The Use and Influence of Health Indicators in Municipal Transportation Plans

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The Use and Influence of Health Indicators in Municipal Transportation Plans

by

Kelly Christine Rodgers

A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Urban Studies

Dissertation Committee:
Jennifer Dill, Chair
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Portland State University
2023
Abstract

Transportation is an important social determinant of health that shapes the places where people “live, learn, work, and play” to the extent that an individual’s zip code better predicts their health than their genetic code. Researchers and practitioners have called for the use of health indicators in transportation as one way to integrate public health concerns into transportation. However, it is unclear how indicators are used and what impact they have on policy—the creation or modification of policies and planning documents—and practice, especially in transportation. Using a case study approach, this dissertation explores the use and influence of health indicators in municipal transportation plans, addressing an identified gap in knowledge regarding the extent and use of health indicators in transportation planning and decision-making processes, especially in cities, which are understudied compared to studies of indicators at the metropolitan level and the state level. Organizational factors were more important than indicator usability factors for influencing administrative decision-making, including the institutionalization of indicators over time. Social learning occurred within participatory processes where policy actors framed problems to be addressed in transportation plans. A change in the cultural values regarding the role of transportation was a critical component in making major policy change, although social learning may have also played a role. Minor policy learning and change regarding the use of indicators as a management strategy occurred within all cases. Previous experience with data-driven management helped institutionalize indicators into administrative routines.
Acknowledgements

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1. Overall Introduction

Transportation is an important social determinant of health (SDOH) that shapes the places where people “live, learn, work, and play” (CDC, 2022) to the extent that an individual’s zip code better predicts their health than their genetic code (RWJF, 2021-2023). Transportation systems affect public health through multiple pathways. Thousands of people are killed or seriously injured on U.S. roads every year (NHTSA, 2020). Transportation systems expose people to air and noise pollution, enable or prevent access to the goods, services, and social networks essential to health, and facilitate or constrain healthy behaviors, such as opportunities for physical activity (Frank et al., 2019). Lack of adequate transportation and the subsequent access to resources can exclude people from their full participation in society, resulting in adverse health outcomes (Mackett & Thoreau, 2015).

Researchers and practitioners have called for the use of health indicators in transportation as one way to integrate public health concerns into transportation decision-making (Giles-Corti et al., 2014; Giles-Corti et al., 2016; Malekafzali, 2009; Sandt et al., 2019; Singleton & Clifton, 2017). The call for health indicators comes amidst the growing emphasis on the use of indicators for transportation plans and projects in general (Handy, 2008; Marsden et al., 2006), particularly calls to expand beyond traditional mobility metrics into measures that include, for example, access to destinations (e.g., Center for Transportation Studies, 2010; Osborne & Searfoss, 2015) and equity (e.g., Malekafzali, 2009). The underlying hope is that new organizational
routines, such as measuring and tracking indicators, can translate policy goals into policy practice (Bauler, 2012; Rydin et al., 2003). However, it is unclear how indicators are used and what impact they have on policy—the creation or modification of policies and planning documents—and practice, especially in transportation. Research on the capacity for indicators, health or otherwise, to affect decision-making has shown mixed results (Gudmundsson & Sørensen, 2013; Petticrew et al., 2004), with some studies showing that indicators may instead reinforce the status quo (Pineo et al., 2019).

Despite the substantial amount of research on how technical information, including indicators, is used in policy and practice, there are several theoretical gaps in the literature. As the literature across these diverse fields is large (Contandriopoulos et al., 2010; Smith, 2013), research findings remain in silos and insights from one field are not transferred to another (Oliver & Boaz, 2019). Another challenge is that research on indicators is focused on their development and use rather than their influence (Contandriopoulos et al., 2010; Innes & Booher, 2000; Oliver, Lorenc et al., 2014; Oliver, Innvær et al., 2014; Sébastian et al., 2014). Another problem is that constructs of “use” and “influence” of technical information have proven notoriously difficult to operationalize (Hezri, 2005; Landry et al., 2003; Oliver, Innvær et al., 2014; Weiss & Buculavas, 1980).

This dissertation examines the perceptions of indicator use and influence by actors involved in the production and/or use of health indicators in the development and implementation of municipal transportation plans. My dissertation is motivated by
the larger question: Are health indicators successful in integrating health concerns into transportation decision-making and if so, how?

My research questions are:

1. How are health indicators used in transportation plans? What factors are responsible for their use?
2. How influential are health indicators in shaping transportation decisions? What factors explain their influence?

Using a case study approach, this dissertation explored the use and influence of health indicators in municipal transportation plans, addressing an identified gap in knowledge regarding the extent and use of health indicators in transportation planning and decision-making processes (Sandt et al., 2019). I examined indicators within cities, which are understudied compared to studies of indicators at the metropolitan level (Dumbaugh & Meyer, 2003; Handy, 2008; Lyons et al., 2012; McAndrews & Marcus, 2014; Singleton & Clifton, 2017) and the state level (Dumbaugh & Meyer, 2003; Hendren & Niemeier, 2006; Lyons et al., 2014; Miller & Evans, 2011). The study of indicators within cities is important because cities make decisions about transportation, land use, and other areas that create environments that support health (Browne et al., 2019; Lorenc et al., 2014). Finally, to address the disconnections among related literatures, my dissertation synthesizes multiple theories that explain the use and influence of indicators, offering an improved framework for defining outcomes, explanatory factors, and the mechanisms at work.
This dissertation is organized with an introduction that contains a brief overview of the literature and key concepts, followed by the methodology, and then an overview of the transportation plans and indicators therein. Chapter 5 discusses the use and institutionalization of health indicators and their influence on administrative decision-making. This includes a chapter-specific literature review, findings, discussion, and conclusion. Chapter 6 addresses the influence of health indicators on social learning and policy change. Within this chapter is a literature review, findings, discussion, and conclusion. Finally, I provide an overall conclusion to the dissertation that includes recommendations for further research and using indicators in practice.
2. Overall Literature and Concepts

To understand how indicators are used and influence transportation policy and practice, I examined several fields of study with different underlying theories for how scientific information (a.k.a. technical information, evidence) relate to social learning, policy change, and organizational learning and routines. After an overview of major fields that address the above, I explain how this literature has informed the key concepts of my dissertation.

2.1. Knowledge Utilization

The term knowledge utilization (KU) broadly encompasses research utilization and evidence-based policy (Rabin & Brownson, 2017). Research utilization concerns itself with the production end of evidence; that is, the uptake of research in policy from the researcher’s perspective (“is the research being used?”). Evidence-based policy is focused on implementation (“does the policy reflect the evidence?”). Weiss (1979, 1991) defines three uses of research: instrumentally, which has direct application to a policy problem; conceptually, when research shapes how policy makers understand an issue; and politically to justify decisions, mobilize allies, or argue against opponents (Ozawa, 1991; Weible, 2008). Evidence-based policy has evolved since its introduction, which was envisioned as a way to elevate policymaking from messy political ambiguity into objective high ground (Oliver & Pearce, 2017). Its origins in instrumental and rationalist use of evidence have been critiqued from many quarters (Oliver, Lorenc, et al., 2014; Smith, 2013). Some argue that evidence-based policy is not just, or even primarily, a
problem-solving tool but rather a tool for the democratization of knowledge (Shulock, 1999; Young et al., 2002).

2.2. Indicator Literature

The indicator “industry” has existed for at least 30 years (Hezri & Dovers, 2006; Holman, 2009). It is particularly robust in the field of sustainable development (Hezri & Dovers, 2006; Holman, 2009; Innes & Booher, 2000; Rydin et al., 2003). Indicators in city planning are influenced by work in public administration, environmental studies, and sustainable development (Davern et al., 2017; Dluhy & Swartz, 2006; Hezri & Dovers, 2006; Innes & Booher, 2000). Although indicators can be found in city planning research and practice, the concept of evidence-based policy per se is practically non-existent in planning. Planning theory has a more constructivist orientation and emphasizes the importance of balancing the needs of multiple stakeholders (Healey, 2006; Hezri & Dovers, 2006; Oliver & Pearce, 2017), making it challenging to elevate research findings above other concerns into practice (Lorenc et al., 2014; Krizek et al., 2009). Operating in the tradition of communicative planning theory (CPT), Innes & Booher (2000) found that indicators are influential when they are developed collaboratively and are clearly linked to decision-making processes.

In the public health tradition, indicators are considered a way to operationalize evidence-based policy (Bell & Morse, 2011; Sébastien et al., 2014). Dissemination and implementation science is a common framework for integrating research insights into practical guidance in the health field (Rabin & Brownson, 2017). Generally, these
frameworks assume a linear process of research production to research consumption, a conceptualization owing partly to its positivist roots and influence from the health field (Pineo et al., 2020; Rabin & Brownson, 2017). As a result, the research focus is on identifying and removing the barriers between the production of evidence and its consumption by practitioners (Oliver, Innvær, et al., 2014; Oliver, Lorenc, et al., 2014). However, policy process theories are increasingly being used within public health (Baker et al., 2018; Béland & Katapally, 2018; Cairney & Oliver, 2017). Although the public health field is increasingly turning to the social determinants of health (SDOH) as a way to improve population health, transportation does not always register as an area of concern. While transportation is frequently mentioned in community and neighborhood and livability indicator systems, it is underrepresented in health indicator tools (Elias et al., 2019; Parrish, 2016). Pineo et al. (2018, 2020) found that health indicator tools used by municipal actors have an indirect influence on city planning decisions and were most effective when embedded in policy processes.

The use of indicators in transportation—more commonly called performance measures—have origins in business and public administration (Davoudi, 2006; Grant et al., 2013; Heinrich, 2007; Hezri & Dovers, 2006). Although the field of public administration has theoretical connections to evidence-based policy, overall the greater concern about the use of indicators in transportation are about efficiency (Grant et al., 2013), stakeholder communication (Pickrell, 2014; Reiff & Gregor, 2005), and
accountability (Grant et al. 2013; Hendren & Niemeier, 2006; Miller et al., 2008; Osborne & Searfoss, 2015; Pickrell, 2014), rather than fidelity to the evidence base.

2.3. Policy Process

Policy process theories, which emerged in the 1950s, integrate policy, politics, and public administration. Drawing from cognitive psychology and behavioral economics, policy process theories assume that actors operate with bounded rationality. Policy process researchers often examine actors—individuals, organizations, or coalitions—and their attributes, such as their knowledge, beliefs, strategies, and resources. The multiple streams framework (MSF) (Kingdon, 1995) is one of the most popular approaches to studying policy change (Cairney, 2018; Colditz & Emmons, 2017; Goyal & Howlett, 2019; Ritter et al., 2018; Sallis et al., 2016; Weible & Sabatier, 2018), although it faces criticism for insufficient specificity and theoretical development (Cairney & Jones, 2016; Herweg et al., 2018; Mukherjee & Howlett, 2015; Reardon, 2018). The MSF describes how three streams—the problem stream, the policy stream, and the political stream—must converge to set the agenda. Indicators, which reside in the problem stream, alert policymakers to a condition that can be defined as a problem (Kingdon, 1995). Also a prominent theory, the advocacy coalition framework (ACF) draws on political science, policy studies, and social psychology research (Ritter et al., 2018). The ACF was developed partly to respond to the perceived shortcomings in the policy process research, including the need to better understand the role of scientific and technical information in policy debates (Mukherjee & Howlett, 2015; Sabatier, 1987) and
address the debates found in the policy implementation literature (Jenkins-Smith et al., 2018).

2.4. Social Learning

Policy and organizational learning, or more broadly, social learning, has an extensive literature that spans the fields of business management, organization science, public administration, and public policy. Learning is increasingly used as a lens to study the policy process, policy transfer, and evidence-based policy (Dunlop & Radaelli, 2020). Social learning involves power and “collective puzzlement on society’s behalf” (Heclo, 1974, p. 305, cited in Bennett & Howlett, 1992 and Holden, 2008); that is, it integrates learning and power (Parsons, 1995; Moyson et al., 2017). Many policy-learning models, such as the ACF, view learning as a change in belief systems or policy preferences (Moyson et al., 2017; Sabatier, 1987). Although a less well-defined area of study in the urban planning literature (Holden, 2008), social learning in communicative planning theory perceives learning as a component of democratic action: "It is a multi-dimensional model where communication, learning and action are joined together and where the polity, interests and citizenry co-evolve" (Innes & Booher, 2004, p. 422).

Organizational learning either focuses on the improvement of government performance or is centered on organizational learning behaviors (Moyson et al., 2017). The organizational learning framework articulated by Argyris and Schön (1996) includes concepts such as espoused theory of action vs. theory-in-use, error detection, and single- and double-loop learning. These are especially relevant for how indicators are
in institutionalized into practice and will be discussed further in the chapter-specific literature reviews.

2.5. Policy Implementation

Policy implementation is focused on the steps after policy change occurs. Policy implementation is generally considered understudied for several reasons. First, many policy scholars left the field in the wake of debates over the “top-down” and “bottom-up” (e.g., street-level bureaucrat, Lipsky, 1980) approaches to studying policy implementation. In addition, many policy change frameworks abandoned the idea of implementation as a distinct stage of the policy process. Scholars also shifted to study changes in governance, particularly neo-liberalism as it came to prominence in the 1990s (Saetren, 2005). Implementation has also been understudied in city planning as well (Talen, 1996). While there has been a lot of study of what planners do, there has been a lack of evaluation of the plans and their outcomes. Talen (1996) distinguishes between *ex ante* analysis of plan impacts, which is commonly undertaken, and the *ex post* analysis of plan implementation. “Third-generation” policy implementation research offers new frameworks for studying implementation. Ansell et al. (2017) recommend engaging front-line staff and the targeted policy groups in policy design (cf. Hoppe et al. 1987; Howlett, 2014). This produces not only superior policy design but generates political support during its implementation (Ansell et al., 2017). Responding to calls for more third-generation implementation studies, Laurian et al. (2010, 2017)
developed implementation analysis frameworks for city plans, primarily focusing on the organizational factors that lead to implementation success or failure.

2.6. Institutionalism

From an institutionalist perspective, institutions facilitate or constrain opportunities for policy change (Béland & Katapally, 2018). Hall (1993) defines institutions as “the formal rules, compliance procedures, and standard operating procedures that structure the relationship between individuals in various units of the polity and community” (p. 19-20). In general, institutional theory asserts most policy change can be explained based on dissatisfaction with the results of previous policy, not just from current conditions (Hall, 1993). That is, the key factor affecting “policy at time-1 is policy at time-0” (Hall, 1993, p. 277). These policy legacies “create their own constituencies and vested interests, which tend to support the status quo” (Béland & Katapally, 2018, p. 370). Policy paradigms are an institutionalist concept that, among other things, determine the viability of certain policy solutions. Rietveld and Stough (2005) assert that the primary barriers to sustainable transportation are institutional.

