivity in their neighborhoods once light rail service began.

When it disbanded in 2016, the Funders Collaborative was already nearing the goal it had set for affordable housing units built or preserved by 2020 and had played an important role in maintaining University Avenue as a thriving small and minority-owned business district, as well as assisted in general livability initiatives including the addition of green space. The work it accomplished shows the value of equity initiatives tied directly to major, transformative infrastructure projects and the communities they are built to serve, as well as of building such programs around a holistic view of those communities.

3.5 DISCUSSION

The three typologies of transportation equity programs presented above show the variety of structures, understandings of equity and approaches to promoting equity—both in terms of how those programs position their work and in terms of what they specifically do—the programs studied adopt. The promotion of equity through or around the transportation system, is, in a very real sense, not a single, unified field, but a variety of disparate sub-fields of planning, policy and public administration which intersect with each other in ways that relate to transportation. This finding is crucial to bear in mind in designing equity initiatives for a transportation agency like MnDOT, as promoting transportation equity in general is likely to require acting in areas beyond a transportation agency's traditional responsibilities. Specifically, if MnDOT wishes to approach equity promotion from anywhere near as broad a range of perspectives and strategies as found here, it will likely require a mix of both collaboration with other agencies and organizations and capacity building on MnDOT's part, as well as quite possibly on the part of partner agencies and organizations.

The findings from the equity perspectives typology suggest the potential for an agency like MnDOT to act as a leader in integrating deeper, compensatory equity perspectives into the traditionally procedural fairness-focused domain of transportation planning and implementation. While the procedural focus of federal funding requirements is likely to continue for the foreseeable future, a transportation agency's own approach to satisfying them, and to promoting equity more broadly, can incorporate other perspectives as well.

There may be value in a state agency like MnDOT taking such a leadership role simply due to the current prevalence of MPOs in the promotion of transportation equity. While MPOs are well-positioned to

manage the collaboration necessitated by complex social equity issues, those issues do not end at metropolitan county lines. The importance of MPOs and local governments (which tend to be the governments of the central cities of major metropolitan areas) suggests a lack of capacity for transportation equity promotion in rural areas in general and Greater Minnesota in particular, especially given the small size of Minnesota metropolitan areas besides the Twin Cities.

Finally, the heavy focus of the programs studied on transportation as one part of the promotion of broad social equity goals—despite the need for promoting many of those broad social equity goals arising from the history and form of the transportation system—also suggests a need for transportation agencies such as MnDOT to take a larger role in transportation equity. Transportation professionals seem to implicitly understand the importance of their field in shaping the inequities of society, but our results show that formal, intentional equity promotion efforts could benefit from a deeper interrogation of the central role of transportation systems in attempts to redress them.

CHAPTER 4: STAKEHOLDER ENGAGEMENT

An integral component of our efforts in formulating specific recommendations for MnDOT and other partners to consider in advancing transportation equity, identifying future research directions, and defining ‘transportation equity’ included engaging with a Project Advisory Group and a group of transportation users and equity stakeholders to seek input for and feedback on our efforts. Additionally, we also sought direct input from community members to better understand how transportation-related barriers negatively impacted their day-to-day lives and what ‘transportation equity’ means to them.

Project Advisory Group

The Project Advisory Group included thirteen individuals representing MnDOT and other public-sector agencies, university researchers, and other external community partners who have expertise in addressing disparities and inequities. The Advisory Group provided input to the research team and the MnDOT technical lead on project tasks and deliverables to ensure that the findings will provide meaningful guidance to MnDOT and other agency partners in developing transportation strategies that will reduce disparities. The research team met with the Project Advisory Group at several key points during the project, specifically at the completion of deliverables, to review drafts and provide comments for consideration in the drafting of the final report. The Project Advisory Group will also identify key audiences for the products and potential mechanisms for distribution.

Transportation Users/Equity Stakeholders Group

A group of transportation users and equity stakeholders were invited to help us gain a better understanding of how transportation contributes to disparities and inequities for underserved and underrepresented communities and population groups in Minnesota. This group consisted of several individuals from organizations that serve or represent disadvantaged populations in the state. At the first focus group discussion that was held in July 2018, participants shared with us information about their preferred transportation modes for the future, their understanding of what ‘transportation equity’ means, as well as opportunities and challenges for advancing equity in transportation.

Table 5 summarizes responses to key focus group questions by theme and indicates the number of responses that reflected this theme. According to this table, participants’ most preferred types of transportation for the future are multi-modal transportation and public transit. Inadequacies in leadership, perceptions of safety, lack of understanding, and lack of funding stand out as the top four challenges to advancing transportation equity. The top two opportunities for advancing transportation equity include, public engagement/relationship-building and coordination across all levels and sectors. At this gathering, participants also identified additional agencies/groups/populations whose experiences, expertise, and feedback can provide valuable insights on the topic of equity in transportation.

Table 4.1: Responses to focus group questions and number of responses

Preferred Transportation Mode for the Future	Challenges to Advancing Transportation Equity	Opportunities for Advancing Transportation Equity
Public transit (12)	Inadequacies in leadership (5)	Public engagement/relationship building (15)
Integration of modes (8)	Safety and perceptions of safety (5)	Coordination/planning across all levels and sectors (6)
Autonomous vehicles (5)	Lack of understanding of issues (5)	Workforce development (4)
Ridesharing (4)	Limited funding (5)	Improving quality of life (3)
Personal vehicle (4)	Land use patterns (3)	Education/awareness (2)
Biking (3)	Lack of implementation (3)	Socioeconomic mobility (2)
Walking (2)	Lack of inclusiveness and accommodation (2)	
Motorized scooters (2)	Lack of access to personal vehicles in emergencies (2)	
Accessible vehicles (2)	Urban/rural divide (2)	

At the second stakeholder gathering that was held in November 2018, attendees participated in small group discussions to provide input on the draft recommendations for potential changes to policies and practices that will advance transportation equity in Minnesota. Primarily, the stakeholder group identified several additional recommendations for MnDOT and their partners to consider in advancing transportation equity. These recommendations have been incorporated into Chapter 5 of this report.

Engaging community members

In addition to engaging with the Project Advisory Group and the group of transportation users and equity stakeholders, we also engaged with community members at a community event held at the University of Minnesota's Urban Research and Outreach-Engagement Center in North Minneapolis. At this event, we used intercept surveys to seek direct input from attendees about the day-to-day

transportation challenges they face. A summary of these responses along with the number of responses are categorized under key themes in Table 6.

Table 4.2: Responses to survey questions: What needs to be improved

	Better Infrastructure	Increased Affordability	More Convenience of Use	Increased Safety and Security
Walk/Roll	10	1	1	8
Bicycle	9	0	0	4
Transit	6	3	8	5
Drive	1	3	3	1
Shared Mobility	4	3	1	3

Better infrastructure as well as increased safety and security are the most identified needs in relation to walking and rolling to get around for day-to-day needs. Particularly, several community members identified issues related to broken sidewalks and curb ramps (responses collected via sticky notes). Community members also thought that better infrastructure was needed for bicycling, including protected bicycle lanes on streets with low vehicular traffic. In relation to transit use, the most needed improvement identified was convenience of use. Attendees shared that long travel times and limited service made public transit use inconvenient.

We also asked attendees what modes of transportation were difficult to use to reach different destinations. As Figure 1 depicts, using automobiles was the least difficult to use mode of transportation. This is reflective of the fact that we live in an automobile-oriented built environment. According to community members, walking and using new mobility options, including rideshare, are modes of transportation that are difficult to use, particularly for traveling to jobs.

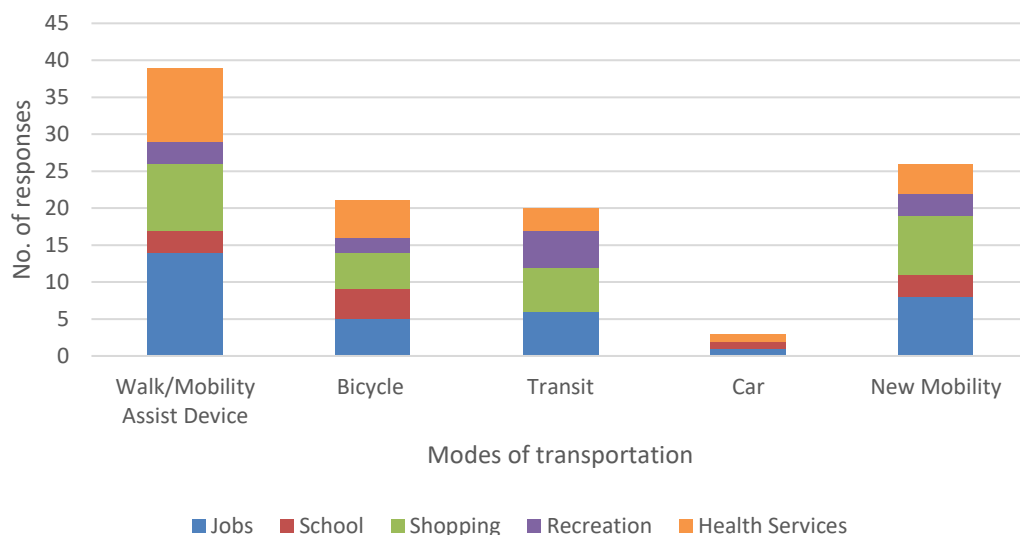


Figure 4.1: Modes of transportation that are difficult to use to reach destinations

4.1 DEFINING TRANSPORTATION EQUITY

As we discussed in Chapter 2, equity is a prominent concept in transportation scholarship, and it is a concept that can be defined in a variety of ways. Policy makers who are interested in promoting transportation equity often need to clarify and define what constitutes equity. Prior to developing a definition for transportation equity, we asked the Transportation Users/Equity Stakeholders Group what transportation equity meant to them and then used their input as well as what we learned from the literature and current practice review to create a draft definition. Based on community feedback, we identified the following key words that characterize what transportation equity meant to community members (See Figure 2).



Figure 4.2: Transportation equity key words identified by stakeholders and community members

In light of the local community input we received, we developed the following working definition of equitable transportation:

- *Transportation systems* that support multi-modal options that are affordable, sustainable, reliable, efficient, safe, and easy to use;
- *Quality transportation services* are accessible to all populations for reaching destinations independently, if needed; and
- *Transportation decision-making processes* that incorporate inclusive public engagement to reduce the longstanding socioeconomic disparities experienced by underserved and underrepresented communities.

CHAPTER 5: RECOMMENDATIONS

This chapter builds on the work of Chapters 2 and 3 and community input gathered from focus group discussion and intercept surveys to formulate specific recommendations for future strategies that MnDOT might consider in meaningfully reducing disparities and advancing transportation equity. The recommendations focus on potential changes to policies and practices that will strengthen MnDOT's consideration of equity in planning, implementing, and coordinating transportation in Minnesota; help local agencies responsible for transportation in their jurisdictions improve considerations of equity in their programming; and improve considerations of equity in inter-agency coordination, whether between transportation-focused agencies within Minnesota, between transportation and non-transportation agencies, or between Minnesota agencies and the federal government.

In the following section, we identify a set of overarching themes, recommendations for potential changes to policies and practices, and specific action steps for MnDOT and their partners to consider in advancing transportation equity. The section will inform the creation of a future research agenda that identifies research needs and potential research funding programs in Chapter 6.

5.1 OVERARCHING THEMES

As discussed in Chapters 2 and 3, efforts to advance transportation equity need to focus on the structural inequities built into our communities, such as segregation and discrimination, automobile dependency, and user-pay transportation finance practices as well as the specific transportation inequities that affect neighborhoods, individuals, and groups of individuals due to racial/ethnic identity, income, ability, gender, age, and geography. The recommendations highlight how equity perspectives can be integrated into transportation planning and programming to redress or mitigate inequities experienced by underserved and underrepresented communities across the state.

The recommendations can be categorized under the following overarching themes:

1. Designing engagement processes that facilitate community leadership and the inclusive participation of traditionally underserved and underrepresented communities, where community members drive conversations around their transportation needs and strategies for implementing solutions;
2. Supporting programs and policies that increase access to social and economic opportunities, such as jobs, affordable housing, healthy food, education, health care, and recreation, particularly for underserved and underrepresented communities;
3. Creating policies and programs that support active transportation and provide safe, smart, and affordable transportation alternatives that minimize automobile dependency to create healthier, more sustainable communities;
4. Integrating equity promotion as a standardized practice at the agency and program level, particularly in prioritizing spending across the system and distributing infrastructure projects;

5. Collaborating and coordinating across transportation and non-transportation agencies, institutions, and organizations, including academic institutions, to improve considerations of equity while leveraging existing programs and policies that advance transportation equity; and
6. Incorporating both quantitative and qualitative metrics for evaluating transportation programs and projects as well as its impacts on underserved and underrepresented populations.

5.2 RECOMMENDATIONS

This section identifies recommendations and action steps for MnDOT and its partners to consider in advancing transportation equity. The recommendations and actions steps are categorized under the six overarching themes. We have also included our rationale for the recommendation we have proposed under each overarching theme. A table including the recommendations, the population(s) and mode(s) the recommendations primarily aim to impact, and the level of cross-collaboration needed in the implementation of each recommendation can be found in Appendix B.

Theme 1: Designing engagement processes that facilitate community leadership and the inclusive participation of traditionally underserved and underrepresented communities, where community members drive conversations around their transportation needs and strategies for implementing solutions.

Rationale: The recommendations and action items listed under this theme address both structural and specific inequities identified in the literature review. The need to incorporate inclusive and culturally-sensitive engagement practices, in particular, was a recurring theme in community discussions.

Recommendation 1.1 Incorporate inclusive and culturally-sensitive community engagement practices in decision-making processes.

- a. Facilitate outreach and engagement in places where communities already gather, including cultural events, farmers markets, community centers, and places of worship.
- b. Prior to public engagement, learn and understand the histories and experiences of underrepresented communities, including how transportation policies and practices have disproportionately impacted communities of color, low-income communities, people with disabilities, and older adults.
- c. Provide accommodations and/or alternatives for single parent households, older adults, people who work non-traditional hours, and people with disabilities to participate in meetings and provide input on projects.
- d. Identify opportunities for education around the relationship between transportation and the economy, environment, and health as well as strategies for preventing and managing conflict.
- e. Allocate resources within project budgets to compensate community partners for their time and expertise as well as to provide incentives that will encourage community participation.

- f. Diversify agency workforce at every level to ensure that the workforce and leadership are representative of the communities that they serve.

Recommendation 1.2 Conduct multilingual outreach and engagement with limited English populations, particularly with immigrant communities.

- a. Provide translations of informational material, including websites, brochures, flyers, and posters that are written in plain language.
- b. Work with communities to identify the best locations for making informational material available, including places of worship, community centers, and senior centers.
- c. Recruit interpreters from the community to facilitate discussions.
- d. Provide multilingual phone lines during outreach and engagement efforts.
- e. Expand outreach via media blogs and radio stations popular among limited English populations.
- f. Collaborate with cultural organizations, social service entities, faith-based organizations, and other community-based organizations to develop effective outreach and engagement strategies.

Recommendation 1.3 Work in close partnership with community members to build trust over time and maintain effective relationships that go beyond project deadlines.

- a. Leverage already established relationships with communities by partnering with nonprofit organizations, community development corporations, neighborhood associations, community advocacy groups, and other organizations and individuals to help connect the state with the community, improve communication, and build relationships.
- b. Effectively communicate how community input is being incorporated into project decision-making processes throughout the project.

Theme 2: Initiating programs and policies that increase access to social and economic opportunities, such as jobs, affordable housing, healthy food, education, health care, and recreation, particularly for underserved and underrepresented communities.

Rationale: The recommendations and action items listed under this theme specifically address structural inequities built into our communities, including segregation and discrimination.

Recommendation 2.1 Provide quality and affordable public transit facilities and services, particularly for transit-dependent communities.

- a. Improve transit routes and schedules to reflect the travel patterns and needs of people dependent on transit for daily travel, including low-wage workers, individuals and families without vehicles, people with disabilities, people travelling to and from jobs at non-traditional times, and older adults who are unable to drive.
- b. Provide increased services during peak times to prevent riders from being denied

boarding due to overcrowding.

- c. Improve facilities at transit stops and waiting areas to increase safety and comfort for all transit users.
- d. Ensure that transit stops are connected through safe sidewalks and crosswalks that are accessible to all populations.
- e. Provide information on transit services in languages other than English, printed in a font size large enough to be easily read by all age groups.
- f. Place information on transit services in community gathering places such as community centers, local schools, places of worship, businesses, and senior centers.
- g. Prioritize subsidizing fares for seniors, low-income communities, youth, and people experiencing homelessness.
- h. Invest in public transit in rural and suburban Minnesota, particularly in areas where there is lower automobile ownership, areas of concentrated poverty, and areas with poor transit so that people can more easily reach jobs and other amenities such as recreation and shopping.
- i. Expand paratransit service areas while improving the quality and efficiency of services for people with disabilities and older adults.