2.7. Social Studies of Science

Generally, the social studies of science, such as Science and Technology Studies and Science, Technology, and Society (similar fields that both abbreviate as STS) is concerned with the interface between science and policy. A key concept brought forward from STS is the role of indicators as boundary objects: a mechanism to facilitate relationships between scientists and decision-makers. STS also emphasizes the role of
boundary organizations in managing boundary objects by mediating between information producers and decision-makers (Cash et al., 2002; Hansson & Polk, 2018). Boundaries can also exist between disciplines, which can also be interpreted as between departments or agencies, and can serve as barriers to communication, collaboration, and action (Cash et al., 2002).

2.8. Key Concepts and Definitions

Following Corburn & Cohen’s (2012) terminology and consistent among many indicator approaches (Parrish, 2016), I define indicator as a construct, often consisting of more than one measure, with metric being the actual quantitative or qualitative data used to populate the indicator. Indicators are often built on an underlying theoretical framework, unlike data or statistics (Sébastien et al., 2014). With its origins in performance management, the transportation field tends to use the term objective or performance area as an indicator construct whereas the performance measure is akin to the metric. For example, “increase the number of people traveling actively” is an indicator (or objective) and a metric could be the “percent of walk, bicycle, and transit commute mode share.” I primarily use indicator in this dissertation, although use performance measure when an informant or other document specifically uses that term.

Following Gudmundsson and Sørenson (2013) and Sébastien et al. (2014), I define use as where an indicator was “handled” in the process (e.g., discussed, reported). My dissertation specifically examines how indicators are used in municipal transportation plans and other transportation planning processes that are specified by
the transportation plans. This includes the use of indicators as part of on-going systems monitoring, which may or may not have formal reporting requirements (cf. Gudmundsson & Sørensen, 2013; Innes & Booher, 2000). Indicators may also be used as evaluation criteria to prioritize or recommend projects within the plan document itself (cf. Innes & Booher, 2000). Evaluation criteria may have a life beyond the plan if they are used to prioritize projects for capital improvement programming.

Generally, influence is the consequence of these uses. While inconsistently operationalized in the literature, Weiss’ (1991) categories of conceptual, instrumental, and political uses are helpful for delimiting general influences. Theories from other fields refine some of these terms. The instrumental use of indicators, the focus of the Chapter 5, is when the transportation agency makes decisions based on the information that indicators provide. Institutionalization, also discussed in the Chapter 5, is when the on-going use has been integrated into the agency’s routines; it is repeated administrative action. Institutionalization can affect the degree of influence an indicator has. I refer to Argyris and Schön’s (1996) theory of organizational learning to identify double-loop learning, in which the organization has reflected upon the systems that produce problems or mistakes and take the necessary steps to change the systems and routines that produce them. Single-loop learning is when policy actors correct “mistakes” (e.g., improve an intersection) when they are surfaced through the existing administrative processes (Argyris & Schön, 1996).
The conceptual use of indicators includes drawing attention to a problem, policy learning, or social learning. I describe these in further detail in Chapter 6 of my dissertation. The political use of indicators is typically described as justification or rationalization of projects by members of elected office. This is not a focus of my dissertation, and the data I collected suggests that this type of use was rare within my case cities. However, the public reporting of indicators on a regular basis, an administrative action, has a political component, as it can generate political pressure in the direction from council to staff or from advocates to council.
3. Overall Methodology

This research employs a multiple city case study approach to understand the use and influence of health indicators in municipal transportation planning. This methodology section applies to the dissertation as a whole. Chapters 5 and 6 provide more detail about the specific literature relevant to the focus of the research. The Portland State University Institutional Review Board (IRB) determined that this research posed little to no risk for research participants and was exempt from requirements of the federal policy for the protection of human subjects.

This dissertation examines the perceptions of indicator use and influence by actors involved in the production and/or use of health indicators in five case cities. This research was motivated by the larger question: Are health indicators successful in integrating health concerns into transportation decision-making and if so, why and how?

The research questions are:

1. How are health indicators used in transportation plans? What factors are responsible for their use?

2. How influential are health indicators in shaping transportation planning decisions? What factors explain their influence?

Based on the literature review, I hypothesized that the factors that best explain indicator use would be organizational, specifically the procedural elements, whereas political factors would explain influence, particularly in more contested environments. I expected that the influence of indicators would depend on whether there is an
influential champion within the agency or an effective coalition of advocates. In both cases, the policy actor’s success would likely depend on their ability to use the indicator results rhetorically to make a compelling argument for change (Contandriopoulos et al., 2010).

Based on the literature, I developed two propositions regarding the use and influence of health indicators in transportation plans:

- **Use** depends on the degree to which indicators are organizationally embedded

- **Influence** depends on the presence of an influential champion or effective coalition of advocates

In addition, I developed a second set of propositions for social learning and policy change, which are discussed in Chapter 6. I also developed a set of rival propositions, which are akin to alternative hypotheses that might explain outcomes. Strong rival propositions encourage the selection of multiple cases to show how the rival explanation has been considered (Yin, 2014).

**Rival Proposition 1: Use is highest in cities with highly valid indicators**

The basis of this proposition comes from the literature that asserts (or presumes) that evidence quality—the technical validity and rigor with which the indicator has been developed—will determine how useful the indicator is (Holman, 2009; Lehtonen et al., 2016).
Rival Proposition 2: Influence depends on city characteristics and context

Cradock et al. (2009) found disparities in active travel funding and implementation in counties based on population size, location, and the socio-economic characteristics of the county, suggesting that this context may be meaningful for transportation decisions. In practice, contextual factors are often cited as rationale why something does or does not work. One might argue, for example, that health-related indicators are likely to be influential only in rapidly growing cities or in high-income cities. Multiple cases with varying characteristics increase representativeness and also address this rival proposition.

3.1. Case Study Approach

Case study is a research method appropriate for studying complex, real-world social phenomena when the variables of interest cannot be controlled and the boundaries between the variables and context are not readily apparent. It is often used when the research seeks to understand how or why decisions are made (Yin, 2014). The exchange of knowledge in decision-making processes is complex because it involves complex human actors (Contandriopoulos et al., 2010) who interact with organizational structures and political contexts. Rather than a single role, indicators may serve multiple functions (Gudmundsson & Sørensen, 2013; Lehtonen et al., 2016; Sébastien et al., 2014; Weible, 2008) and be perceived differently by different actors (Sébastien et al., 2014). Information is not used in a straightforward manner in decision-making, but rather interacts with policies “through indirect and largely unforeseen pathways”
(Sébastien et al., 2014, p. 318). That "an indicator may not always be used; use may fail to lead to influence; and the influence may not necessarily concern the targeted policy" (Lehtonen et al., 2016, p. 4) exemplifies the indirect and complex role of indicators in decision-making. For these reasons, answering how exactly indicators are used and influence transportation planning is well suited to a case study approach.

In general, multiple cases are stronger than a single case. Multiple cases allow for understanding how different contexts affect outcomes (Yin, 2014) and can increase the representativeness of the case study (Gerring, 2004). In addition, multiple cases also have more data for addressing rival explanations. Furthermore, studying multiple municipalities is recommended to understand how different institutional decision-making and policy legacies explain the successful uptake of certain policy ideas (Béland & Katapally, 2018). Rather than employing a statistical sampling logic for case selection, the choice of cases is similar to multiple experiments or replication logic. Literal replication refers to cases that are expected to produce similar findings. Theoretical replication refers to cases that are expected to have contrasting findings, but for anticipated reasons (based on theory). Two to three cases should aim for literal replication but choosing five or six cases facilitates examination of different patterns of theoretical replication (Yin, 2014). Multiple cases increase the chances of finding both literal and theoretical replication.

Cities, and the policy actors operating within them, are the unit of analysis in my dissertation because cities are understudied compared to metropolitan areas
(Dumbaugh & Meyer, 2003; Handy, 2008; Lyons et al., 2012; McAndrews & Marcus, 2014; Singleton & Clifton, 2017) and states (Dumbaugh & Meyer, 2003; Hendren & Niemeier, 2006; Lyons et al., 2014; Miller & Evans, 2011). While states and metropolitan planning organizations (MPOs) are federally required to use performance measures, they have less responsibility for implementation at the local level. Cities, on the other hand, make decisions about transportation through citywide and neighborhood planning efforts, project prioritization and selection, corridor-level planning and project delivery, and site-level analysis of transportation impacts from land development (Casey et al., 2016; Semler et al., 2016). As such, cities provide an opportunity to trace the use of indicators through multiple scales of decision-making and observe whether policy goals are indeed being translated into project implementation. Cities also make decisions about land use and other areas that are important for creating environments that support health (Browne et al., 2019; Lorenc et al., 2014). Furthermore, public concerns about health tend to arise from local, rather than regional, activity (McAndrews & Marcus, 2014), making the study of actors working within local jurisdictions an appropriate unit of analysis for studying the role of health in the planning process.

To develop a set of comparable cases for case study selection, cases were bounded to cities 1) with a population of approximately 600,000 to 900,000, 2) having health-related indicators in transportation planning documents that had been adopted between 2010 and 2019 and 3) having addressed at least three of the five possible health domains, such as air quality or physical activity. Plans developed after 2019 were
discarded to eliminate the influence of COVID-19 in the plan compared to cities without the influence of COVID. Cities whose plans did not contain any health-related transportation indicators or did not provide any planning documents online were excluded from the prospective case study list. Washington, D.C. was also removed because it has federally mandated planning requirements, effectively operating as a state department of transportation as well as a local agency. Cities that were just outside the middle tertile of city population size were included in the list for consideration because of the contextual variety they offered. This resulted in 22 eligible cities for case study selection.

The tertiles of the 22 eligible cities were used to determine the high, middle, and low thresholds of their contextual characteristics and used to select a set of cities that helped increase representativeness of the case study (U.S. Census Bureau, 2019). These characteristics included: geographic region, population size, population density, population change, percent of the population that is white, and median household income. The final five cities were: Boston, MA; Denver, CO; Indianapolis, IN; Memphis, TN; and Seattle, WA (Table 1). The five cities selected for case study collectively provide representativeness of other cities within the same population range.
Table 1 Case Characteristics

<table>
<thead>
<tr>
<th>City</th>
<th>Population, 2019a</th>
<th>Population density per sq mi</th>
<th>Population change from 2010 to 2019</th>
<th>Percent white, not Hispanic</th>
<th>Largest non-white groupb</th>
<th>Median household income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>692,600</td>
<td>7,672</td>
<td>+12%</td>
<td>44.5</td>
<td>25.2% B</td>
<td>$71,115</td>
</tr>
<tr>
<td>Denver</td>
<td>727,211</td>
<td>3,922</td>
<td>+21%</td>
<td>54.2</td>
<td>29.9% H</td>
<td>$68,592</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>876,384</td>
<td>2,270</td>
<td>+6.8%</td>
<td>55.5</td>
<td>28.6% B</td>
<td>$47,873</td>
</tr>
<tr>
<td>Memphis</td>
<td>651,073</td>
<td>2,053</td>
<td>-0.1%</td>
<td>25.7</td>
<td>64.1% B</td>
<td>$41,228</td>
</tr>
<tr>
<td>Seattle</td>
<td>753,675</td>
<td>7,251</td>
<td>+24%</td>
<td>63.8</td>
<td>15.4% A</td>
<td>$92,263</td>
</tr>
</tbody>
</table>

a All data in Table 1 is from the 2019 American Community Survey’s 1-Year Data Estimates, U.S. Census Bureau. b The largest group of non-white alone population, including race and ethnicity: A=Asian, B=Black, H=Hispanic

The cases work together as a set, with each city offering at least one unique characteristic. Boston is the only city located on the East Coast and is the only city with a middle percentage white population. The City of Boston is almost 90 square miles in size, with 48 square miles of land area and the remaining 41 miles in water (U.S. Census Bureau, 2020a), which makes it the second smallest major U.S. city in terms of land area (Boston Redevelopment Authority, n.d.) and the smallest city in land area in this case set. Denver offers three unique characteristics: It is the only city located in the Mountain West, with a mid-range population density, and a Hispanic population as its largest non-white population. Indianapolis is the only city that is located in the Midwest and is approximately 360 square miles in size (U.S. Census Bureau, 2020b), making it the case city with the greatest land area as well as the greatest total population. Memphis is uniquely located in the Southeast and is the smallest in size by total population. Memphis is the only city that has experienced population decline and has a lower percent white population. Seattle is the only city located on the West Coast and is a high population growth, high density, and high-income city. Seattle is the only city to have a
large Asian population (15.4%); the remaining cities have either large Black (Boston, Indianapolis, Memphis) or non-white Hispanic (Denver) populations.

I used a social determinants of health framework to identify health-related indicators. Transportation affects public health through several pathways, including access to destinations, active transportation/physical activity, traffic safety, air pollution, and climate pollution (Frank et al., 2019). Although other pathways have been identified (Glazener et al., 2021), I used these pathways to define health-related indicators in transportation plans because they are well-established and commonly addressed in transportation plans. These health indicators are not always explicitly labeled as “health” per se (Berke & Conroy, 2000; Laurian et al., 2017). For example, the concept of access to employment is often associated with economic development goals and not public health, even though access to employment is a critical health determinant (RWJF, 2013). Each case city addressed at least three health domains in their transportation plans (Table 2).

Table 2 Health Indicator Domains in each City

<table>
<thead>
<tr>
<th>City and number of domains addressed</th>
<th>Access to destinations</th>
<th>Physical activity/active travel</th>
<th>Traffic safety</th>
<th>Air quality</th>
<th>Climate change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston (5)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Denver (5)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Indianapolis (5)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Memphis (3)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Seattle (5)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
3.2. Data and Analysis

3.2.1. Documents

I reviewed the primary transportation plan in each city, which in some cases was the transportation element of a comprehensive plan. Informants referred others, and based on the referred actor’s availability, I also reviewed the plans they were involved in. For example, if a policy actor involved in a modal transportation plan was responsive to requests for an interview, I also reviewed that modal plan. Beyond primary transportation plans, I reviewed pedestrian plans, bicycle plans, and a Vision Zero plan (Table 3). Transit plans were also mentioned by informants but due to scope and time constraints, these were not included in my review. As I discuss in the conclusion, transit planning is worth further study.

I examined transportation plans to determine which health indicators were used as well as how they were intended to be used (e.g., evaluation criteria). Plan vision and goal statements reflect public opinion as captured and interpreted by staff through the engagement process. To an extent, the vision and goal statements also reflect the policy beliefs of city departments. I also examined the mission statements of departments to identify the departments’ expressed values, which may differ from the adopted transportation plan goals. That is, the policy beliefs of the participants in the engagement process, on-the-ground planning staff, and departmental leadership may not correspond perfectly. I interpreted the objectives and strategies as a part of the
cities’ espoused theory of action (Argyris & Schön, 1996); that is, the ostensible means for accomplishing their transportation goals.