Recommendation 2.2 Create and expand connections between employment centers and underserved communities that are physically isolated from job opportunities.

- a. Prioritize effective route planning and transit stops as well as coordinated schedules between transit providers to reduce travel/wait time and improve connectivity.
- b. Improve first-mile and last-mile connectivity by providing a cohesive network of interconnected travel options including ride share options and shuttle buses to job centers.
- c. Develop effective strategies for optimizing route directness and minimizing transfers.
- d. Diversify public transit options and provide more mobility options for underserved and underrepresented communities, particularly in rural and suburban areas.

Recommendation 2.3 Support transit-oriented development that offers affordable housing options and support community economic development.

- a. Encourage thoughtful planning within walking and biking distance of public transit to provide affordable housing near transit.
- b. Identify strategies for addressing potential impacts of gentrification in relation to displacement of residents as well as businesses, ensuring that low-income communities, small business owners, and community services can thrive in areas near transit.
- c. Partner with transportation network companies and other shared mobility companies to provide subsidized rates for low-income riders.

- d. Support development that integrates transportation and land use planning with social equity goals.

Recommendation 2.4 Ensure that shared and technology-based mobility options such as ride share, bike share, scooter share, and telecommuting provide mobility opportunities for underrepresented communities.

- a. Identify areas with higher percentages of low-income, transit-dependent populations as well as older adults, and partner with shared mobility companies to make transit stops, jobs, schools, grocery stores, health care centers, and other important destinations more reachable.
- b. Develop educational/training programs for people who are new to smart technology to demonstrate how to set up and use shared mobility smartphone applications and electronic payments.
- c. Work with transportation network companies to make shared mobility options more available, particularly in rural Minnesota.
- d. Identify organizations to partner with shared mobility companies to establish user systems that are not solely reliant on smartphones and credit card use.

Theme 3: Creating policies and programs that support active transportation and provide safe, smart, and affordable transportation alternatives that minimize automobile dependency to create healthier, more sustainable communities.

Rationale: The recommendations and action items listed under this theme specifically address structural inequities related to automobile dependency. They also address specific inequities experienced by communities.

Recommendation 3.1 Encourage transportation agencies to design, construct, maintain, and improve roadways to encourage active transportation.

- a. Encourage complete street policies that direct transportation agencies to enable safe and comfortable travel for all users through well-designed streets.
- b. Support Safe Routes to School programs to prioritize strategies that encourage students from low-income and minority communities to walk, roll, or bicycle to school.
- c. Integrate Crime Prevention Through Environmental Design techniques, particularly near and along transit corridors to improve safety for women and girls, youth, older adults, communities of color, and others.
- d. Identify strategies to ensure that developing pedestrian and bicycle infrastructure as well as green streets do not lead to the displacement of low-income communities.

Recommendation 3.2 Support initiatives that decrease the harmful impacts of automobile use on community health and wellbeing.

- a. Create a funding source to replace conventional diesel vehicles with zero emissions, near zero emissions technology, or electric vehicles to reduce air pollution.
- b. Invest in infrastructure needed to support the use of electric vehicles, including charging stations that are strategically placed in locations that people frequent and stay long.
- c. Expand high-occupancy vehicle lanes and provide designated or discounted parking near transit-facilities to encourage commute options such as carpooling/vanpooling.
- d. Identify strategies for addressing the impacts of Transit Hubs and Park & Ride facilities on communities, including the potential disruption due to the influx of cars as well as light and noise pollution.

Recommendation 3.3 Reduce adverse impacts of freight transportation systems, particularly on low-income and communities of color who are disproportionately located near freight routes and facilities.

- a. Integrate health equity considerations into freight-related plans and projects to prevent or mitigate emission-related health impacts on communities.
- b. Identify freight-impacted areas and work with communities to identify strategies for mitigating the negative impacts of freight operations.

Theme 4: Integrating equity promotion as a standardized practice at the agency and program level, particularly in prioritizing spending across the system and distributing infrastructure projects.

Rationale: The recommendations and action items listed under this theme address both structural and specific inequities identified in the literature review.

Recommendation 4.1 Increase access to jobs and training in the transportation industry for communities that are historically underrepresented.

- a. Expand training programs that help populations that have historically faced barriers to employment, including lower-income people and communities of color, to prepare them for employment in the transportation sector.
- b. Recruit, retain, and support a diverse workforce at every level to ensure that decision-makers are representative of the communities that they serve with respect to race/ethnicity and gender.
- c. Create staff education opportunities around methods of community engagement, cultural competency, diversity, and sensitivity trainings.
- d. Identify pathways to promotion to support diversity in leadership positions.

Recommendation 4.2 Increase contracts to businesses owned/operated by underrepresented populations to support wealth building among underrepresented communities.

- a. Expand outreach and provide technical assistance to Disadvantaged Business Enterprises (DBEs) and other businesses owned by minorities and women to remove barriers to contracting opportunities.
- b. Provide capacity building and financing opportunities for businesses owned/operated by underrepresented populations.

Recommendation 4.3 Strengthen the role of equity among the criteria for spending across the system and distributing infrastructure projects based on community priorities.

- a. Strengthen the existing criteria-based process for allocating funds, selecting projects, and prioritizing capital investments to ensure an equitable distribution of benefits.
- b. Maintain transparency about project identification and prioritization and measures for accountability.
- c. Use inclusive and collaborative processes to expand community members' access to decision-making power and resources related to infrastructure projects.
- d. Incentivize projects that integrate programs that serve low income, disabled, senior, and tribal populations in both urban and rural areas.
- e. Increase the share of investment in walking, rolling, and bicycling facilities particularly in underserved communities.

Theme 5: Collaborating and coordinating across transportation and non-transportation agencies, institutions, and organizations, including academic institutions, to advance equity.

Rationale: The following recommendation and action items listed under this theme call for a broader and more systematic approach for advancing transportation equity.

Recommendation 5.1 Engage in multi-stakeholder collaboration to create a collective vision with mutually beneficial outcomes, potentially following successful collaborative practices that are part of the Minnesota Toward Zero Deaths program.

- a. Work in partnership with community-based organizations and environmental justice groups to learn and understand the community's culture, needs, and vision to inform and shape collaborative work with community members.
- b. Build strong partnerships with tribal communities to improve safe transportation on tribal lands.
- c. Work with social services to identify the travel needs and related challenges of people experiencing homelessness.
- d. Leverage public-private partnerships to support the travel needs of people with disabilities.
- e. Work collaboratively with stakeholders with diverse interests, across sectors and policy areas to develop innovative solutions to addressing transportation-related inequities.
- f. Collaborate with academic institutions to identify research and education opportunities.

Theme 6: Incorporating both quantitative and qualitative metrics for evaluating transportation programs and projects as well as its impacts on underserved and underrepresented populations.

Rationale: The following recommendation and action items listed under this theme call for a broader and more systematic approach for advancing transportation equity.

Recommendation 6.1 Develop a framework for measuring and evaluating the impacts of policy, program, and project implementation from an equity standpoint.

- a. Set equity objectives and performance measures for transportation projects and programs to identify what outcomes would reflect success.
- b. Use quantitative and qualitative data collection methods, including longitudinal studies, case studies, focus groups, and interviews to identify transportation challenges, particularly in relation to where people live and their unique travel behaviors and needs.
- c. Identify and understand measures for assessing accessibility to destinations rather than mobility measures for minority and low-income populations as well as older adults and people with disabilities to help with project prioritization, evaluation, resource allocation, and decision making in both urban and rural areas.
- d. Evaluate impacts across multiple years and across communities to inform transportation policies and identify investment needs.

Recommendation 6.2 Facilitate accountability and effective implementation of projects and programs by developing an implementation plan with an equity lens.

- a. Identify potential partner agencies, roles, and responsibilities for initiating the implementation of equity-focused action steps.
- b. Work with partner agencies and communities to identify low-, medium-, and high priority strategies for advancing transportation equity, including short-, medium-, and long-term targets to ensure the timely implementation of strategies.

Recommendation 6.3 Evaluate the potential positive and negative health impacts of a program or project before it is implemented.

- a. Make Health in All Policies (HiAP) approach an element of transportation environmental impact statements and assessments to identify populations that might be disproportionately affected by the program or project.
- b. Identify strategies for considering both direct and indirect economic impacts of negative health outcomes and benefits.