**Table 3 Transportation Plans Reviewed**

<table>
<thead>
<tr>
<th>City</th>
<th>Transportation plan</th>
<th>Date adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Boston</td>
<td><em>Go Boston 2030 Vision and action plan</em></td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td><em>Vision Zero Boston action plan</em></td>
<td>2016</td>
</tr>
<tr>
<td>City and County of Denver</td>
<td><em>Blueprint Denver: A blueprint for an inclusive city</em></td>
<td>2019</td>
</tr>
<tr>
<td></td>
<td><em>Denver moves: Pedestrians &amp; trails</em></td>
<td>2019</td>
</tr>
<tr>
<td>City of Indianapolis/Marion County</td>
<td><em>Indy moves transportation integration plan</em></td>
<td>2018</td>
</tr>
<tr>
<td></td>
<td><em>Indianapolis pedestrian plan: Walkways</em></td>
<td>2016</td>
</tr>
<tr>
<td>City of Memphis</td>
<td><em>Memphis 3.0 comprehensive plan</em></td>
<td>2019</td>
</tr>
<tr>
<td>City of Seattle</td>
<td><em>City of Seattle pedestrian master plan</em></td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td><em>Move Seattle: Mayor Edward B. Murray’s 10-Year strategic vision for transportation</em></td>
<td>2015</td>
</tr>
<tr>
<td></td>
<td><em>City of Seattle bicycle master plan</em></td>
<td>2014</td>
</tr>
</tbody>
</table>

In addition to planning documents, I examined the 2019 approved budgets to understand the organizational capacity and resources of the cities. In Table 4 below I include the transportation budgets for the case cities, their citywide budgets, and per capita allocation of the citywide budgets. Where a city does not have a transportation department, I used the budget for the public works department. Two cities have a dedicated, stand-alone transportation department: Boston’s Streets Cabinet and Seattle’s Department of Transportation. These cities have separate departments for other infrastructure responsibilities, such as water or sewer. Denver, Memphis, and Indianapolis have public works departments that include responsibilities for transportation-related design, operations, and maintenance. In these cases, the budget shown in Table 4 below is used not only for transportation but also other public works
purposes. That is, the budget dedicated to transportation in these cities is less than what is represented within the table.

**Table 4 City Budgets**

<table>
<thead>
<tr>
<th>City</th>
<th>FY 2019 Transportation/Public Works Budget</th>
<th>FY 2019 City Budget</th>
<th>Per Capita FY 2019 City Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Boston&lt;sup&gt;a&lt;/sup&gt;</td>
<td>$152.9 million</td>
<td>$3.29 billion</td>
<td>$4,750</td>
</tr>
<tr>
<td>City and County of Denver&lt;sup&gt;b&lt;/sup&gt;</td>
<td>$146.01 million</td>
<td>$2.4 billion</td>
<td>$3,300</td>
</tr>
<tr>
<td>City of Indianapolis/Marion County&lt;sup&gt;c&lt;/sup&gt;</td>
<td>$117.04 million</td>
<td>$1.17 billion</td>
<td>$1,335</td>
</tr>
<tr>
<td>City of Memphis&lt;sup&gt;d&lt;/sup&gt;</td>
<td>$15.85 million</td>
<td>$685 million</td>
<td>$1,052</td>
</tr>
<tr>
<td>City of Seattle&lt;sup&gt;e&lt;/sup&gt;</td>
<td>$619 million</td>
<td>$5.9 billion</td>
<td>$7,828</td>
</tr>
</tbody>
</table>

Note. Denver, Indianapolis, and Memphis have combined public works and transportation departments while Boston and Seattle have separate public works and transportation departments. <sup>a</sup> Boston (n.d.). <sup>b</sup> Denver (n.d.). <sup>c</sup> Indianapolis (2018). <sup>d</sup> Memphis (n.d.). <sup>e</sup> Seattle (n.d.)

### 3.2.2. Interviews

The target informants for interviews were a variety of stakeholders engaged in the planning process, including representatives from the transportation department, planning department, departmental leadership, consultants, representatives from community-based organizations, public health professionals as well as representatives from the Metropolitan Planning Organization (MPO). Because not everyone has the same access to information and has different vantage points of the planning process, interviews from a variety of sources help to paint a more complete picture of the use and influence of health indicators. Informants were identified from transportation plan documents and through personal contacts in the departments. From that point, a snowballing process was used to identify other relevant actors. I conducted 34 interviews (Table 5): seven each in Boston, Denver, Memphis, and Seattle and six in
Indianapolis. Some informants represent more than one category, so the informant total by category is greater than thirty-four.

**Table 5 Informant Characteristics**

<table>
<thead>
<tr>
<th>Informant category</th>
<th>Boston</th>
<th>Denver</th>
<th>Indianapolis</th>
<th>Memphis</th>
<th>Seattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning staff, City</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Transportation/public works staff, City</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Other department, City</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department director, City</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public health practitioner</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community-based organization</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>MPO staff</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Consultant</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total informants, by city</td>
<td>7</td>
<td>8(^a)</td>
<td>7(^a)</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

\(^a\) An informant represents two categories

Interview questions were developed from the concepts and constructs identified in the literature review, such as whether indicator results surprised the informant or others, if departmental management supported the use of indicators, and whether staff had sufficient technical capacity to track indicators over time. Interviews were semi-structured, adjusting questions to be more relevant for informants who were internal or external to the city. Interviews were conducted via Zoom and typically were one hour in duration. The live transcript function on Zoom was used to create the initial transcript; the transcript was corrected and clarified by listening to the audio recording.

I employed thematic analysis to arrive at the findings. Like most thematic analysis, my dissertation examined the actual behaviors and events under study (Vaismoradi et al., 2013). I coded the interview transcripts in Dedoose (2016) using a hybrid deductive (i.e., a priori) and inductive coding scheme. I created a codebook to help guide coding at the outset and revised after reading the texts. The first round of
coding involved broader categories. In the second round of coding, I teased apart lumped concepts and re-coded with the improved understanding that comes from re-reading the texts. I used memos to help identify themes among codes and reconnect themes to the literature (Fereday & Muir-Cochrane, 2006).

I developed an analytical framework by identifying the key indicator usability, organizational, and political factors for indicator use, influence, and institutionalization, populating it with observed data for each case city. Once I had populated my analytical framework, I sent follow-up questions by email to informants to address missing information. I drew from the analytical framework to write the dissertation findings. After I had completed the initial findings of each case city, I sent informants the case city drafts relevant to them in order to determine whether I had captured their experiences well (Padgett, 2012). I asked for corrections in the timelines or events and whether they felt I had accurately quoted them.
4. Overview of Transportation Plans and Indicators

In this section I provide an overview of the transportation plans I reviewed within each case city. I include plan goals and key concepts and a list of the indicators that address health, as defined by the social determinants of health; that is, those indicators that address access to destinations, active travel or physical activity, traffic safety, air quality, and climate change. I also identify the vision or mission statement of the agency developing the plans.

4.1. City of Boston

4.1.1.1. Go Boston 2030 Vision and Action Plan

Adopted in 2017 during the Walsh administration, the Go Boston 2030 Vision and Action Plan (Go Boston) is Boston’s long-range transportation plan and was produced by the Boston Transportation Department (BTD) whose “vision is for Boston’s streets to be safe, inclusive, and vibrant” (Boston, n.d.-b). Other key actors involved in the development of Go Boston include non-profit organizations such as LivableStreets, which “envision a world where streets are safe, vibrant public spaces that connect people to the places where they live, work, and play” (LivableStreets, n.d.), WalkBoston, which “makes walking safer and easier in Massachusetts to encourage better health, a cleaner environment and more vibrant communities” (WalkBoston, 2023), the Boston Cyclists Union, which indicates they are “making streets safe for everybody” (Boston Cyclists Union, 2023, original emphasis), and the Disabilities Commission, a City department that
facilitates “full and equal participation in all aspects of life by persons with disabilities in Boston” (Boston, n.d.-a).

Go Boston’s vision framework includes three guiding principles: equity, economic opportunity, and climate responsiveness. Key themes emerged from the engagement process and targets (i.e., indicators) were developed to correspond to them (Table 6). Targets were aspirational in the sense that they might not be met by 2030, but still offered guidance for project planning and programming (Boston, 2017, p. 99). Table 6 below provides a verbatim list of Go Boston’s themes and targets; the ones in bold are primary (Boston, 2017, pp. 61-79).

Table 6 Go Boston Indicators

<table>
<thead>
<tr>
<th>Themes</th>
<th>Aspirational target</th>
</tr>
</thead>
<tbody>
<tr>
<td>How we get to work</td>
<td>Mode for Bostonian commutes</td>
</tr>
<tr>
<td></td>
<td>Public transit: Up by a third</td>
</tr>
<tr>
<td></td>
<td>Walk: Up by almost a half</td>
</tr>
<tr>
<td></td>
<td>Bike: Increases fourfold</td>
</tr>
<tr>
<td></td>
<td>Carpool: Declines marginally</td>
</tr>
<tr>
<td></td>
<td>Drive alone: Down by half</td>
</tr>
<tr>
<td></td>
<td>Other/work from home: Slight increase in work from home</td>
</tr>
<tr>
<td>Expanding access</td>
<td>Every home in Boston will be within a 10 minute walk of a rail station or key bus route stop, Hubway station, and carshare (original emphasis)</td>
</tr>
<tr>
<td></td>
<td>Transportation infrastructure will be completely ADA compliant at all points of access</td>
</tr>
<tr>
<td></td>
<td>By supporting the development of mixed-use neighborhoods and improved pedestrian facilities, the number of households classified as “car dependent” will be cut in half (measured by Walk Score)</td>
</tr>
<tr>
<td>Improving safety</td>
<td>Eliminate traffic fatalities and severe injuries in Boston</td>
</tr>
<tr>
<td></td>
<td>Reduce the number of pedestrian and bicycle related collisions by 30%</td>
</tr>
<tr>
<td></td>
<td>All households will be within a 5-minute walk of a protected bicycle facility or shared use path</td>
</tr>
<tr>
<td>Ensuring reliability</td>
<td>Bostonians’ average commute to work time will decrease by 10%</td>
</tr>
<tr>
<td></td>
<td>Wait and travel times for MBTA customers will be as fast as scheduled times (or faster) 90% of the time</td>
</tr>
<tr>
<td></td>
<td>Maintain consistent average travel times for vehicle traffic along major arterials during peak hours every day</td>
</tr>
<tr>
<td></td>
<td>All train stations will have bus service and/or shuttle service, carshare, and bikeshare stations</td>
</tr>
<tr>
<td>Themes</td>
<td>Aspirational target</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Focusing on experiential quality</td>
<td>Real time arrival information will be displayed at all rail stations and key route bus stops</td>
</tr>
<tr>
<td></td>
<td>There will be room on every train and bus for anyone waiting to board during peak times</td>
</tr>
<tr>
<td></td>
<td>All street and transit infrastructure will be clean and clear of trash within 24 hours</td>
</tr>
<tr>
<td></td>
<td>All T stations and Mobility Hubs will have public art or gathering spaces</td>
</tr>
<tr>
<td>Leveraging innovation</td>
<td>Every traffic signal will automatically adapt to bus, car, and bike demands</td>
</tr>
<tr>
<td></td>
<td>The number of vehicles in the Boston region providing shared transportation such as carshare, bikeshare, ferries, and pop-up buses will double</td>
</tr>
<tr>
<td></td>
<td>The occupancy status of every metered on-street parking space in Boston will be available in real time</td>
</tr>
<tr>
<td></td>
<td>The proportion of registered clean fuel vehicles will increase fivefold</td>
</tr>
<tr>
<td></td>
<td>Pilot five demonstration projects every year that leverage new technology for mobility</td>
</tr>
<tr>
<td>Securing affordability</td>
<td>Reduce the transportation cost burden for very low income individuals to the citywide average for a median household</td>
</tr>
<tr>
<td></td>
<td>The cost of subsidized transit passes will remain constant relative to inflation</td>
</tr>
<tr>
<td></td>
<td>Double the number of jobs reachable within a 30-minute transit commute</td>
</tr>
<tr>
<td>Building for resiliency</td>
<td>Reduce greenhouse gas emissions from transportation by 50% of 2005 levels by 2030</td>
</tr>
<tr>
<td></td>
<td>Regional vehicle miles traveled will reduce (sic) by 5.5% below 2005 levels by 2020</td>
</tr>
<tr>
<td></td>
<td>All transportation systems will be able to continue operation or have sufficient alternatives during a flood or snow event</td>
</tr>
<tr>
<td></td>
<td>Adopt a municipal vehicle fleet that has no carbon emissions</td>
</tr>
<tr>
<td>Advancing transparent governance</td>
<td>A larger share of capital improvement dollars will be assigned to underserved communities to achieve equitable distribution of investment in transportation infrastructure</td>
</tr>
<tr>
<td></td>
<td>The participants in transportation planning processes will be representative of the demographic make-up of neighborhoods affected by the project</td>
</tr>
<tr>
<td></td>
<td>All transportation infrastructure for City or developer managed projects will adhere to Complete Streets Guidelines</td>
</tr>
<tr>
<td></td>
<td>Address all citizen requests for signal, road, and sidewalk maintenance and repair</td>
</tr>
<tr>
<td>Guaranteeing health</td>
<td>All health centers in Boston will be within a 5-minute walk of bus stop, shuttle, train station, and protected bicycle facility or shared use path (original emphasis)</td>
</tr>
<tr>
<td></td>
<td>Rates of emergency department visits due to asthma among Black and Latinos across all ages will be reduced by 10%</td>
</tr>
</tbody>
</table>

*Note. Bold indicates Go Boston’s primary indicators*

### 4.1.1.2. Vision Zero Boston Action Plan

Adopted in 2016 during the Walsh Administration, the Vision Zero Boston Action Plan (Vision Zero Boston) is considered an “early action project” of Go Boston (Boston,
Vision Zero Boston adopts Vision Zero principles such as: traffic deaths are preventable and unacceptable; human life takes priority over mobility; human error is inevitable; and safe behaviors, education, and enforcement are essential contributions to a safe system (Boston, 2016, p. 6). Actions are directed in four areas: speeds and safe streets, distracted and impaired driving, community engagement, and holding the city accountable (Boston, 2016, p. 7). Some of the actions to promote accountability include collecting data and improving data sources, producing an interactive crash data site, and plans to update the crash map on a monthly basis. Unlike other plans with several indicators, Vision Zero Boston has only one goal and metric: “To eliminate fatal and serious traffic crashes in the city by 2030” (Boston, 2016, p. 7).

4.2. City and County of Denver

The Departments of Community Planning and Development (CPD), Parks and Recreation, and the Department of Transportation and Infrastructure (DOTI) joined forces to produce a suite of community plans simultaneously and branded them as Denveright. Adopted in 2019 by the Denver City-County Council, Blueprint Denver: A Blueprint for an Inclusive City (Blueprint Denver) is the land use and transportation component of the Denveright suite of plans. Its process was managed by the CPD. The vision of CPD is to make “Denver an inclusive, connected, and healthy city for its people now and in the future” (Denver, 2022). DOTI led the development of Denver Moves: Pedestrians & Trails (Denver Moves Pedestrians), the long-term plan for walking and
trails. DOTI is described as “modern agency focused on increasing mobility and safety while reducing congestion and fighting climate change” (Denver, 2022b).

4.2.1.1. Comprehensive Plan 2040

Adopted in 2019, Comprehensive Plan 2040 (Comprehensive Plan) is a framing document, effectively serving as a table of contents for the other plans under the Denveright umbrella and addresses the vision and values in greater detail and presents goals and strategies supporting the vision and values (Informant 25). Although it serves as the foundation to the other Denveright plan documents, the decision to update the prior (year 2000) Comprehensive Plan emerged later in the process once the city realized it could benefit from the engagement efforts connected to the other plans (Informants 24, 25). The indicators for the Comprehensive Plan (Table 7) are included for reference because it informs Blueprint Denver, which contains the transportation plan (Denver, 2019a, p. 20). All of the indicators support improved health outcomes.
Table 7 Comprehensive Plan 2040 Indicators

<table>
<thead>
<tr>
<th>Vision element</th>
<th>Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the amount of cost-burdened households</td>
<td>Percent of Denver households who spend more than 45% of their income on housing and transportation costs</td>
<td>35% by 2040</td>
</tr>
<tr>
<td>Increase the number of neighborhoods with convenient access to transit, jobs and retail</td>
<td>Number of neighborhoods where at least 50% of households have access to quality transit and jobs and retail in walking and rolling distance by 2040</td>
<td>60% by 2040</td>
</tr>
<tr>
<td>Reduce dependence on driving alone</td>
<td>Percent of Denver commuters who drive to work in single-occupancy vehicles</td>
<td>50% by 2030</td>
</tr>
<tr>
<td>Increase the share of jobs supporting a diverse and innovative economy</td>
<td>Percent of local jobs in diverse, innovative economic sectors</td>
<td>60% by 2040</td>
</tr>
<tr>
<td>Reduce Denver’s impact on climate change</td>
<td>Percent below Denver’s 2005 carbon emissions levels</td>
<td>80% by 2050</td>
</tr>
<tr>
<td>Reduce health inequities between Denver neighborhoods</td>
<td>For each component of the equity index, bring the lowest scoring neighborhoods to the level of the highest scoring neighborhoods</td>
<td>By 2040</td>
</tr>
<tr>
<td></td>
<td>Access to prenatal care (82%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Children at a healthy weight (86%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Access to fresh food and parks (45%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Life expectancy (79.3 years)</td>
<td></td>
</tr>
</tbody>
</table>

4.2.1.2. **Blueprint Denver: A Blueprint for an Inclusive City**

Adopted in 2019 by the Denver City-County Council, *Blueprint Denver: A Blueprint for an Inclusive City* (Blueprint Denver) is the land use and transportation component of the Denveright suite of plans. Its process was managed by the CPD.

Another key actor involved in the development of *Blueprint Denver* include the Denver Streets Partnership, “a coalition of community organizations advocating for people-friendly streets in Denver” (Denver Streets Partnership, n.d.-a.).

While the *Comprehensive Plan* provides a foundation for *Blueprint Denver*, *Blueprint Denver* is specifically guided by the following vision elements: an equitable city,
a city of complete neighborhoods and networks, and an evolving city. *Blueprint Denver* is an update to a previous plan by the same name and is structured with goals, recommended policies, and strategies. Transportation-related strategies associated with policy statements include references to other Denver plans or supporting programs like safe routes to school. Among other efforts, implementation of the transportation recommendations will be accomplished through updates of the “city’s street design standards to implement street types, modal priorities and the vision for complete streets” (Denver, 2019b, p. 58). This update to *Blueprint Denver* was the first time indicators were featured, specifically with the intention of reporting annually (Informant 24). As a land use and transportation plan, the *Blueprint Denver* indicators include metrics related to both areas. Health-related indicators are listed verbatim in Table 8 (Denver, 2019a, p. 52).

**Table 8 Blueprint Denver Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of total employment compared to total number of households, citywide</td>
<td>Maintain or improve current ratio of 1.8:1 by 2040</td>
</tr>
<tr>
<td>Eliminate traffic related deaths and serious injuries by 2030</td>
<td>By 2030</td>
</tr>
</tbody>
</table>

### 4.2.1.3. Denver Moves: Pedestrians and Trails

*Denver Moves: Pedestrians & Trails* (*Denver Moves Pedestrians*) is the long-term plan for walking and trails and identifies priorities for projects, policies, and programs to achieve its vision (Denver, 2019b). This dissertation focuses on the “pedestrians” portion of the plan and not the trails component. *Denver Moves Pedestrians* was created by the public works department, which has since changed to the Department of Transportation
and Infrastructure (DOTI) (Informant 26). DOTI houses transportation planning, design, operations, and maintenance as well as other infrastructure-related functions such as wastewater management (DOTI, 2022).

Part of the vision for the pedestrian network is that “the pedestrian network of the City and County of Denver is one that provides residents, employees, and visitors with a walkable environment that is safe and comfortable for all users and treats all users with dignity” (Denver, 2019b, p. 6). Denver Moves Pedestrians replaced the 2004 Pedestrian Master Plan (Denver, 2019b), which did not have indicators (Informant 26). Introducing indicators was perceived as good planning practice (Informant 26). The indicators, verbatim in Table 9, were used to establish existing conditions and to monitor progress moving forward (Denver, 2019b, pp. 8-9).
Table 9 Denver Moves Pedestrians Indicators

<table>
<thead>
<tr>
<th>Goal area</th>
<th>Goal statement</th>
<th>Performance measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>A pedestrian system with a complete network of well-maintained, ADA-compliant sidewalks, walkways, and crossing for users of all abilities</td>
<td>Percent of sidewalks complete throughout the city</td>
</tr>
<tr>
<td>Connectivity</td>
<td>A complete, connected sidewalk network without gaps and with frequent pedestrian crossings across barriers</td>
<td>Average crossing spacing of arterials and major barriers including highways, rivers and railroads</td>
</tr>
<tr>
<td>Destination access</td>
<td>A complete pedestrian network with sidewalks and crossings that are up to standards and provide direct access to key destinations: transit, grocery stores, parks, schools, and health care centers</td>
<td>Percent of sidewalks (≥ 4 feet) complete within ¼ mile from bus stops and bike share stations and ⅔ miles from rail stations, parks, grocery stores, schools and health care centers</td>
</tr>
<tr>
<td>Equity</td>
<td>A complete pedestrian network with sidewalks and crossings up to standards and without gaps within low-income areas</td>
<td>Percent of sidewalks complete (≥4 feet) in census tracts where at least 20 percent of the population is below the Colorado state poverty level</td>
</tr>
<tr>
<td>Health</td>
<td>A complete pedestrian network with sidewalks and crossings up to standards and without gaps within areas of health concern</td>
<td>Percent of sidewalks complete in areas with high child obesity rates</td>
</tr>
<tr>
<td>Safety</td>
<td>A safe network of pedestrian facilities that enables walking as a comfortable transportation mode and is designed to reduce or eliminate crashes involving pedestrians</td>
<td>Percent of sidewalks complete along the corridors with the highest number of crashes causing injuries and fatalities, known as the High Injury Network (HIN); average crossing spacing along the HIN</td>
</tr>
</tbody>
</table>

4.3. City of Indianapolis and Marion County

The two plans studied in my dissertation, Indianapolis/Marion County Pedestrian Plan: Walkways (Walkways) and the Indy Moves Transportation Integration Plan (Indy Moves) were developed as an outgrowth of a larger comprehensive planning effort called Plan 2020. The Plan 2020 Bicentennial Agenda (Plan 2020) contained the vision and values component and included health as a core value. Each Plan 2020 component, such as the thoroughfare plan, the parks plan, the downtown plan, and the land use
plan, as well as subsequent plans like *Walkways* and *Indy Moves*, was oriented toward the vision and values in *Plan 2020*: “Instead of . . . separate conversations for each of those, we had one community conversation and then we extrapolated that into the subject area plans” (Informant 31).

The Department of Metropolitan Development (DMD) is the City’s planning agency and led comprehensive planning efforts. DMD “envisions Indianapolis as a growing, vibrant, and beautiful city where people and businesses thrive in an inclusive, world-class community” (Indianapolis, n.d.-a). The City does not have a transportation department, so street-related design, operations, and maintenance is managed by the Department of Public Works, which is described on the City’s website as supporting “Indianapolis by maintaining roads and street closures, the stormwater program, fleet services, and residential services” (Indianapolis, n.d.-b.).

Additional organizations involved in the development of both plans were Health by Design, which “collaborates across sectors and disciplines to ensure communities in Indiana and beyond have neighborhoods, public spaces, and infrastructure that promote healthy, active living” (Health by Design, n.d.), the Indy Chamber, which empowers “business to ensure all have the opportunity to succeed” (Indy Chamber, n.d.), community development corporations (Informant 34) and the Central Indiana Community Foundation (Informant 31). Other participants included Indy Strong Towns members and individuals from a “niche urbanist and bike twitter population” (Informant 31).
4.3.1.1. City of Indianapolis and Marion County Pedestrian Plan: Walkways

The Indianapolis/Marion County Pedestrian Plan: Walkways (Walkways), the first pedestrian plan in Indianapolis, was adopted by the Metropolitan Development Commission in 2016 as an element of the Comprehensive Plan. A local non-profit organization was awarded a Plan 4 Health grant from the American Planning Association to develop the plan. The stated vision in Walkways is “Indianapolis will be a great place to walk, leading to a community that is healthier, safer, resilient, and economically vibrant” (Indianapolis, 2016, p. 9).

Noting how the lack of safe places to walk limits economic opportunity for families and makes it difficult to attract residents looking for walkable neighborhoods, Walkways states “Indianapolis must use data-driven strategies to prioritize limited funds and target pedestrian improvements in the places where they will have the most impact” (Indianapolis, 2016, p. 2). A first round of evaluation criteria involved mapping priority factors. Then a list of pedestrian projects was created using the City’s capital improvements projects list, safety projects for high crash corridors, all arterial and collector streets without sidewalks, and all signalized intersections outside of downtown, totaling nearly 3,000 projects (Indianapolis, 2016, p. 30). In the second round of prioritization, projects were then scored as high, medium, or low based on six criteria (Indianapolis, 2016, p. 32). The prioritization criteria are summarized below (Indianapolis, 2016, p. 33):
• Improve access to transit and destinations within 1/4 mile of a transit stop, station, or high intensity pedestrian destination

• Enables active living by providing access to a park or recreational facility, trail, greenway, or healthy foods

• Removes a pedestrian barrier or fills a gap in the pedestrian network

• Provides potential to leverage other funding or to piggyback onto another project

• Support pedestrian land use typology allocation targets that were developed in the State of Walkability report

• The project has favorable overriding conditions, such as presence in an existing plan, documented community support, the potential to stimulate investment, and is a city priority

Walkways also had a separate section for “Measuring Success,” which outlined a monitoring program for tracking progress on the vision expressed in the plan (Indianapolis, 2016, p. 63). Each indicator was associated with one of the plan’s four goals (Indianapolis, 2016, p. 64). Table 10 lists the goals and indicators to measure the success of the pedestrian plan over time. It also includes the data sources necessary for monitoring the indicators (Indianapolis, 2016, p. 64).
**Table 10 Indianapolis Walkways Indicators**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Indicator</th>
<th>Trend</th>
<th>Frequency</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create connected and complete communities</td>
<td>Miles of sidewalk network completed</td>
<td>Increase</td>
<td>Yearly</td>
<td>Internal data collection required</td>
</tr>
<tr>
<td></td>
<td>Proportion of intersections with pedestrian signals</td>
<td>Increase</td>
<td>Yearly</td>
<td>Internal data collection required</td>
</tr>
<tr>
<td></td>
<td>Neighborhood Walk Score</td>
<td>Increase</td>
<td>Yearly</td>
<td>Walkscore.com</td>
</tr>
<tr>
<td>Make the experience safe</td>
<td>Number of pedestrian fatalities</td>
<td>Decrease</td>
<td>Yearly</td>
<td>Indianapolis Metropolitan Police Department</td>
</tr>
<tr>
<td></td>
<td>Number of collisions involving pedestrians</td>
<td>Decrease</td>
<td>Yearly</td>
<td>Indianapolis Metropolitan Police Department</td>
</tr>
<tr>
<td>Build walkable places for all</td>
<td>Ratio of commute walk and transit trips to all commute trips</td>
<td>Increase</td>
<td>Yearly</td>
<td>American Community Survey</td>
</tr>
<tr>
<td></td>
<td>Rate of obesity</td>
<td>Decrease</td>
<td>Yearly</td>
<td>Behavioral Risk Factor Surveillance Survey (BRFSS)</td>
</tr>
<tr>
<td></td>
<td>Percent of pedestrian funding allocated using Pedestrian Plan project prioritization</td>
<td>Minimum 85% and increasing</td>
<td>Yearly</td>
<td>Internal data collection required</td>
</tr>
<tr>
<td>Get it done</td>
<td>Number of priority projects that have been completed</td>
<td>Increase</td>
<td>Two years</td>
<td>Internal data collection required</td>
</tr>
<tr>
<td></td>
<td>Number of pedestrian programs, policies, and procedures that have been implemented</td>
<td>Increase</td>
<td>Two years</td>
<td>Internal data collection required</td>
</tr>
</tbody>
</table>

*Walkways* includes additional indicators to consider for monitoring (Indianapolis, 2016, p. 67):

- Pedestrian volumes in designated areas or corridors (measured though pedestrian counts)
- Pedestrian perceptions of the walking environment in designated areas or corridors (measured with intercept surveys)
- Number of trees on city streets (measured with a biannual count)
• Number of intersections with marked crosswalks (requires initial inventory)
• Change in vehicle speeds on high priority corridors (measured via speed survey)

4.3.1.2. Indy Moves Transportation Integration Plan

The Indy Moves Transportation Integration Plan (Indy Moves) was structured similarly to Walkways with regard to how success is measured (Informant 32) in part because the same consultants were engaged in both plans but also because a local nonprofit organization was influential with both plans (Informant 31). Indy Moves was adopted by the Metropolitan Development Commission in 2018.