CHAPTER 6: RESEARCH ROAD MAP

This chapter identifies and prioritizes gaps in research and understanding related to advancing transportation equity based on the review of the literature and the state of the practice. Primarily, the research road map will include a prioritized list of under-researched areas, draft research problem statements for high-priority areas, and a list of potential research programs to consider for funding future research.

6.1 UNDER-RESEARCHED AREAS

We identify the following priority areas in need of further research to develop a deeper understanding of the concept of equity as it relates to transportation so that effective programs and practices that advance transportation equity can be developed and gaps in current programs and practices can be addressed.

1. Implementation strategies and outcomes of existing transportation equity programs

While there are numerous initiatives across the United States that aim to advance transportation equity at different scales, including the programs examined as part of Chapter 3 of this report, an in-depth study of existing programs and plans is necessary to develop a comprehensive understanding of what potential implications these policies and programs have for advancing transportation equity in Minnesota. In-depth case studies developed from one-on-one interviews with agencies already working to advance transportation equity can help MnDOT better understand the contexts in which these plans and programs were created and identify best practices for implementing policy on the ground, including how partnerships with other agencies, organizations, and individuals were leveraged in implementing policy.

Case studies can also be beneficial in identifying the outcomes of existing transportation equity efforts. The Atlanta Regional Commission Equitable Target Area Index, San Francisco Metropolitan Transportation Commission/Association of Bay Area Governments Regional Equity Working Group, and Seattle Department of Transportation's Transportation Equity Program highlighted in Chapter 3 are three potential programs for in-depth exploration. Studying the outcomes of transportation equity policies can help MnDOT identify underlying factors that led to successes and/or failures, including challenges to successful implementation that can potentially inform policy implementation in Minnesota.

2. Outcome evaluation metrics that include both quantitative and qualitative measures

Transportation equity-related policies typically identify the importance and need for equity analyses or evaluation metrics but often do not include clear measures for quantifying the impacts of a program or policy. Further, existing evaluation metrics are typically based on quantitative data (e.g., per household, per vehicle miles, per dollar, etc.). Interviews and focus group discussions with community members can provide valuable information for understanding equity concerns and evaluating equity outcomes particularly for underserved and underrepresented communities. Therefore, further research is

necessary to identify ways to collect and use both quantitative and qualitative data to develop equity evaluation metrics. These metrics could potentially include system-wide measures as well as population-specific measures based on demographic considerations such as race/ethnicity, income, age, household type, and ability. Population specific evaluation can reveal the unique challenges that underserved and underrepresented populations experience in relation to mode use and access to destinations. Additionally, this information can be used to spatially map disparities related to accessibility to destinations for specific populations.

3. Disparities faced by older adults, people with sensory and/or cognitive disabilities, single-parent households, and tribal communities

A review of existing transportation equity initiatives shows that these initiatives share a common understanding of what equity means in relation to transportation. Essentially, transportation equity efforts aim to create a transportation system that all populations can participate in and benefit from, while prioritizing the needs of populations who have been traditionally underserved and underrepresented by transportation systems. Underserved populations identified in transportation equity-related programming typically include people of color, low-income communities, zero-vehicle households, people with physical disabilities, older adults, and populations with limited English. However, further research is necessary to better understand the transportation challenges faced by the following populations:

a. Older adults

Given the increase in the older adult population in Minnesota and the isolation that they experience due to their inability to drive, it is important to study more in-depth about the travel needs and destinations of the older adult population and how transportation facilities and services can best serve those needs. For example, older adults are more likely to use public transit to reach parks, shopping centers, and health-care facilities rather than job centers. Older adults are also becoming the increasing proportion of the population riding paratransit due to difficulties they face in reaching transit stops.

b. People with sensory and/or cognitive disabilities

Conventional approaches to providing transportation that is accessible to people with disabilities does not necessarily consider usability factors that go beyond physical access. Expanding consideration of people with disabilities in transportation planning also requires consideration of people with sensory and/or cognitive disabilities. Therefore, further research is necessary to identify opportunities for creating a more holistic approach to accommodating travelers with disabilities beyond the explicit requirements of the Americans with Disabilities Act.

c. Single-parent households

Single parents, and low-income single mothers in particular, have unique travel patterns due to a variety of reasons, including income limitations, lack of access to a personal vehicle, domestic and childcare responsibilities, and nontraditional work schedules. It is important that research

on travel behavior identify where single parents look for work, how they are likely to look for jobs, and which mode of transportation they use to travel to employment destinations and for household needs.

d. Tribal communities

Tribal communities face barriers to transportation due to high poverty rates, racial discrimination, and low access. Tribal governments also lack the resources and power in relationships with other governments to plan transportation systems that better serve their members (Sullivan, John, & Martin, 2009). Further research can help MnDOT identify opportunities for working closely with tribal governments to address their transportation needs and increase road safety.

4. Effective community engagement methods that lead to ongoing long-term relationships

While innovative strategies are being used to create inclusive public engagement processes, further research can help MnDOT and its partners identify targeted outreach and effective engagement methods that can support the participation of underserved and underrepresented communities, particularly in rural areas and tribal lands. Research should also identify strategies for strengthening community involvement, building trust, and maintaining relationships that go beyond a project timeline. Future research efforts must also continue to identify the transportation needs of underserved populations that existing efforts do not address.

5. Strategies for making new mobility options, including automated vehicles more equitable

New and emerging mobility options including motorized scooters (e.g., Lime and Bird scooters), bike share options (e.g., NiceRide and Lime), as well as rideshare options offered by transportation network companies such as Uber and Lyft, can create barriers for people who do not use smartphones, mobile applications, and credit cards. More research is necessary to identify how new mobility options can be made more accessible for low-income communities, people living in small urban areas and rural areas, older adults, people with disabilities, and people who do not use smartphones and credit cards. An in-depth exploration of the distribution of new mobility options can also help identify additional barriers in relation to where mobility services are available and where underserved populations live.

Additionally, as automated vehicles begin to shape our transportation system, it is important to study the potential equity implications they might have on low-income communities in relation to affordability. It is also important that people with disabilities and older adults have access to ADA accessible vehicles and that rural communities as well as other historically underserved and underrepresented communities can benefit from automated vehicles. Future research should also identify policies and strategies that will ensure that automated vehicles do not perpetuate structural inequities and automobile dependency.

6. Equity considerations in freight planning

While businesses and residents in Minnesota rely on freight to provide their day-to-day delivery needs, freight activity sometimes has negative impacts on the environment and people's health. Low-income

and minority populations, in particular, are disproportionately affected by noise pollution as well as health problems due to an increased exposure to diesel emissions from vehicles. Future research can help MnDOT further identify the specific negative impacts of freight on communities living near ports, truck transfer facilities, and truck routes. Research findings can inform future freight planning decisions so that land use, the environment, the economy, public health, and the experiences of traditionally underserved communities are taken into consideration. Future research can also identify opportunities for integrating health equity and environmental justice considerations into freight-related plans and for working with communities to identify measures to mitigate the negative impacts of freight operations.

7. Impacts of racial bias in traffic enforcement and transit policing

Racial discrimination in traffic enforcement and transit policing can affect the ability of people of color to benefit from the transportation system. Future research can focus on issues such as racial bias in transit policing, the disproportionate enforcement of minor traffic violations in minority areas, racial profiling at traffic stops, unreasonable searches, as well as arrests and fines on both public and private transportation and how they impact the transportation choices and safety, particularly for communities of color. A comprehensive understanding of racial bias in policing in traffic enforcement and transit policing is an important consideration in advancing transportation equity so that all populations can benefit from the transportation system.

8. Specific opportunities for advancing transportation equity in rural Minnesota

Further research is necessary to understand the specific barriers to advancing transportation equity in rural Minnesota and the unique travel needs of rural communities. This includes identifying strategies for effective outreach and engagement with community members and community-based organizations, addressing issues related to transportation systems, identifying the impacts of automobile dependency and transportation costs particularly on low-income households as well as on older adults and people with disabilities who lack the ability to travel independently and therefore experience social isolation.

6.2 POTENTIAL RESEARCH PROGRAMS

Below are a few programs that MnDOT can consider for funding future research that will advance transportation equity. The information provided below about each research program is obtained from their respective websites.

1. National Cooperative Highway Research Program (NCHRP)

The NCHRP addresses issues integral to the state departments of transportation and transportation professionals at all levels of government and the private sector. The NCHRP is administered by the Transportation Research Board (TRB) and sponsored by the individual state departments of transportation of the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration (FHWA). For more information, see <http://www.trb.org/NCHRP/NCHRPOverview.aspx>

2. Transit Cooperative Research Program (TCRP)

Sponsored by the Federal Transit Administration, the TCRP serves as one of the principal means by which the public transportation industry can develop innovative near-term solutions to meet demands placed on it. The TCRP provides useful reports and other tools to help public transportation practitioners solve problems and inform decision makers. For more information, see <http://www.trb.org/TCRP/TCRP.aspx>.

3. National Cooperative Freight Research Program (NCFRP)

The NCFRP carries out applied research on problems facing the freight industry that are not being adequately addressed by existing research programs. NCFRP covers a range of issues to improve the efficiency, reliability, safety, and security of the freight transportation system in the nation. For more information, see <http://www.trb.org/NCFRP/NCFRP.aspx>.

4. State Planning and Research (SP&R) Program

The SP&R program directs research toward finding solutions to local, regional, and statewide planning problems and issues. Funding is typically used for research, development, and technology transfer activities necessary in the planning, design, construction, management, and maintenance of highway, public transportation, and intermodal transportation systems. For more information, see <https://www.fhwa.dot.gov/publications/research/general/spr/os.cfm>.

5. Transportation Pooled Fund (TPF) Program

The TPF Program allows federal, state, and local agencies and other organizations to combine resources to support transportation research studies. For more information, see www.pooledfund.org.

6. Advanced Transportation and Congestion Management Technologies Deployment

This program offers grants for the development of model deployment sites for large-scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. Types of research funded include advanced mobility and access technologies, such as dynamic ridesharing and information systems to support human services for elderly and disabled individuals. For more information, see <https://www.fhwa.dot.gov/fastact/factsheets/advtranscongmgmtfs.cfm>.

7. Highway Research and Development (HRD)

The HRD program funds strategic investment in research activities that address current and emerging highway transportation needs, including activities that reduce congestion, improve highway operations, and enhance freight productivity. For more information, see <https://www.fhwa.dot.gov/fastact/factsheets/highwayrdfs.cfm>.

8. Surface Transportation System Funding Alternatives (STSFA) Program

The STSFA program provides grants to states or groups of states to demonstrate user-based alternative revenue mechanisms that utilize a user-fee structure to maintain the long-term solvency of the Highway Trust Fund. Research topics eligible for funding include equity concerns,

such as the impacts of the user-based alternative revenue mechanism on differing income groups, various geographic areas, and the relative burdens on rural and urban drivers. For more information, see <https://www.fhwa.dot.gov/fastact/factsheets/surftransfundaltfs.cfm>.

9. Training and Education (T&E) Program

The T&E program supports the administration of historical training and education programs such as the National Highway Institute and Local/Tribal Technical Assistance Programs. For more information, see <https://www.fhwa.dot.gov/fastact/factsheets/trainingeducationfs.cfm>.

10. The Public Transportation Innovation Program

This program provides funding to develop innovative products and services assisting transit agencies in better meeting the needs of their customers. For more information, see <https://www.transit.dot.gov/funding/grants/public-transportation-innovation-5312>.

11. The Civil Infrastructure Systems (CIS) Program

The CIS program supports fundamental and innovative research necessary for designing, constructing, managing, maintaining, operating, and protecting efficient, resilient, and sustainable civil infrastructure systems. For more information, see https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13352.

REFERENCES

- Altshuler, A. (2010). Equity, pricing, and surface transportation politics. *Urban Affairs Review*, 46(2), 155-179.
- Andersson, F., Haltiwanger, J. C., Kutzbach, M. J., Pollakowski, H. O., & Weinberg, D. H. (2018). Job displacement and the duration of joblessness: The role of spatial mismatch. *The Review of Economics and Statistics*, 100(2), 203-218.
- Asadi-Shekari, Z., Moeinaddini, M., & Zaly Shah, M. (2012). Disabled pedestrian level of service method for evaluating and promoting inclusive walking facilities on urban streets. *Journal of Transportation Engineering*, 139(2), 181-192.
- Atlanta Regional Commission. (2017). *Equitable Target Area Index*. Retrieved from <https://atlantaregionsplan.org/resources/equitable-target-area-index-eta/>.
- Bedell, G., Coster, W., Law, M., Liljenquist, K., Kao, Y., Teplicky, R., ... Khetani, M. A. (2013). Community participation, supports, and barriers of school-age children with and without disabilities. *Archives of Physical Medicine and Rehabilitation*, 94(2), 315-323.
- Beyerle, R., & Dupree, J. E. (2016). Bridging the gap: Increasing transportation access through training and technology. *Community wayfinding: Pathways to understanding* (pp. 195-211). NY: Springer.
- Blumenberg, E. (2004). En-gendering effective planning: Spatial mismatch, low-income women, and transportation policy. *Journal of the American Planning Association*, 70(3), 269-281.
- Blumenberg, E., & Schweitzer, L. (2006). Devolution and transport policy for the working poor: The case of the US job access and reverse commute program. *Planning Theory & Practice*, 7(1), 7-25.
- Bull, C. N., Krout, J. A., Rathbone-McCuan, E., & Shreffler, M. J. (2001). Access and issues of equity in remote/rural areas. *The Journal of Rural Health*, 17(4), 356-359.
- Bullard, R., Johnson, G., & Torres, A. (2004). *Highway robbery: Transportation racism & new routes to equity*. Cambridge, MA: South End Press.
- Bullard, R. D., & Lewis, J. (1996). *Unequal protection: Environmental justice and communities of color*. San Francisco, CA: Sierra Club Books.
- Burke, P., & Welbes, J. (2018). Minneapolis–St. Paul international airport: Instilling a culture of accessibility for people with disabilities that goes above and beyond requirements. *Journal of Airport Management*, 12(2), 198-206.
- Central Corridor Funders Collaborative. (2016). *Investing beyond the rail*. Retrieved from <http://www.funderscollaborative.org/>.

- Chen, H., Rufolo, A., & Dueker, K. (1998). (1998). Measuring the impact of light rail systems on single-family home prices: A hedonic approach with GIS applications. Paper presented at the *77th Annual Meeting of the Transportation Research Board*, Washington, D.C.
- Cherlow, J. R. (1981). Measuring values of travel time savings. *Journal of Consumer Research*, 7(4), 360-371.
- Clifton, K., Bronstein, S., & Morrissey, S. (2014). *The path to complete streets in underserved communities: Lessons from U.S. case studies*. Retrieved from https://activelivingresearch.org/sites/activelivingresearch.org/files/Clifton_Path_to_Complete_Streets_Underserved_Communities_Oct2014.pdf
- Crane, R., & Takahashi, L. (2009). Sex changes everything: The recent narrowing and widening of travel differences by gender. *Public Works Management & Policy*, 13(4), 328-337.
- del Pilar Rodriguez, M., & Rowangould, G. (2017). The current state of sidewalk ADA compliance and alternative funding methods for Albuquerque, NM. Paper presented at the *96th Annual Meeting of the Transportation Research Board*, Washington, D.C.
- Dickerson, A. E., Molnar, L. J., Eby, D. W., Adler, G., Bedard, M., Berg-Weger, M., . . . Kerschner, H. (2007). Transportation and aging: A research agenda for advancing safe mobility. *The Gerontologist*, 47(5), 578-590.
- Ehrenhalt, A. (2012). *The great inversion and the future of the American city*. New York, NY: Vintage.
- Elman, C. (2005). Explanatory typologies in qualitative studies of international politics. *International Organization*, 59(2), 293-326.
- Emond, C., Tang, W., & Handy, S. (2009). Explaining gender difference in bicycling behavior. *Transportation Research Record: Journal of the Transportation Research Board*, 2125, 16-25.
- Fan, Y. (2012). The planners' war against spatial mismatch lessons learned and ways forward. *Journal of Planning Literature*, 27(2), 153-169.
- Fan, Y., Guthrie, A., & Levinson, D. (2011). Impact of light rail implementation on labor market accessibility: A transportation equity perspective. *Journal of Transport and Land Use*, 5(3), 28-39.
- Fan, Y., & Huang, A. (2011). *How affordable is transportation? A context-sensitive framework*. Minneapolis: Center for Transportation Studies.
- Farber, S., Bartholomew, K., Li, X., Páez, A., & Habib, K. M. N. (2014). Assessing social equity in distance based transit fares using a model of travel behavior. *Transportation Research Part A: Policy and Practice*, 67, 291-303.
- Farmer, S. (2011). Uneven public transportation development in neoliberalizing Chicago, USA. *Environment and Planning A*, 43(5), 1154-1172.