The title of Chapter 2 of Indy Moves, “Using our values to set priorities,” reinforces the importance of the prioritization process first established in Walkways (Indianapolis, 2018, p. 11). Table 11 below is a list of Indy Moves goals and priorities (Indianapolis, 2018, p. 16). Indy Moves priorities were used to develop the capital project evaluation framework (Indianapolis, 2018, Appendix C, p. 1). The projects identified in Indy Moves are drawn from the Indy Greenways Master Plan, the Thoroughfare Plan, Pedal Indy, and Walkways as well as ideas from the community. Appendix D within Indy Moves contains the results from the evaluation criteria scoring, with a list of ranked projects and their score.
### Table 11 Indy Moves Goals and Priorities

<table>
<thead>
<tr>
<th>Goals</th>
<th>Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; safety</td>
<td>No traffic-related fatalities or serious injuries</td>
</tr>
<tr>
<td></td>
<td>More physical activity and better health outcomes</td>
</tr>
<tr>
<td>Sustainability &amp; resilience</td>
<td>Climate resilient infrastructure</td>
</tr>
<tr>
<td></td>
<td>Landscaping and complete streets</td>
</tr>
<tr>
<td></td>
<td>Clean air and reduced emissions</td>
</tr>
<tr>
<td>Economic development</td>
<td>Transportation network connectivity</td>
</tr>
<tr>
<td></td>
<td>Access to employment and education</td>
</tr>
<tr>
<td></td>
<td>Seamless connections</td>
</tr>
<tr>
<td>Equity</td>
<td>Access to community destinations</td>
</tr>
<tr>
<td></td>
<td>Infrastructure for communities of concern</td>
</tr>
<tr>
<td></td>
<td>Mobility options for vulnerable populations</td>
</tr>
<tr>
<td>Choices</td>
<td>Faster, more reliable transit</td>
</tr>
<tr>
<td></td>
<td>Better active transportation options</td>
</tr>
<tr>
<td></td>
<td>Accessible transportation network</td>
</tr>
<tr>
<td>Connections</td>
<td>Transportation for all ages and abilities</td>
</tr>
<tr>
<td></td>
<td>Better access to emerging villages, neighborhood nodes, and regional destinations</td>
</tr>
<tr>
<td></td>
<td>Safe, inviting, active spaces at all times of day</td>
</tr>
<tr>
<td>Strategic investment</td>
<td>Well-maintained infrastructure</td>
</tr>
<tr>
<td></td>
<td>Cost-benefit balance in project delivery</td>
</tr>
<tr>
<td></td>
<td>Easy to find project information for the public</td>
</tr>
</tbody>
</table>

Indicators for long-term systems monitoring were also included (Table 12). *Indy Moves* differentiates between output measures, activities that have been completed, and outcome measures, the desired final condition. *Indy Moves* notes that “the city must continue to collect data and expand its data monitoring and management capacity” (Indianapolis, 2018, p. 45).
### Table 12  Indy Moves Systems Indicators

<table>
<thead>
<tr>
<th>Goals</th>
<th>Metrics</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health &amp; safety</td>
<td>Miles of bike facilities (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Blocks of sidewalks (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Number of crashes resulting in injuries and fatalities (outcome)</td>
<td>Decrease</td>
</tr>
<tr>
<td>Sustainability &amp; resilience</td>
<td>Number of green infrastructure streets (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Number of intersections with operational improvements (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Total greenhouse gas emissions from transportation (outcome)</td>
<td>Decrease</td>
</tr>
<tr>
<td>Economic development</td>
<td>Number of job centers or post-secondary institutions served by projects (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Miles of projects that include two or more modes (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Percent of low-income population with transit access to living wage jobs (outcome)</td>
<td>Increase</td>
</tr>
<tr>
<td>Equity</td>
<td>Number of projects in racially/ethnically-concentrated areas of poverty (R/ECAP) neighborhoods (output)</td>
<td>Increase</td>
</tr>
<tr>
<td>Choices</td>
<td>Number of projects within 1/2-mile of BRT or 1/4-mile of frequent transit (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Number of projects within 1/2-mile of existing or proposed greenways (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Drive alone commute mode share (outcome)</td>
<td>Decrease</td>
</tr>
<tr>
<td>Connections</td>
<td>Number of projects within 10 minutes of a village or neighborhood node (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Percent of households with transit, walking, or biking access to job centers (outcome)</td>
<td>Increase</td>
</tr>
<tr>
<td>Strategic investment</td>
<td>Miles of poor pavement condition addressed by projects (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Local dollars leveraged (output)</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Positive responses to customer satisfaction surveys (outcome)</td>
<td>Increase</td>
</tr>
</tbody>
</table>

#### 4.4. City of Memphis

The *Memphis 3.0 Comprehensive Plan (Memphis 3.0)* was adopted in 2019 by the Memphis and Shelby County Land Use Control Board and later the same year by the Memphis City Council. The *Memphis 3.0* planning process was led by the Office of Comprehensive Planning (OCP) within the Division of Planning and Development. The Division of Planning and Development is described as “a joint agency serving the City of Memphis and Shelby County. Its mission is to develop and administer plans, programs, and services that result in thriving, livable neighborhoods, connected communities,
enhanced human potential, and safe and efficient buildings” (Memphis and Shelby County, n.d.-a.).

*Memphis 3.0* is the first comprehensive plan for the city since 1981. The overall strategy for the plan is “build up, not out,” which distinguishes it from the historical model of development that centered on land annexation and was accompanied by flat population growth (Memphis, 2021). The vision for *Memphis 3.0* is that “Memphis will be a city that anchors growth on strengths of the core and neighborhoods; a city of greater connectivity and access; a city of opportunity for all” (Memphis, 2021, p. 11).

Non-profit organizations involved the Memphis 3.0 process include BLDG Memphis, which “drives investments in Memphis neighborhoods through building capacity in members, public policy, and civic engagement” (BLDG Memphis, n.d.), Innovate Memphis, which develops “initiatives, nurture partnerships and innovate solutions to move Memphis forward and deliver impactful, sustained change (Innovate Memphis, 2023), and the Memphis Center for Independent Living, which is dedicated to facilitating “the full integration of persons with disabilities into all aspects of community life” (MCIL, 2023).

The transportation component of *Memphis 3.0* serves as the City’s primary transportation plan. The City also has a *Memphis Pedestrian and School Safety Action Plan* and a *Complete Streets Project Delivery Manual* (Informant 45). *Memphis 3.0* included street typologies to guide the design of streetscapes and listed actions for each objective (e.g., increase transportation and mobility options that are accessible to all).
Adopting Vision Zero was one action item and others included establishing goals and metrics for mode share. Key indicators (identified through the community planning process) framed the future growth scenarios (Informant 41). Indicators identified in the Connectivity element in *Memphis 3.0* are below (Memphis, 2019, p. 153). Specific metrics and indicator methodologies for on-going use were not identified at the time of plan development or adoption (Informants 41, 43).

- Transit frequency
- Access to frequent transit
- Change in access to walkable areas
- Change in access to bikeable areas
- Change in infrastructure maintenance cost
- Infrastructure investment in anchors and anchor neighborhoods
- Reduced energy consumption
- Reduced crashes and roadway fatalities
- Reduced travel-to-work time
- Increase in transit use, bicycling, and walking for transportation

These *Memphis 3.0* indicators are used primarily for monitoring and evaluation (Informant 41). The *Memphis 3.0* plan indicates that the “OCP will continue to track the outcomes of the plan based on key indicators identified in the future growth scenario planning process” (Memphis, 2021, p. 153). The OCP committed to reporting annually on *Memphis 3.0* actions, investments, and partnerships (Memphis, 2021, p. 153). The
responsibility for indicator data management and reporting lies within the City’s Office of Performance Management (OPM), which was created with funding from the Bloomberg Innovative grant (Informants 41, 44). The OPM is designed to “help make the City of Memphis more productive, transparent, and accountable for its performance” (Memphis, 2023a). Among the OPM’s responsibilities are maintaining the Memphis Data Hub and Performance Dashboard for city staff.

4.5. City of Seattle

4.5.1.1. *Move Seattle: Mayor Edward B. Murray’s 10-Year Strategic Vision for Transportation*

Adopted in 2015, *Move Seattle: Mayor Edward B. Murray’s 10-Year Strategic Vision for Transportation* (Move Seattle) is a strategy for creating a “safe, affordable, connected system that works for people, regardless of whether they’re walking, biking, driving, or using transit” (Seattle, 2015, p. iii). *Move Seattle, the City of Seattle Pedestrian Master Plan* (PMP, below), and the *City of Seattle Bicycle Master Plan* (BMP, below) were developed by the Seattle Department of Transportation (SDOT), which describes Seattle as “a thriving, equitable community powered by dependable transportation” with a mission “to deliver a transportation system that provides safe and affordable access to places and opportunities” (Seattle, 2020).

One aim of *Move Seattle* is facilitating the integration of the city’s 20-year modal master plans with projects in the near-term (Seattle, 2015, p. 1). Because *Move Seattle* was produced as an initiative of the mayor at the time, it was shaped by the adopted
values of the mayor’s office: a safe city, an interconnected city, a vibrant city, an affordable city, and an innovative city. In November 2015, a 9-year, $930 million transportation levy passed to help achieve the vision expressed in Move Seattle (Seattle, 2015, p. 17) and help sell the bond package by communicating how the City would spend the funds (Informant 53). Indicators are intended to track progress against Move Seattle core values (Seattle, 2015, p. 29). The indicators include baseline data, desired trend, the 2025 goal, and the core value it measures. Table 13 below excerpts the health-related measures, desired trends, goals, and core values.

Table 13 Move Seattle Indicators

<table>
<thead>
<tr>
<th>Measures</th>
<th>Desired trend</th>
<th>2025 goal</th>
<th>Core value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rate of pedestrian collisions (per 100,000 residents)</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Safety</td>
</tr>
<tr>
<td>Annual rate of bicycle collisions per 1,000 commuters (from American Community Survey data)</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Safety</td>
</tr>
<tr>
<td>Annual rate of collisions (per million annual daily trips)</td>
<td>Decrease</td>
<td>Decrease</td>
<td>Safety</td>
</tr>
<tr>
<td>Annual number of fatalities and serious injuries by all modes of travel</td>
<td>Decrease</td>
<td>Zero</td>
<td>Safety</td>
</tr>
<tr>
<td>Percentage of households within a 10-minute walk of a frequent transit route running every 10 minutes or better</td>
<td>Increase</td>
<td>72%</td>
<td>Interconnected</td>
</tr>
<tr>
<td>Percentage of Seattle residents who drive alone to work (single-occupant vehicle)</td>
<td>Decrease</td>
<td>25% or less SOV by 2035</td>
<td>Interconnected, vibrant</td>
</tr>
<tr>
<td>Percentage of destinations (business districts, schools, community centers and similar destinations) with adjacent sidewalks, and within ¼ mile of an all ages and abilities bicycle facility and the Frequent Transit Network</td>
<td>Increase</td>
<td>75%</td>
<td>Interconnected</td>
</tr>
</tbody>
</table>
4.5.1.2. **City of Seattle Pedestrian Master Plan**

The 2017 *City of Seattle Pedestrian Master Plan* (*PMP*) is a 20-year modal plan outlining strategy and actions to achieve the vision of becoming the “most walkable and accessible city in the nation” (Seattle, 2017a, p. 4). The 2017 *PMP* was an update of the 2009 *PMP*, so the planning process did not involve a wholesale re-envisioning of the strategy but rather an update that included an assessment of the previous plan’s accomplishments and updated data and metrics (Informant 53; Seattle, 2017a, p. 11).

Goals for the *PMP* include safety (pedestrian crashes); vibrancy (connected network); equity (engagement, accessibility, prioritized investments); and health (increase walking for health) (Seattle, 2017a, p. 4).

A “data-based framework” for prioritizing strategies and investments was introduced through the 2009 plan (Seattle, 2017a, p. 5), one of the first of Seattle’s modal plans to do so (Seattle, 2017a, p. 124). The *PMP* “re-grounded” the prioritization process to ensure connection to other City policies and national best practices (Seattle, 2017a, p. 40). Prioritization occurs through a four-step analysis, shown verbatim in Table 14. The prioritization process within the *PMP* guides the implementation of Move *Seattle* levy funds allocated for pedestrian improvements (Seattle, 2017a, p. 17).
Table 14 Pedestrian Master Plan Prioritization Process

<table>
<thead>
<tr>
<th>Step Number</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Develop a city-wide PIN (Priority Investment Network) using access to public schools and the frequent transit network; these streets will be prioritized for pedestrian improvements</td>
</tr>
<tr>
<td>Step 2</td>
<td>Identify specific opportunities within the PIN to improve conditions along and across those streets, including locations with missing sidewalks and curb ramps and those with wide crossing distances or widely-spaced controlled crossing locations</td>
</tr>
<tr>
<td>Step 3</td>
<td>Conduct quantitative safety and equity/health analyses to score opportunity areas for sidewalk and crossing improvements within the PIN</td>
</tr>
<tr>
<td>Step 4</td>
<td>Create a 3- to 5-year implementation plan by applying qualitative criteria and input from the Seattle Pedestrian Advisory Board</td>
</tr>
</tbody>
</table>

The PMP prioritization framework is used to guide investments through four major program and activity areas: pedestrian programs, capital projects, education and encouragement activities, and maintenance activities. Pedestrian programs include PMP-specific implementation activities as well as safe routes to school, vision zero, and neighborhood greenways (Seattle, 2017a). As part of capital improvement programming, projects are assessed relative to the PMP and “PMP recommendations are folded into larger project scopes when possible” (Seattle, 2017a, p. 30). Education and encouragement activities are implemented by safe routes to school and vision zero programs. Maintenance activities include a sidewalk safety repair program and maintenance for marked crosswalks (Seattle, 2017a).