- Feeley, C. (2010). Evaluating the transportation needs and accessibility issues for adults on the autism spectrum in New Jersey. Paper presented at the *89th Annual Meeting of the Transportation Research Board*, Washington, D.C.
- Fletcher, C., Garasky, S., & Nielsen, R. (2005). Transportation hardship: Are you better off with a car? *Journal of Family and Economic Issues*, 26(3), 323-343.
- Foreman, C. C., Tucker, L. E., Flynn, J., & West, M. (2003). *Senior transportation alternatives: Why are they important and what makes them work?* (No. BC-137-36). Tampa: National Center for Transit Research.
- Forman, H., Kerr, J., Norman, G. J., Saelens, B. E., Durant, N. H., Harris, S. K., & Sallis, J. F. (2008). Reliability and validity of destination-specific barriers to walking and cycling for youth. *Preventive Medicine*, 46(4), 311-316.
- Frank, L. D., Saelens, B. E., Powell, K. E., & Chapman, J. E. (2007). Stepping towards causation: Do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity? *Social Science & Medicine*, 65(9), 1898-1914.
- Franke, S. (2004). Eigentlich ideal, so ein CashCar! "Ergebnisse eines feldversuchs. *Die Mobilitätsmaschine. Versuche Zur Umdeutung Des Autos*, Berlin, 68-80.
- Golledge, R. G., & Gärling, T. (2004). Cognitive maps and urban travel. In D. Hensher, K. Button, K. Haynes, P. Stopher (Ed.), *Handbook of transport geography and spatial systems* (pp. 501-512). Bingley, UK: Emerald Group Publishing Limited.
- Gould, G., & Niemeier, D. (2009). Review of regional locomotive emission modeling and the constraints posed by activity data. *Transportation Research Record: Journal of the Transportation Research Board*, (2117), 24-32.
- Gray, D., Shaw, J., & Farrington, J. (2006). Community transport, social capital and social exclusion in rural areas. *Area*, 38(1), 89-98.
- Grengs, J. (2005). The abandoned social goals of public transit in the neoliberal city of the USA. *City*, 9(1), 51-66.
- Grengs, J. (2010). Job accessibility and the modal mismatch in Detroit. *Journal of Transport Geography*, 18(1), 42-54. Retrieved from <http://www.sciencedirect.com.ezp3.lib.umn.edu/science/article/pii/S0966692309000131>.
- Grengs, J. (2015). Nonwork accessibility as a social equity indicator. *International Journal of Sustainable Transportation*, 9(1), 1-14.
- Growth & Justice. (2018). *Transportation*. Retrieved from <http://www.growthandjustice.org/issues/transportation>.

- Guthrie, A. (2018). *Can transit-oriented development enhance social equity: Current state and active promotion of equitable transit-oriented development*. (PhD). University of Minnesota, Minneapolis.
- Guthrie, A., Fan, Y., & Burga, F. (2018). Collaboration in transit planning and workforce development: *Journal of Transport and Land Use*, (in press).
- Guthrie, A., & Fan, Y. (2016). Developers' perspectives on transit-oriented development. *Transport Policy*, 51, 103-114.
- Houston, D., Krudysz, M., & Winer, A. (2008). Diesel truck traffic in low-income and minority communities adjacent to ports: Environmental justice implications of near-roadway land use conflicts. *Transportation Research Record: Journal of the Transportation Research Board*, (2067), 38-46.
- Iragavarapu, V., Carlson, P., & Schertz, G. (2015). Review of tribal transportation safety. *Transportation Research Record: Journal of the Transportation Research Board*, 2531, 153-160.
- ISAIAH. (2018). *Issues & campaigns*. Retrieved from <https://isaiahmn.org/issues-and-campaigns/>.
- Jacques, C., Manaugh, K., & El-Geneidy, A. M. (2013). Rescuing the captive [mode] user: An alternative approach to transport market segmentation. *Transportation*, 40(3), 625-645.
- Johnson, V., Currie, G., & Stanley, J. (2010). Measures of disadvantage: Is car ownership a good indicator? *Social Indicators Research*, 97(3), 439-450.
- Kain, J. (1968). Housing segregation, negro employment, and metropolitan decentralization. *Quarterly Journal of Economics*, 82(2), 175-197.
- Kain, J. (2004). A pioneer's perspective on the spatial mismatch literature. *Urban Studies*, 41(1), 7-32.
- Karner, A. (2016). Planning for transportation equity in small regions: Towards meaningful performance assessment. *Transport Policy*, 52, 46-54.
- Karner, A. (2018). Assessing public transit service equity using route-level accessibility measures and public data. *Journal of Transport Geography*, 67, 24-32.
- Karner, A., & London, J. (2014). Rural communities and transportation equity in California's San Joaquin Valley. *Transportation Research Record: Journal of the Transportation Research Board*, (2452), 90-97.
- Karner, A., & Niemeier, D. (2013). Civil rights guidance and equity analysis methods for regional transportation plans: A critical review of literature and practice. *Journal of Transport Geography*, 33, 126-134.
- Katzmann, R. A. (2010). *Institutional disability: The saga of transportation policy for the disabled*. Washington, D.C.: Brookings Institution Press.

- Keen Independent Research. (2017). *2017 Minnesota joint disparity study*. Saint Paul: Metropolitan Council.
- Kuhnimhof, T., Armoogum, J., Buehler, R., Dargay, J., Denstadli, J. M., & Yamamoto, T. (2012). Men shape a downward trend in car use among young Adults—Evidence from six industrialized countries. *Transport Reviews*, 32(6), 761-779. doi:10.1080/01441647.2012.736426
- Lees, L. (2008). Gentrification and social mixing: Towards an inclusive urban renaissance? *Urban Studies*, 45(12), 2449-2470.
- Levasseur, M., G  n  reux, M., Bruneau, J., Vanasse, A., Chabot,   , Beaulac, C., & B  dard, M. (2015). Importance of proximity to resources, social support, transportation and neighborhood security for mobility and social participation in older adults: Results from a scoping study. *BMC Public Health*, 15(1), 503.
- Levine, J., Grengs, J., Shen, Q., & Shen, Q. (2012). Does accessibility require density or speed? A comparison of fast versus close in getting where you want to go in US metropolitan regions. *Journal of the American Planning Association*, 78(2), 157-172.
- Levinson, D., & Krizek, K. (2005). *Access to destinations*. London: Elsevier.
- Levy, C. (2013). Travel choice reframed: “deep distribution” and gender in urban transport. *Environment and Urbanization*, 25(1), 47-63.
- Litman, T. (2018). *Evaluating transportation equity: Guidance for incorporating distributional impacts in transportation planning*. Victoria, BC: Victoria Transport Policy Institute.
- Lubin, A., & Deka, D. (2012). Role of public transportation as job access mode: Lessons from survey of people with disabilities in new jersey. *Transportation Research Record: Journal of the Transportation Research Board*, 2277, 90-97.
- Lundman, R. J., & Kaufman, R. L. (2003). Driving while black: Effects of race, ethnicity, and gender on citizen self-reports of traffic stops and police actions. *Criminology*, 41(1), 195-220.
- Makowsky, M. D., & Stratmann, T. (2009). Political economy at any speed: What determines traffic citations? *American Economic Review*, 99(1), 509-527.
- Manaugh, K., Badami, M. G., & El-Geneidy, A. M. (2015). Integrating social equity into urban transportation planning: A critical evaluation of equity objectives and measures in transportation plans in North America. *Transport Policy*, 37, 167-176.
- Mayerson, A. (1992). The history of the ADA: A movement perspective. Retrieved from <http://Dredf.Org/News/Publications/the-History-of-the-Ada>
- McDonagh, J. (2006). Transport policy instruments and transport-related social exclusion in rural republic of Ireland. *Journal of Transport Geography*, 14(5), 355-366.

- Meloni, I., Bez, M., & Spissu, E. (2009). Activity-based model of women's activity-travel patterns. *Transportation Research Record: Journal of the Transportation Research Board*, 2125, 26-35.
- Minnesota Department of Employment and Economic Development. (2017). Cost of living in Minnesota. Retrieved from <https://mn.gov/deed/data/data-tools/col/>
- Mohl, R. A. (2004). Stop the road: Freeway revolts in American cities. *Journal of Urban History*, 30(5), 674-706.
- Moniruzzaman, M., Páez, A., Scott, D., & Morency, C. (2015). Trip generation of seniors and the geography of walking in Montreal. *Environment and Planning A*, 47(4), 957-976.
- Moreland-Russell, S., Eyler, A., Barbero, C., Hipp, J. A., & Walsh, H. (2013). Diffusion of complete streets policies across US communities. *Journal of Public Health Management and Practice: JPHMP*, 19(3 Suppl. 1), S89-S96. doi:10.1097/PHH.0b013e3182849ec2
- Morello-Frosch, R., Pastor, M., & Sadd, J. (2001). Environmental justice and southern California's "riskscape" the distribution of air toxics exposures and health risks among diverse communities. *Urban Affairs Review*, 36(4), 551-578.
- Nutley, S. D. (1996). Rural transport problems and non-car populations in the USA: A UK perspective. *Journal of Transport Geography*, 4(2), 93-106.
- Pastor, M., Sadd, J., & Hipp, J. (2001). Which came first? toxic facilities, minority move-in, and environmental justice. *Journal of Urban Affairs*, 23(1), 1-21.
- Preston, J. (2009). Epilogue: Transport policy and social exclusion—Some reflections. *Transport Policy*, 16(3), 140-142.
- Puckett, S., Bucci, G., & Biernbaum, L. (2016). *Impact assessment of integrated dynamic transit operations*. Cambridge, MA: John A. Volpe National Transportation System Center.
- Raynault, E., Crowe, B., & Ngo, C. N. (2010). (2010). Selected examples of tribal road safety audits (RSAs) in the united states. Paper presented at the *89th Annual Meeting of the Transportation Research Board*, Washington, D.C. 18-27.
- Rubin, V. (2009). *All Aboard: Making Equity and Inclusion Central to Federal Transportation Policy*. PolicyLink. Retrieved from http://equitycaucus.org/sites/default/files/AllAboard_final_web.pdf
- Schwartz-Shea, P., & Yanow, D. (2012). Ways of knowing: Research questions and logics of inquiry. *Interpretive research design: Concepts and practices* (pp. 24-44). New York: Routledge.

- Seattle Department of Transportation. (2018). *Transportation Equity Program*. Retrieved September 2, 2018 from <https://www.seattle.gov/transportation/projects-and-programs/programs/transportation-equity-program>.
- Sullivan, I. V., John, J., & Martin, C. (2009). The role of TTAPs in tribal transportation. *Public Roads*, 73(3).
- Taylor, B., Miller, D., Iseki, H., & Fink, C. (2009). Nature and/or nurture? analyzing the determinants of transit ridership across US urbanized areas. *Transportation Research Part A*, 43, 60-77.
- Taylor, S. (1970). The rapid tramway: A feasible solution to the urban transportation problem. *Traffic Quarterly*, 24(4), 513-529.
- Thoebald, D. (2001). Land use dynamics beyond the American urban fringe. *Geographical Review*, 91(3), 544-564.
- Thomas, R., & Bertolini, L. (2015). Defining critical success factors in TOD implementation using rough set analysis. *Journal of Transport and Land Use*, 10(1), 139-154.
- Tilahun, N., & Levinson, D. (2009). Unexpected delay and the cost of lateness on I-394 high occupancy/toll lanes. *Travel demand management and road user pricing: Success, failure and feasibility* (pp. 173-184). Burlington, VT: Ashgate.
- Tilahun, N., Levinson, D., & Krizek, K. (2007). Trails, lanes, or traffic: Value of different bicycle facilities using adaptive stated-preference survey. *Transportation Research Part A - Policy and Practice*, 41(4), 287-301.
- Tilahun, N., Thakuriah, P. V., Li, M., & Keita, Y. (2016). Transit use and the work commute: Analyzing the role of last mile issues. *Journal of Transport Geography*, 54, 359-368.
- Tomer, A. (2012). *Where the jobs are: Employer access to labor by transit*. Washington, D.C.: Brookings Institution.
- Turkel, E. (2016). *Delaware's paratransit policy and the need for innovation*. Newark, DE: University of Delaware.
- Vardigan, M., Heus, P., & Thomas, W. (2008). Data documentation initiative: Toward a standard for the social sciences. *International Journal of Digital Curation*, 3(1), 107-113.
- Venner, M., & Ecola, L. (2007). Financing transit-oriented development: Understanding and overcoming obstacles. *Transportation Research Record: Journal of the Transportation Research Board*, 1996, 17-24.
- Venter, C., & Behrens, R. (2005). (2005). Transport expenditure: Is the 10% policy benchmark appropriate? Paper presented at the *24th South African Transport Conference*, Pretoria, South Africa.

- Vigdor, J., Massey, D., & Rivlin, A. (2002). Does gentrification harm the poor? *Brookings-wharton papers on urban affairs* (pp. 133-182). Washington, D.C.
- Wachs, M. (2003). *Improving efficiency and equity in transportation finance*. Washington, D.C.: Brookings Institution.
- Williams, E., Pollack, S., & Billingham, C. (2014). (2014). Measuring transportation equity: Commute time penalties by race and mode in Greater Boston. Paper presented at the *93rd Annual Meeting of the Transportation Research Board*, Washington, D. C.
- Winters, P. (2014). *2014 TMA survey - final results*. Sharon, MA: Association for Commuter Transportation.
- Wohlwill, D. (1996). (1996). Development along busway: A case study of development along the Martin Luther King, Jr. east busway in Pittsburgh, Pennsylvania. Paper presented at the *Proceedings of the 1996 Rapid Transit Conference of the American Public Transit Association*, Atlanta, Georgia.
- Woldeamanuel, M., & Kent, A. (2015). Measuring walk access to transit in terms of sidewalk availability, quality, and connectivity. *Journal of Urban Planning and Development*, 142(2), 04015019.
- Yousuf, M., Spencer, J., Sheehan, R., & Armendariz, L. (2016). Accessible transportation technologies research initiative (ATTRI)—Advancing mobility solutions for all. *Road Vehicle Automation* 3, 27-38.
- Zhao, Z. J., Vardhan Das, K., & Becker, C. (2010). Funding surface transportation in Minnesota: Past, present, and prospects. Retrieved from <https://conservancy.umn.edu/bitstream/handle/11299/97671/CTS%2010-02.pdf?sequence=1&isAllowed=y>

APPENDIX A: COMPLETE PROGRAM LIST

This Appendix presents a more detailed table of the programs studied, including name, web address, detailed description and the simplified, common dimensions of similarity and difference they have. It represents an amalgamation of the raw data our typologies are built from and allows the reader to see some of the process of synthesizing common dimensions that shape the types in our typologies.

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
1	Atlanta Regional Commission Equitable Target Area Index https://atlantaregional.org/leadership-and-engagement/guidelines-compliance/regional-equity-and-inclusion/	MPO	Evaluation of broad regional equity planning initiative	Evaluation	Compensatory, Geographic	Social
2	Baltimore City Department of Planning Equity in Planning Committee https://planning.baltimorecity.gov/equity-planning-committee	Municipal	Coordinating body for municipal equity planning	Coordination	Compensatory, Procedural	Transportation, Social
3	Boston Region Metropolitan Planning Organization Transportation Equity Program http://www.ctps.org/equity	MPO	Internal anti-discrimination program for regional transportation planning	Title VI compliance	Procedural	Transportation

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
4	Center for Rural Policy https://www.ruralmn.org/wp-content/uploads/2015/09/Public-transit-fact-sheet.pdf	Nonprofit	Nonprofit organization dedicated to producing policy solutions for issues specific to rural communities in Minnesota. Includes rural transit evaluation and planning.	Evaluation, Planning	Geographic	Transportation
5	City of Minneapolis 20 Year Streets Funding Plan http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/wcmssp-193216.pdf	Municipal	Long term strategy for municipal street renewal/improvement with an equity component	Planning	Compensatory	Transportation
6	City of Oakland Department of Transportation's Strategic Plan https://www.oaklandca.gov/services/dot/departments-of-transportation-a-strategic-plan	Municipal	Strategic plan of a newly-created transportation department with a strong equity focus	Planning	Procedural	Social, Transportation

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
7	Delaware Valley Regional Planning Commission Indicators of Potential Disadvantage https://www.dvrpc.org/webmaps/IPD/	MPO	Equity mapping initiative guiding regional transportation planning	Mapping	Compensatory, Geographic	Social, Transportation
8	EPA Creating Equitable, Healthy, and Sustainable Communities https://www.epa.gov/smartgrowth/creating-equitable-healthy-and-sustainable-communities	Federal	Model policies to assist state and local equity planning	Planning	Compensatory, Procedural	Social
9	Equity principles incorporated into the Metropolitan Council's Regional Solicitation https://metro council.org/Transportation/Planning-2/Transportation-Funding/Regional-Solicitation.aspx	MPO	Equity-focused evaluation criteria for bottom-up allocation of federal formula funds to local transportation projects	Implementation	Compensatory	Social, Transportation