The PMP systems monitoring indicators are primarily outcome-based and connected to plan goals (Seattle, 2017a, p. 43). Table 15 below excerpts the performance measures, performance targets and PMP goals addressed (the original table also includes the desired trends, data sources, and the baseline conditions).
Table 15 Pedestrian Master Plan Performance Measures

<table>
<thead>
<tr>
<th>PMP performance measure</th>
<th>Performance target</th>
<th>PMP goal addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pedestrian fatalities and serious injury collisions</td>
<td>Pedestrian fatalities and serious-injury collisions reach zero by 2030</td>
<td>Safety, equity, health, vibrancy</td>
</tr>
<tr>
<td>Rate of crashes involving pedestrians, reported both by</td>
<td>50 or fewer pedestrian collisions per 100,000 residents by 2035</td>
<td>Safety, equity, health</td>
</tr>
<tr>
<td>pedestrian crashes per 100,000 residents and pedestrian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>crashes per pedestrian trips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent of sidewalks within the Priority Investment Network</td>
<td>100% of Priority Investment Network sidewalks complete by 2035</td>
<td>Safety, equity, health, vibrancy</td>
</tr>
<tr>
<td>completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode share (percentage of trips made on foot as measured in</td>
<td>35% of all trips are made on foot by 2035</td>
<td>Safety, equity, health, vibrancy</td>
</tr>
<tr>
<td>the PSRC household travel survey)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian activity (number of pedestrians in selected count</td>
<td>Double the number of pedestrians at SDOT count locations by 2035</td>
<td>Safety, health, vibrancy</td>
</tr>
<tr>
<td>locations)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children walking or biking to school</td>
<td>None recommended</td>
<td>Safety, equity, health, vibrancy</td>
</tr>
</tbody>
</table>

4.5.1.3. City of Seattle Bicycle Master Plan

The 2014 Seattle Bicycle Master Plan (BMP) was an update of a 2007 Bicycle Master Plan. While this planning effort did not completely restructure the BMP, the 2014 plan did shift from serving the needs of vehicular cyclists, which had resulted in implementing sharrows (a.k.a. shared-lane marking, indicating that bicyclists share the roadway with automobiles) and multi-use trails, to the idea of an all ages and abilities network, which prioritizes neighborhood greenways, protected bicycle lanes (Informants 51, 57), and inclusivity and equity (Informant 54). The BMP evaluates the progress from the 2007 plan indicators, noting which indicators were “on track, not on track, and unsure (have not tracked)” (Seattle, 2014a, p. 24). The five goals in the plan are: improve safety, enhance connectivity, address equity, increase ridership, and enhance livability.
In the BMP prioritization framework, the first step is sorting projects into citywide network projects or local connector projects; the former is higher priority (Seattle, 2014a, p. 104). The next step in the process is using evaluation criteria related to the plan’s goals (Table 16, verbatim). Safety and connectivity goals are weighted more heavily than the other goals (Seattle, 2014a, p. 105). Projects are compared against each other, with the results organized in tiered project priorities. Qualitative criteria are also used to evaluate projects in the BMP (Table 17, verbatim). Afterwards, these projects are taken to the standing Seattle Bicycle Advisory Board (SBAB) to review. Other organizations that were involved in the BMP include Seattle Neighborhood Greenways, which is “making Seattle a safer, healthier and more equitable place to live” (SNG, n.d.), and the Cascade Bicycle Club, which teaches “the joys of bicycling, advocate for safe places to ride, and produce world-class rides and events” (Cascade Bicycle Club, n.d.).
**Table 16 Bicycle Master Plan Performance Measures**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Criteria definition</th>
</tr>
</thead>
</table>
| Improve safety | Addresses location with bicycle location history and emphasis on vulnerable roadway users.  
Enhances bicyclist safety by promoting travel on streets with low motorist speeds and low volumes.  
Addresses locations or streets that are associated with greater bicyclist stress and more severe collision potential due to high motor vehicle volumes (ADT) and high speeds. |
| Enhance connectivity | Removes a barrier or closes a system gap in the bicycling network.  
Makes a connection that will immediately extend the bicycle network. |
| Address equity | Serves populations that are historically underserved, including areas with a higher percentage of minority populations, households below poverty, people under 18, people over 65, and households without access to an automobile.  
Provides a health benefit for people in areas with the greatest reported health needs, represented by obesity rates, physical activity rates (self-reported), and diabetes rates. |
| Increase ridership | Provides a connection to destination clusters  
Provides a connection to areas with high population density |
| Enhance livability | Reaches the greatest number of riders, but recognizes that all bicycle facilities provide a measurable benefit to at least some bicyclists.  
Distribute bicycle facilities across the city so people riding bicycles can reach all destinations. |

**Table 17 Bicycle Master Plan Qualitative Criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential to leverage other funding</td>
<td>Initiating projects will help secure funding</td>
</tr>
<tr>
<td>Policy directive</td>
<td>Project specified by policy or City Council</td>
</tr>
<tr>
<td>Community interest</td>
<td>Local community has expressed interest in bicycle infrastructure improvements</td>
</tr>
<tr>
<td>Geographic balance</td>
<td>Project improves the balance of bicycle funding to be spent among geographic sectors of the city. Project expands the percentage of Seattle residents living within ¼ mile of a bicycle facility.</td>
</tr>
</tbody>
</table>

The 2014 *BMP* long-term performance indicators, organized by target and trend, are intended to monitor progress moving forward and are associated with the five plan goals (Table 18, Table 19) (Seattle, 2014a, p. 112). The intention of systems monitoring indicators in the *BMP* are to “help inform project selection and design, the development
and success of education and encouragement programs, measures to improve safety, and other issues” (Seattle, 2014a, p. 113).

**Table 18 Bicycle Master Plan Performance Measure Targets**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Performance measure</th>
<th>Performance target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridership</td>
<td>Number of bicyclists counted at locations throughout Seattle</td>
<td>Quadruple ridership between 2014 and 2030</td>
</tr>
<tr>
<td>Safety</td>
<td>Bicycle collision rate</td>
<td>Reduce bicycle collision rate by half (50%) between 2013 and 2030</td>
</tr>
<tr>
<td></td>
<td>Number of serious injuries and fatalities</td>
<td>Zero fatalities by 2030</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Percentage of bicycle facility network completed</td>
<td>100 percent of bicycle system constructed by 2035</td>
</tr>
<tr>
<td>Equity</td>
<td>Areas lacking bicycle facilities</td>
<td>Zero areas of city lacking bicycle facilities by 2030</td>
</tr>
<tr>
<td>Livability</td>
<td>Percentage of households within ¼ mile of an all ages and abilities bicycle facility</td>
<td>100% of households in Seattle within ¼ mile of an all ages and abilities bicycle facility by 2035</td>
</tr>
</tbody>
</table>

**Table 19 Bicycle Master Plan Performance Measure Trends**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Performance measure</th>
<th>Desired trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridership</td>
<td>Commute mode share</td>
<td>Increase</td>
</tr>
<tr>
<td>Safety</td>
<td>Percentage of Seattle residents who identify safety as a major impediment to bicycling</td>
<td>Decrease</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Key travel sheds completed</td>
<td>Increase</td>
</tr>
<tr>
<td>Equity</td>
<td>Percentage of females, older adults, and people of color who ride regularly (a few times a month or more)</td>
<td>Increase</td>
</tr>
<tr>
<td>Livability</td>
<td>Number of bicycle racks and on-street bicycle corrals</td>
<td>Increase</td>
</tr>
<tr>
<td></td>
<td>Self-reported physical activity</td>
<td>Increase</td>
</tr>
</tbody>
</table>

4.6. Indicator Summary

Table 20 below summarizes the number of indicators within each health domain. The social determinants of health examined in this dissertation are access, active travel or physical activity, traffic safety, air quality, and climate change. The most commonly addressed domains are access (23), active travel or physical activity (21), and traffic safety (19).
Any given indicator may represent multiple domains or goal areas. They may explicitly address multiple domains; for example, the Seattle PMP noted the indicator “Number of pedestrian fatalities and serious injury collisions” met safety, health, equity, and vibrancy goals. In other cases, the indicator may be categorized under one domain but nonetheless also addressed other goals. For example, reducing drive-alone mode share is considered as reducing dependence on driving (Denver Comprehensive Plan), how we get to work (Go Boston), transportation choices (Indy Moves) and vibrancy (Move Seattle). However, it could also easily be categorized as an indicator for climate change. As such, these numbers in Table 20 represent approximations of domain popularity based on the taxonomy I used.

As defined in Table 20, access refers to indicators that address access to destinations; access to employment; walkable neighborhoods (particularly as measured by WalkScore); access to transportation options; and design in compliance with Americans with Disabilities Access (ADA) standards. Active travel/physical activity refers to pedestrian and bicycle infrastructure; network connectivity; and increasing pedestrian, bicycle, and transit mode share. Traffic safety refers to collisions, fatalities, and injuries. Climate change refers to efforts to reduce drive-alone trips, reduce greenhouse gas emissions, the adoption of clean vehicles, or other climate adaptation activities. Air quality was rarely explicitly addressed. Because I am being inclusive about indicators, I count most climate change-related indicators as air quality indicators, given that greenhouse gas emissions are also polluting. However, it should be noted that only
one city directly addressed air quality: Go Boston’s asthma indicator. Indy Moves had a clean air priority area that was operationalized as a greenhouse gas emissions indicator.

In addition to these health domains, Table 20 below also includes indicators that address racial equity, affordability (e.g., transportation costs or low-income populations), and governance (e.g., implementation efficiency, project distribution).

**Table 20 Indicator Health Domains**

<table>
<thead>
<tr>
<th>SDOH indicators</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Access</td>
</tr>
<tr>
<td>Boston</td>
<td></td>
</tr>
<tr>
<td>Go Boston 2030</td>
<td>4</td>
</tr>
<tr>
<td>Vision Zero</td>
<td></td>
</tr>
<tr>
<td>Boston</td>
<td></td>
</tr>
<tr>
<td>Denver</td>
<td></td>
</tr>
<tr>
<td>Comprehensive Plan</td>
<td>2</td>
</tr>
<tr>
<td>Blueprint Denver</td>
<td>1</td>
</tr>
<tr>
<td>Denver Movers</td>
<td>2</td>
</tr>
<tr>
<td>Indianapolis</td>
<td></td>
</tr>
<tr>
<td>Walkways</td>
<td>1</td>
</tr>
<tr>
<td>Indy Moves</td>
<td>6</td>
</tr>
<tr>
<td>Memphis 3.0</td>
<td>2</td>
</tr>
<tr>
<td>Seattle</td>
<td></td>
</tr>
<tr>
<td>Move Seattle</td>
<td>2</td>
</tr>
<tr>
<td>Seattle PMP</td>
<td>4</td>
</tr>
<tr>
<td>Seattle BMP</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

Several plans explicitly measured health care, health outcomes, or health inequities. Generally, I did not treat these indicators as distinct from the indicators that measure the SDOH. However, I did examine whether policy actors found that an explicit
health message was compelling for social learning or policy change, found in Chapter 6.

The explicit health indicators are listed in Table 21 below, verbatim.

**Table 21 Explicit Health Indicators**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>All health centers in Boston will be within a 5-minute walk of bus stop,</td>
<td><em>Go Boston</em></td>
</tr>
<tr>
<td>shuttle, train station, and protected bicycle facility or shared use path</td>
<td></td>
</tr>
<tr>
<td>(original emphasis)</td>
<td></td>
</tr>
<tr>
<td>Rates of emergency department visits due to asthma among Black and Latinos</td>
<td><em>Go Boston</em></td>
</tr>
<tr>
<td>across all ages will be reduced by 10%</td>
<td></td>
</tr>
<tr>
<td>Reduce health inequities between Denver neighborhoods (access to prenatal</td>
<td><em>Denver Comprehensive</em></td>
</tr>
<tr>
<td>care; children at a healthy weight; access to fresh food and parks; life</td>
<td></td>
</tr>
<tr>
<td>expectancy)</td>
<td><em>Plan</em></td>
</tr>
<tr>
<td>A complete pedestrian network with sidewalks and crossings up to</td>
<td><em>Denver Moves</em></td>
</tr>
<tr>
<td>standards and without gaps in areas of health concern (areas with high</td>
<td></td>
</tr>
<tr>
<td>child obesity rates)</td>
<td><em>Pedestrians</em></td>
</tr>
<tr>
<td>Rates of obesity</td>
<td><em>Walkways</em></td>
</tr>
<tr>
<td>Provides a health benefit for people in areas with the greatest reported</td>
<td><em>Seattle BMP</em></td>
</tr>
<tr>
<td>health needs, represented by obesity rates, physical activity rates</td>
<td></td>
</tr>
<tr>
<td>(self-reported), and diabetes rates</td>
<td></td>
</tr>
<tr>
<td>Self-reported physical activity</td>
<td><em>Seattle BMP</em></td>
</tr>
</tbody>
</table>
5. Health Indicators in Municipal Transportation Plans: Use, Institutionalization, and Administrative Decision-Making

5.1. Introduction

With the widespread acknowledgement that the nature and quality of places affect health (Advisory Committee on Urban Health Affairs, 1967; Braveman et al., 2011; Coburn, 2007; Pineo et al., 2017), the public health field is shifting to a social determinants of health (SDOH) model to improve population health (Elias et al., 2019). The SDOH are the places in which people “live, learn, work, and play,” (CDC, 2022). As a SDOH, the built environment is not merely the background for people’s health decisions, but rather an exposure that directly affects people’s health status (Northridge et al., 2003; Pineo et al., 2017). Transportation is a critical health determinant that enables access to essential services and resources and facilitates physical activity as part of everyday life. People are also exposed to life-threatening traffic violence (i.e., crashes) and the air and noise pollution created by transportation systems (Frank et al., 2019). In addition, the adverse impacts of transportation systems are disproportionately borne by low-income individuals, people of color, and other marginalized groups (APHA, 2021).

Rather than measuring health outcomes (e.g., diabetes rates) directly, indicators that measure the SDOH address the causes of health outcomes; this is often called an “upstream” approach to public health (Corburn & Cohen, 2012). Within a municipal context, indicators provide information about the aspects of the built environment that affect health and can be used to inform policy and decision-making (Pineo et al., 2018).
However, it is not clear how indicators are used and what influence they have in planning (Pineo et al., 2018) or transportation decision-making processes (Sandt et al., 2019). Research on indicators tends to focus on their development, use, and validation, rather than their influence (Contandriopoulos et al., 2010; Pineo et al., 2017; Sébastien et al., 2014; e.g., Giles-Corti et al., 2014). Research on the capacity for indicators to affect policy has shown mixed results (Gudmundsson & Sørensen, 2013; Petticrew et al., 2004), with some studies showing that indicators may instead reinforce the status quo (Pineo et al., 2019).

Using a case study approach, I explored whether health-related indicators are being used in municipal transportation plans, whether they are institutionalized into transportation agency decision-making processes, and what influence they have on administrative decision-making. I used the SDOH to define which indicators were health-related: traffic safety, active transportation, access to essential destinations, air quality, and climate change. I have chosen to examine indicators within municipalities, which are understudied compared to studies of indicators at the metropolitan level (Dumbaugh & Meyer, 2003; Handy, 2008; Lyons et al., 2012; McAndrews & Marcus, 2014; Singleton & Clifton, 2017) and the state level (Dumbaugh & Meyer, 2003; Hendren & Niemeier, 2006; Lyons et al., 2014; Miller & Evans, 2011).

5.2. Literature and Concepts

This literature review addresses how technical information (e.g., research, indicators) is used within policy-making processes, how new information is
institutionalized into agency routines, and how indicators influence administrative decision-making. It draws from research in the fields of knowledge utilization, organizational science, science and technology studies, and the advocacy coalition framework to identify key concepts and operationalize outcomes and explanatory factors.