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
0 110	Hennepin County Address Disparities Program https://www.racialequityalliance.org/jurisdictions/hennepin-county-minnesota/	County	Employment-focused racial disparity remediation program; includes transportation planning component to connect served populations with opportunity	Planning	Compensatory	Social
11	LACMTA Consent Decree (in force 1996-2010) http://www.apta.com/mc/transitceos/previous/2011/Presentations/LACMTA-Consent-Decree-1996-2010.pdf	Transportation Agency	Racial-equity focused civil rights litigation settlement requiring balance between maintaining and improving local transit service quality and expanding regional transit	Implementation	Compensatory	Social

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
112	Metro Transit Everyday Equity Initiatives https://www.metrotransit.org/equity-initiatives	Transportation Agency	A variety of equity promotion initiatives from a “set of questions that helps a person view a decision from an equity perspective” to Spanish language training for operators, to a program of improving bus stops in areas of concentrated poverty	Title VI compliance	Compensatory, Procedural	Transportation
113	Metropolitan Council Equity Advisory Committee https://metro council-Meetings/Committees/Equity-Advisory-Committee.aspx	MPO	Coordinating body for incorporating equity promotion in regional planning	Coordination	Compensatory, Procedural	Social

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
114	Metropolitan Council Joint Disparities Study https://mn.gov/admin/assets/Keen%20Independent%20Met%20Council%20Disparity%20Study%20draft%20full%20report%2001292018_tcm36-325265.pdf	MPO	Detailed study of equity in public procurement focused on POC- and women-owned firms	Evaluation	Procedural	Transportation
115	Metropolitan Council Metro Stats program https://metro council.org/Data-and-Maps/Publications-And-Resources/MetroStats/Census-and-Population/Diving-Deeper-Understanding-Disparities-Between-B.aspx	MPO	Evaluation initiative focused on identifying demographic and economic factors that intersect with racial disparities while validating race a key factor in explaining those disparities	Evaluation	Compensatory	Social
116	Metropolitan Washington Council of Governments Equity Emphasis Areas https://www.mwcog.org/transportation/planning-areas/fairness-and-accessibility/environmental-justice/equity-emphasis-areas/	MPO	Equity mapping initiative guiding regional transportation planning	Mapping	Compensatory, Geographic	Social

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
117	Minnesota Compass program, Wilder Research https://www.mncompass.org/disparities/overview	Nonprofit	Equity-focused social data resource	Research	Compensatory	Social
118	Minnesota Department of Health “Advancing Health Equity in Minnesota” implementation process http://www.health.state.mn.us/divs/chs/healthequity/ahe_1eg_report_020414.pdf	State agency	Health-focused equity research initiative with transportation component	Research	Compensatory	Social
119	North Central Texas Council of Governments Transportation and Environmental Justice Program https://www.nctcog.org/trans/quality/ej	MPO	Regional program to actively enforce Title VI compliance in transportation projects	Title VI compliance	Procedural	Transportation
220	Policy Link National Equity Atlas http://nationalequityatlas.org/	Nonprofit	National-scale equity-focused mapping initiative for social data	Mapping	Equality, Geographic	Social, Transportation

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
221	Polk County, Florida Neighborhood Mobility Audits http://polktpo.com/what-we-do/our-planning-documents/neighborhood-mobility-audits	County	Multi-destination accessibility analysis for underserved communities. Focuses on multi-modal mobility solutions to accessibility problems	Evaluation	Compensatory	Social, Transportation
222	Pratt Center for Community Development Transportation Equity Project https://prattcenter.net/transportation-equity-project	Nonprofit	Community-led equity mapping and bus rapid transit planning initiative in New York. Pratt Center is a nonprofit corporation that coordinates activities of community organizations.	Mapping, Planning, Coordination	Compensatory	Social, Transportation

Ref#	Program	Scale	Description	Primary Activity	Equity Focus	Equity Approach
223	San Francisco Metropolitan Transportation Commission/Association of Bay Area Governments Regional Equity Working Group https://mtc.ca.gov/about-mtc/what-mtc/mtc-organization/interagency-committees/regional-equity-working-group	MPO	Coordinating body for incorporating equity promotion in regional planning.	Coordination	Compensatory, Procedural	Social, Transportation
224	Seattle Department of Transportation, Transportation Equity Program https://www.seattle.gov/transportation/projects-and-programs/programs/transportation-equity-program	Transportation Agency	Provides discounted transit passes and vehicle access to low-income Seattle residents, and conducts outreach to community organizations in racially and economically marginalized areas.	Direct services	Compensatory, Procedural	Transportation

APPENDIX B: RECOMMENDATIONS, TARGET POPULATION(S), MODE(S) IMPACTED, AND IMPLEMENTATION

Recommendations		Target Population(s)	Modes Impacted	Level of Cross Collaboration Needed
Recommendation 1.1	Incorporate inclusive and culturally-sensitive community engagement practices in decision-making processes.	Low-income communities, communities of color, people with disabilities, older adults, single parent households	N/A	High
Recommendation 1.2	Conduct multilingual outreach and engagement with limited English populations, particularly with immigrant communities.	Communities of color and/or limited English populations	N/A	High
Recommendation 1.3	Work in close partnership with community members to build trust over time and maintain effective relationships that go beyond project deadlines.	Low-income communities, communities of color, people with disabilities, older adults	N/A	High
Recommendation 2.1	Provide quality and affordable public transit facilities and services, particularly for transit-dependent communities.	Zero vehicle households, low-income communities, people with disabilities, older adults, youth, the homeless	Transit	Medium
Recommendation 2.2	Create and expand connections between employment centers and underserved areas	Low-income communities, communities of color,	Transit, shared mobility	Medium

Recommendations		Target Population(s)	Modes Impacted	Level of Cross Collaboration Needed
	that are physically isolated from job opportunities.	people with disabilities, zero vehicle households, rural/suburban communities		
Recommendation 2.3	Support transit-oriented development that offers affordable housing options and support community economic development.	Low-income communities, communities of color, people with disabilities, zero vehicle households, older adults	Walking, rolling, biking, shared mobility	Medium
Recommendation 2.4	Ensure that shared and technology-based mobility options such as ride share, bike share, scooter share, and telecommuting provide mobility opportunities for underrepresented communities.	Low-income communities, zero vehicle households, older adults, people with disabilities, children and youth, rural and/or suburban communities	Shared mobility	Medium
Recommendation 3.1	Encourage transportation agencies to design, construct, maintain, and improve roadways to encourage active transportation.	Children and youth, women, older adults, people with disabilities, low-income communities	Walking, rolling, biking	Low

Recommendations		Target Population(s)	Modes Impacted	Level of Cross Collaboration Needed
Recommendation 3.2	Support initiatives that decrease the harmful impacts of automobile use on community health and wellbeing.	All underserved and underrepresented populations	Automobile	Medium
Recommendation 3.3	Reduce adverse impacts of freight transportation systems, particularly on low-income and communities of color who are disproportionately located near freight routes and facilities.	Low-income communities and communities of color	Freight	High
Recommendation 4.1	Increase access to jobs and training in the transportation industry for communities that are historically underrepresented.	All underserved and underrepresented populations	N/A	Low
Recommendation 4.2	Increase contracts to businesses owned/operated by underrepresented populations to support wealth building among underrepresented communities.	All underserved and underrepresented populations	N/A	Low
Recommendation 4.3	Strengthen the role of equity among the criteria for spending across the system and distributing infrastructure projects based on community priorities.	All underserved and underrepresented populations	N/A	Low

Recommendations		Target Population(s)	Modes Impacted	Level of Cross Collaboration Needed
Recommendation 5.1	Engage in multi-stakeholder collaboration to create a collective vision with mutually beneficial outcomes, potentially following successful collaborative practices that are part of the Minnesota Toward Zero Deaths program.	All underserved and underrepresented populations	N/A	High
Recommendation 6.1	Develop a framework for measuring and evaluating the impacts of policy, program, and project implementation from an equity standpoint.	All underserved and underrepresented populations	N/A	Low
Recommendation 6.2	Facilitate accountability and effective implementation of projects and programs by developing an implementation plan with an equity lens.	All underserved and underrepresented populations	N/A	Low
Recommendation 6.3	Evaluate the potential positive and negative health impacts of a program or project before it is implemented.	All underserved and underrepresented populations	N/A	Low