5.2.1. Use, Influence, and Institutionalization

One challenge in studying the use and influence of health indicators is in operationalization of the terms. Operationalizing the use of technical information, such as indicators, as a research construct has been problematic since its early empirical study (Landry et al., 2003; Weiss, 1977; Weiss & Bucuvalas, 1980) and has not become clearer over time (Contandriopoulos et al., 2010; Oliver & Pearce, 2017; Parkhurst & Abeysinghe, 2016). Similarly, the definitions of influence vary. Influence can include intangible concepts—e.g., thinking about a problem—as well as more discrete impacts such as choosing a course of action (Gudmundsson & Sørensen, 2013; Rich & Oh, 2000).

In transportation planning processes, indicators can be used at different scales and phases of decision-making. Broadly, indicators can be used in five places: problem identification, strategy development, scheme (a.k.a. alternatives) design, implementation, and operation (Marsden et al., 2006). The path from indicator use to influence is more complex than many indicator producers realize (Contandriopoulos et al., 2010; Pineo et al., 2018; 2019, 2020; Decoville, 2018; Sébastien, et al., 2014; Innes & Booher, 2000). Much sustainability, transportation, and health transportation indicator
research focus on the data characteristics necessary for developing indicators (Hezri & Dovers, 2006; Pineo et al., 2018; Rydin et al., 2003; e.g., Grant et al., 2013; Joumard et al., 2011; Miller et al., 2013; Zietsman et al., 2011). This indicator literature draws from the instrumental rationality traditions within city planning and transportation (Hezri & Dovers, 2006; Næss, 2005), new public management, which encourages the adoption of private sector practices (Bell & Morse, 2011; Heinrich, 2007), and evidence-based medicine and policy (Bell & Morse, 2011; Oliver & Cairney, 2017). However, other scholars have studied the use and influence of indicators by using theories and frameworks from fields that typically draw upon constructivist research traditions, describing the importance of user perceptions, belief systems, and argumentation in how indicators or other technical information is received by policy actors.

Indicators have several pathways for influence, generally by becoming increasingly more embedded into organizational decision-making. Indicators or other technical information can become influential by providing information for making decisions instrumentally (Gudmundsson & Sørensen, 2013), by changing policy actor attitudes (Bell & Morse, 2012; Hezri, 2005) if the indicators have been developed within an inclusive process (Gudmundsson & Sørensen, 2013; Innes & Booher, 2000), and finally become institutionalized when organizations change their routines based on the new learning (Argyris & Schön, 1996; Bell & Morse, 2012; Gudmundsson & Sørensen, 2013; Hezri, 2005; Innes & Booher, 2000).
When indicators routinely inform administrative actions, this means that indicators have been integrated into agency processes, i.e., they have been institutionalized. From an organizational learning perspective, the routines and strategies organizations employ to perform tasks represent organizational knowledge (Argyris & Schön, 1996). The organization may have an “espoused” theory of action that explains how things are done that differs from the organization’s “theory-in-use,” which contains the (often implicit) values, action strategies, and assumptions behind the routines. The organization’s espoused theory of action—the official rules—may differ from its theory-in-use; that is, the actual routines and processes employed in the organization. One reason for this mismatch may be that the theory-in-use is undiscussable or undesirable (Argyris & Schön, 1996).

Following Gudmundsson and Sørenson (2013) and Sébastien et al. (2014), I define use as where an indicator was “handled” in the process. Within this chapter, I focus on indicator influence on administrative decision-making. However, it should be noted that it is difficult to ascribe causal relationships with regard to indicators and their influence on actions (Bell & Morse, 2011; Hezri & Hasan, 2004) because multiple factors contribute to agency decision-making. Indicator influence is enhanced when indicators become institutionalized after organizations change their routines based on the new learning (Argyris & Schön, 1996; Bell & Morse, 2012; Gudmundsson & Sørensen, 2013; Hezri, 2007; Innes & Booher, 2000).
5.2.2. Indicator Usability Factors

Several fields emphasize that the characteristics and the process by which indicators are developed are important to their use and influence. While some indicator research is focused on the indicators’ technical merits, other research indicates that scientific information with greater internal validity (i.e., scientific plausibility) does not make it more useful. This could be because users do not have the skills to assess its validity or that validity is “irrelevant to the actual use” (Contandriopoulos et al., 2010, p. 457). Most likely it is because that scientific information is only one piece of information that policymakers must consider in decision-making (Contandriopoulos et al., 2010). However, the technical quality of scientific information becomes more important in politicized environments, as challenging the merit of the information is a common strategy for detractors (Innes & Booher, 2000; Jasanoff, 1990; Ozawa, 1991). Studies using the advocacy coalition framework (ACF) have found that a higher level of conflict in the policy subsystem reduces the opportunity for learning across coalitions (Weible, 2008).

In science and technology studies (STS), salience, credibility, and legitimacy are the key characteristics of useful scientific information (Cash et al., 2002). Salience is the degree to which the information, such as an indicator, is relevant to the needs of decision-makers. Salience can include concepts of policy responsiveness, action orientation, or timeliness (Weiss & Bucuvalas, 1980). A clear and easy-to-communicate indicator is also considered important (Davern et al., 2017; Marsden et al., 2006; Reiff &
Gregor, 2005). Legitimacy refers to procedural fairness and lack of bias in the indicators’ development. Credibility refers to technical adequacy (Cash et al., 2003), although questions of legitimacy also surface because it involves trust in the indicator producers and their methodology. Legitimacy and credibility have been combined in Contandriopoulos et al.’s (2010) taxonomy of scientific information, whereas Cash et al. (2002) separate the two concepts. Other research categorizes the characteristics of useful scientific information into legitimacy and content (Hezri & Dovers, 2006) or as truth tests and utility tests (Weiss & Buculavas, 1980).

Transportation indicator research suggests that indicators should have certain characteristics to be useful. Joumard et al. (2011) organize indicator characteristics according to their technical qualities, practical issues, and policy application: representation (validity, reliability, sensitivity); operation/monitoring (measurability, data availability, ethical concerns); and policy application/management (transparent, target relevance, actionability). Whether an indicator is forward-looking (ability to be forecasted) or backward looking (evaluative) may be influential. Forward-looking indicators boosted perceived utility (Sébastien et al., 2014) and influence (Gudmundsson & Sørensen, 2013). In the transportation field, where travel demand models are influential in the planning process (Handy, 2008), whether the indicator can be forecasted may be an important criterion (Reiff & Gregor, 2005). However, Singleton & Clifton (2017) found that travel model forecasting capabilities did not appear to be strongly related to health-related guidance or performance measures within
metropolitan planning organizations. This could reflect the unimportance of travel forecasting for indicators or conversely a lack of usability on the part of indicators chosen.

Rather than examining indicators according to their technical merits, this chapter borrows the concept of “indicator usability” from STS. Both the STS and CPT literatures suggest that communicative processes are essential to the usability of an indicator. This makes the indicator more likely to be institutionalized in practice and to influence policy beliefs compared to indicators developed by external actors. I draw from knowledge utilization, STS, and transportation indicator research to define specific usability characteristics. Table 22 lists the indicator usability factors examined.
Table 22 Indicator Usability Factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Characteristic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salient</td>
<td>Measurability</td>
<td>Is the indicator measurable? Is it relatively easy and inexpensive to measure (Joumard et al., 2011)?</td>
</tr>
<tr>
<td></td>
<td>Availability</td>
<td>Are there data readily available (Joumard et al., 2011)?</td>
</tr>
<tr>
<td></td>
<td>Spatial scale</td>
<td>Is the indicator measured at a spatial scale that is useful to decision-makers?</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Is the frequency with which data is collected/updated useful for decision-makers?</td>
</tr>
<tr>
<td></td>
<td>Policy-relevant/actionable</td>
<td>Does the indicator reflect something that policymakers have control over (Joumard et al., 2011; Weiss &amp; Bucuvalas, 1980)?</td>
</tr>
<tr>
<td></td>
<td>Targets</td>
<td>Do practitioners set indicator targets? What is the basis for targets?</td>
</tr>
<tr>
<td></td>
<td>Policy-sensitive</td>
<td>Does the indicator reflect changes in policy or practice (Joumard et al., 2011)?</td>
</tr>
<tr>
<td></td>
<td>Communication/complexity</td>
<td>Is the indicator easy or challenging to communicate to stakeholders (a.k.a. transparent and interpretable, Joumard et al., 2011)?</td>
</tr>
<tr>
<td></td>
<td>Forward-looking</td>
<td>Can the indicator be forecasted (Reiff &amp; Gregor, 2005)?</td>
</tr>
<tr>
<td>Credible</td>
<td>Reliability</td>
<td>Can the indicator be consistently measured (Joumard et al. 2011)?</td>
</tr>
<tr>
<td></td>
<td>Construct/content validity</td>
<td>Does the indicator measure the concept it is intended to measure (Joumard et al. 2011)?</td>
</tr>
<tr>
<td></td>
<td>Internal validity</td>
<td>Does the indicator accurately measure the phenomenon? Are the causal links scientifically plausible (Contandriopoulos et al., 2010)?</td>
</tr>
<tr>
<td></td>
<td>Conformity to user expectations</td>
<td>Does the indicator conform to user expectations? Is it compatible with users’ ideas and sense of the situation (Weiss &amp; Bucuvalas, 1980)?</td>
</tr>
<tr>
<td>Legitimate</td>
<td>Legitimate</td>
<td>Was the indicator developed in an unbiased manner and through a fair process (Cash et al., 2002)?</td>
</tr>
</tbody>
</table>

5.2.3. Organizational Factors

Several literatures address organizational factors that affect whether indicators are used and influence decisions, including institutionalism, knowledge utilization (KU), and the Advocacy Coalition Framework (ACF). Organizational factors said to facilitate the uptake of scientific information include organizational structure, organizational culture, organizational interest (Landry et al., 2003; Rich & Oh, 2000; Weiss & Bucuvalas, 1980), and collaborative processes (Cash et al., 2002; Innes & Booher, 2000; Rydin et al, 2003).
The structure of formal institutions and basic legal structure of policy subsystems shape political decision-making systems (Béland & Katapally, 2018) and tend to be “quite resistant to change” (Sabatier, 1987, p. 656). In this dissertation, formal institutions refer to the structure of city council, the role of advisory bodies, and other laws that govern the adoption of transportation plans and departmental processes. This factor examines how local government structures the environment for learning and action, rather than focusing on the activities of appointed or elected officials.

An organization’s culture includes characteristics such as organizational values and norms, bureaucratic support, active leadership, and organizational interest. Culture plays a role in whether organizational learning can occur; learning is difficult in an environment that avoids discussion of mistakes or sensitive issues (Argyris & Schön, 1996). Organizational culture refers to agency values, such as those expressed on agency websites and in planning documents, and agency leadership.

Administrative governance, or the minor rules and routines of an organization, affect whether indicators are useful or influential. Indicators have greater influence when procedural connections, such as programming, budgeting, and reporting requirements, have been made (Bauler, 2012; Dluhy & Swartz, 2006; Innes & Booher, 2000). The institutionalist perspective suggests that changes to administrative routines can be challenging. The institutional concept of path dependency describes how the “self-perpetuating mechanisms of organizational practices” resist change (Liverani et al.,
Institutional norms were found to be an impediment in advancing a health equity agenda in Baker et al.’s (2018) narrative review.

In Weiss and Buculavas’ (1980) research, organizational interest is defined as “challenge to the status quo,” which includes “challenges to assumptions and institutional arrangements, implications for major change in philosophy, organization, or services; new issues or perspectives; and politically unacceptable implications” (p. 305, original emphasis). To their surprise, rather than finding counter-organizational information less useful, they found that this information was perceived as valuable, possibly because practitioners were looking for new ideas (Weiss & Bucuvalas, 1980).

Communication and collaboration are considered important to the use and institutionalization of indicators. From an STS perspective, indicators serve as boundary objects that bridge science and policy actors. The two-way communication between the users and producers of indicators are necessary for developing salient, legitimate, and credible indicators (Cash et al., 2002; cf. Innes & Booher, 2000). According to Innes and Booher (2000), the collaborative development of indicators between producers and users influences their thinking, can influence public discourse, and gives the indicators legitimacy. Collaboration between departments and agencies is a sign of an environment that is receptive to organizational learning (Argyris & Schön, 1996).

The constraints and resources of policy actors affect their ability to affect change. Within the ACF, these constraints are technically treated as a mediator between the dynamic parameters of the subsystem (e.g., new elected leadership) and policy change.
(Jenkins-Smith et al., 2018). For simplicity, I discuss these resources as an organizational factor. I also examined each city’s transportation budget, overall municipal budget, and municipal budget per capita to assess its financial capacity (see Table 4).

In the MSF, actors in the policy community can “soften up” policy solutions through debate (Kingdon, 1995). Learning about policy solutions from other cities can be considered a form of softening up that makes the policy solution more acceptable. In this research, I also examined cities’ participation in data-driven programs to discern if this had an impact on a city’s ability to institutionalize indicators. I specifically focused on Bloomberg Philanthropies’ What Works Cities certification program, which “recognizes and celebrates local governments for their exceptional use of data to inform policy and funding decisions, improve services, create operational efficiencies, and engage residents” (Bloomberg, 2022).

In summary, this review identified several organizational factors that enable indicator influence administrative action (Table 23).
<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal institutions</td>
<td>How do institutional structures and laws affect the processes of indicator development, use, and influence?</td>
</tr>
<tr>
<td>Organizational culture and leadership</td>
<td>How are the values of the agency expressed in mission statements and planning documents? Does agency leadership support indicator use by providing resources?</td>
</tr>
<tr>
<td>Administrative governance</td>
<td>How do agency routines and decision-making processes incorporate indicators?</td>
</tr>
<tr>
<td>Financial and technical resources</td>
<td>How do agency resources affect the ability to develop, use, and monitor indicators?</td>
</tr>
<tr>
<td>Communication and collaboration</td>
<td>How do city departments work together? Did the users and producers of indicators work together? What was the nature of forums for dialogue?</td>
</tr>
<tr>
<td>Previous experience with data-driven management</td>
<td>Has the city participated in a program that encourages data-driven management? Is the city <em>What Works Cities</em>-certified?</td>
</tr>
</tbody>
</table>
5.3. Findings

In this section, I describe the findings for each city, followed by a synthesis.

Within each city’s profile is a description of the transportation plans studied, indicators identified in the plans, and how the indicators specified in those plans were used. The findings are organized by use case—the type of indicator use—because these bound the influences possible from the indicator. The findings include evidence of the factors that explain the influences (e.g., social learning, administrative action) within each case.

Within the text, I use the capitalized “City” to refer to the government agency, not the geographic place, unless otherwise specified. For ease of reading, I also refer to city-county governments as the “City” as well. For example, although the City of Indianapolis and Marion County are one government entity, I primarily refer to the joint enterprise as the “City” in the text.

5.3.1. The City of Boston

5.3.1.1. Use Cases

Existing Conditions

In the existing conditions use case, indicators drew attention to issues that could be framed as problems within Go Boston but did not for Vision Zero Boston. The key issues that Go Boston sought to address were derived from the community engagement process, in which participants were invited to ask questions about getting around in Boston. After collecting questions from the community, a “question review session” developed nine themes: access, affordability, experiential quality, governance, health,
innovation and technology, reliability, safety, and sustainability and resiliency (Boston 2017, p. 16, 28). The city’s existing conditions analysis examined mode share, affordable travel and access to jobs, safety, vulnerability to climate change, transit service, walkability, bicycling, ridesharing, car ownership, and roadway traffic flow (Boston, 2017, p. 34). One informant indicated these analyses did not reveal new problems, with one exception: Go Boston perhaps “put a real pin on . . . affordable travel and access to jobs” (Informant 16). One of the findings from the existing conditions analysis found high transportation costs in peripheral neighborhoods that did not have good transit access. This finding reinforced previous research conducted by researchers at Northeastern University that had found that Black Bostonians riding transit had significantly higher commute times than white riders:

It takes thinking outside the box to measure things that people don’t know about yet, and then [it] changes the conversation . . . the fact that black Bostonians spend so many more hours a year commuting than white bus riders was shocking to people . . . . To actually put a number on it made people go, “Whoa . . . that's a big deal” (Informant 16).

Vision Zero Boston’s existing conditions analysis provided information about the number of fatalities in Boston by mode as well as percentages of total fatalities and injuries by mode. The analysis also discussed the level of care crash victims received, the types of crashes involving injured pedestrians and bicyclists and the geographic distribution of crashes (Boston, 2016). The public did not provide input about which indicators or data to use; this is partly because there was not an extensive engagement process to develop the plan (engagement efforts are focused on projects) (Informant 13)
but also the indicator target was already established for Vision Zero; i.e., zero fatalities and serious injuries.

**Project Prioritization**

The use of indicators as evaluation criteria was the primary goal and innovation in *Go Boston* (Informant 11). *Go Boston* was designed to “both justify the projects and say you did what you promised by hitting these metrics” (Informant 11). The policies and projects listed in *Go Boston* came from “identification as early action projects, a public voting process, and a detailed needs assessment” (Boston, 2017, p. 130). The needs assessment involved travel projections and GIS analyses to assess how the proposed projects and policies addressed the targets in *Go Boston*. Pre-existing policies and projects were also scored, resulting in additions to the final list (Boston, 2017, p. 132). The projects and policies *Go Boston* identified included not only local efforts within Boston’s jurisdiction but also recommended actions for other agencies, such as transit line extensions, and those were regional in nature, such as developing a regional transit district. Project selection occurred through the “science of the prioritization” (Informant 14) as well as an evaluation process involving key stakeholders: “There was [sic] some sort of key moments when those things were evaluated and, or even ultimately projects were selected based on those performance metrics and the people from . . . LivableStreets, The Boston Cyclists Union, WalkBoston . . . (and) . . . the Disabilities Commission” (Informant 11).
Go Boston did not recommend criteria for on-going prioritization processes, such as capital improvement programming. One informant was not clear if new projects would be subject to Go Boston’s evaluation criteria or compared against its project list (Informant 11). The Boston Transportation Department (BTD) is in fact developing an on-going project prioritization process for the city’s capital improvement program prioritization framework that builds off of the criteria in Go Boston. To date, it contains three primary criteria: safety, equity, and mobility by mode (Informant 17). Because the plan indicators were not suitable for the “nitty-gritty of how to score projects” (Informant 17), City staff refined the evaluation criteria for capital improvement programming: “On a more day-to-day basis [BTD is taking] the values and goals out of Go Boston and using a set of indicators under it to use a data-driven approach to score projects to figure out which ones we should prioritize to put it in our capital program” (Informant 17). Vision Zero Boston does not use evaluation criteria per se but uses crash data to prioritize projects.

**Systems Monitoring**

Go Boston and Vision Zero Boston both contained indicators for systems monitoring. BTD currently reports on the following six Go Boston indicators: improving safety, expanding access, ensuring reliability, reducing car use, reducing emissions, and increasing affordability. BTD received a grant to fund the tracking of the Go Boston indicators, but the disruption associated with COVID-19 slowed down implementation.
BTD intends to report on the other indicators but is still building the data infrastructure in order to do so (Informant 17).

There was no annual reporting required of Go Boston. A non-profit organization, LiveableStreets, supported the City’s work to create an online platform for Go Boston. However, one informant had hoped the City would be reporting more, and more frequently, noting that the Go Boston dashboard hadn’t been updated in over a year-and-half (Informant 14). There were plans for an advisory data committee, drawn in part from advisory committee members, to “ensure the plan was still alive and being used and connected with community” (Informant 14) but it never materialized (Informants 14, 16). One informant was disappointed that the Go Boston indicators were not publicly published and discussed as part of the annual budget process:

Originally, I was hearing . . . that they were going to be publishing [indicators’ status] every budget cycle, so that it was very transparent about . . . how projects were ranked . . . when I got that update . . . it was like, “Oh no, this is all happening behind the scenes. We just want you to know that there's a process” (Informant 14).

The Vision Zero Boston Action Plan committed to making crash data publicly available through an online crash map, an online dashboard summarizing crash data, and a map of projects (Informant 13). As part of regular updates to the Vision Zero dashboard, the BTD had produced maps showing “the top 15 crash locations, and the number one was, at least to me . . . was a surprise . . . . And we were using data, you know, that was a couple years old so, as it turned out, our signals group had already started working on a change” but the updated high-crash corridor maps accelerated the
multi-step improvements, having generated a sense of “Wow, we got to do this right away’” (Informant 13).

Some informants credited indicators for helping to make transportation evaluation processes more equitable (Informants 13, 15). Prior to the adoption of Vision Zero Boston’s data-driven approach, the City did not have a method of prioritizing “constituent requests” and “311” calls. Now the City is able to “use the crash data, and other data, demographic data, to help decide . . . of the hundreds of . . . spot improvement requests . . . which one should we really take a closer look at” (Informant 13)?

The ability to learn and make improvements based on regular monitoring is one function of long-term systems indicators. The other function is an accountability mechanism. The City conducted an internal evaluation of Go Boston in 2019 and LivableStreets produced their own progress report, Not on a Shelf: Reporting on the City of Boston’s Progress on Go Boston 2030, in 2020 (Informant 11). The LiveableStreets’ Go Boston progress report was an accountability strategy that “absolutely made [the City], like, change decisions or timelines . . . . It did light a fire under them” (Informant 14). In the progress report, LivableStreets concluded that important changes had been made but “implementation of these projects and policies has not yet demonstrated significant progress toward most of Go Boston 2030’s goals and targets” (LiveableStreets, 2020, p. 2). The Boston-based Barr Foundation has since provided “additional funding for a six-
year review that the advocates and the City are supposed to do in partnership” (Informant 11).

LiveableStreets had learned that progress reports were an effective accountability mechanism from Vision Zero Boston’s progress reports (Informant 14). In 2018, the Massachusetts Vision Zero Coalition reviewed Boston’s performance “to ensure public accountability in reaching its Vision Zero goals” (Massachusetts Vision Zero Coalition, 2018). They found that Boston had made progress in the “Vision Zero fundamentals” with one exception: “Set measurable goals with a clear timeline for implementation” (Massachusetts Vision Zero Coalition, 2018, p. 1). At the time of writing, the City’s Vision Zero dashboard shows that crashes across all modes have decreased since 2016 (Boston, 2022).

5.3.1.2. **Explanatory Factors**

**Indicator Usability**

How useful indicators are to users impacts the influence they have on transportation decisions. The primary concerns Boston informants expressed about indicator data involved the saliency of the indicators, such as data availability and the spatial scale of the data. The scale at which the data is available is based in part on requirements for health data anonymity and has implications for its utility: “We wanted to look at obesity versus Walk Score, and the obesity data, because it has to be anonymized . . . [it] was only available at like, this level . . . . It's useful for this type of
planning, but it’s not that useful for like, you should put a sidewalk on the street” (Informant 12).

One informant acknowledged that some Go Boston metrics were “unmeasurable” but worth including in the plan (Informant 11). The “[consulting] team, basically said, you know, we can only really do a good metric on nine of the many aspirational targets” (Informant 11, original emphasis). This frustrated one informant who wanted to see a plan for measuring all the indicators because “in theory, [BTD] would be the ones monitoring their progress and report back” (Informant 14).

Questions around how to set targets were also raised. For Go Boston mode share indicators, BTD “purposefully wrote [them] in kind of a conversational way because I don’t think anybody wanted to be held to like, 19.2%. I mean, this about what we want to do, we want to cut driving in half” (Informant 12). In other cases, the concern was more about determining the appropriate numerical target from both policy and technical perspectives:

What is it reasonable to expect in terms of change in 15 years in mode shift? You know . . . it’s felt like there has been a huge increase in cycling—certainly has been a huge increase in cycling infrastructure. But . . . the data numbers are so small that, like, what is it reasonable and how are we going to measure it, what tools are we going to use (Informant 11)?

The complexity of the indicators and how easily to communicate them matters in influencing public discussion. One informant expressed concern about decision-makers’ ability to focus on complex indicators:
So, there’s a lot of people in City Hall, or who were in City Hall, who are really into metrics, but they were into metrics they could count quickly and easily. And this plan doesn’t have a lot of quick and easy metrics . . . I think the right metrics are in here but they’re not like, sexy dashboard metrics (Informant 11).

The clarity of metrics associated with Vision Zero Boston offers a foil to the complexity of Go Boston’s indicators: “It’s such a clear thing to communicate . . . how many people died or how many people were seriously injured. And Go Boston—it’s a much more convoluted report” (Informant 14).

Another issue with indicators is the choice of outcome or output indicators. Outcome indicators represent the desired future condition; in contrast, output indicators measure the completion of a project or program that is intended to make progress toward the outcome. Outcomes are often more difficult to achieve, in part because there are many factors outside of City control that contribute to that outcome. The attribution issues associated with outcome indicators make it difficult to assess the effectiveness of any given plan, project, or program:

It's a little bit hard to draw the clear conclusions like . . . in aggregate where we're seeing the numbers go down, but it's a little hard to say project-by-project . . . we're not at a stage where we can say like here's, here's like a long list of projects and we know that every single one of these . . . did a great job or reduced crashes by X percent. We're not quite there yet (Informant 13).

*Go Boston* targets were aspirational. This was frustrating to one informant because it appeared that the City was not “connecting the actual outcomes of implementing projects or policies with those targets” (Informant 14). At the same time, the informant recognized that it was challenging to connect projects with certain outcome measures:
Bostonians average commute to work time will decrease by 10% . . . . It is a useful thing to . . . measure progress against within the context of a . . . long term mobility plan for the City of Boston, but . . . how could they tie specific projects to that goal (Informant 14)?

In terms of credibility, the largest issue was with the reliability and accuracy of crash data, which was widely considered problematic. In fact, the Massachusetts Vision Zero coalition wrote to the police department about reporting more crashes and providing demographic information. Reliability issues can be partly attributed to the fact that the forms do not contain standardized questions and checkboxes and instead rely on narratives from police officers. As a result, the data collected is not consistent and can’t be used to reliably measure, year-to-year, which areas have greater or fewer crashes. Emergency Medical Service (EMS) data tends to be more accurate, although less so for motor vehicle-motor vehicle crashes because there are more of them compared to bicycle and pedestrian crashes. Matching the police data to the EMS data has proven to be challenging (Informant 13).

Informants did not express concerns about the legitimacy of the indicators. For Go Boston, this may be due to the engagement process used to create them. Nearly all informants, both internal and external to the City, said the engagement process for Go Boston was “extensive” (Informants 11-12, 14, 16-17) or “unprecedented” (LiveableStreets, 2020), although one informant lamented that it was too “pie-in-the-sky” (Informant 16). For Go Boston, BTD spent as much on public engagement as they did for the development of the plan (Informant 12). Indicators were directly developed from the issues raised in the community engagement process (Informant 11). With the
exception of one person, who felt that the Go Boston indicators were too “generic” to be useful (Informant 16), most informants had a high degree of comfort with the indicators despite the occasional data challenges. An informant external to the City approved of the Go Boston engagement effort, supported the final plan, and felt that “a lot of these targets are really good” (Informant 14).

Vision Zero Boston did not have an engagement process for the development of its indicators given that the indicator and target is implicit in Vision Zero itself, although BTD engages with community members for Vision Zero project-level work (Informant 13). Neither did the Vision Zero program solicit feedback from the public on which data to use. The immediacy and clarity of the indicator (e.g., zero traffic deaths and serious injuries) in general was quickly understood by community members, generating public support for speed reduction and traffic calming (Informant 13).

Organizational Factors

A change in mayoral leadership in 2014 provided an opportunity for the creation of Go Boston (Informant 11). Newly elected Mayor Walsh was advised to create a transportation plan, among other city plans (Informants 11, 13). The previous mayor was not known for prioritizing planning efforts, describing himself as a nuts-and-bolts “mechanic” (Boeri, 2014; Informant 11). Departmental leadership took advantage of the planning opportunity and moved forward with the intention of creating an award-winning plan. Setting goals, measures, and targets was a way to distinguish Go Boston from previous planning efforts. Specifically, departmental leadership encouraged a
departure from traditional decision-making processes by using indicators to evaluate and score projects (Informant 11).

The City’s previous data-driven learning processes may have helped orient BTD to using indicators. Boston improved contract management for increased accountability through its engagement with Bloomberg Philanthropies *What Works Cities* program; Boston is certified at the silver level (Bloomberg, 2022). Boston was also part of Bloomberg Philanthropies *American Cities Climate Challenge* that provides staff capacity, technical assistance, and peer-to-peer networking opportunities to the winning cities (Boston 2022).

Within BTD, there was general support for the use of indicators as a way to change status quo planning and hold the City accountable (Informants 11, 14, 17). However, not everyone saw metrics as a decision-making innovation: “There’s not a lot of people who, like, resonate with metrics or systemic change” (Informant 11). Some agency managers had not incorporated indicators as part of their routines:

We haven’t had [indicators] in the past . . . that’s not something that has been a topic of conversation. It’s more like ‘Hey, like, what are you getting done?’ But . . . not . . . make this specific goal on these specific performance measures . . . . I don’t think that, like, top leadership is a barrier . . . it’s not been part of the culture . . . of these departments (Informant 17).

*Vision Zero Boston* was also created as part of Mayor Walsh’s new planning efforts. However, an informant felt that the Vision Zero was thoroughly supported within the organization: “I would say that it was pretty bottom up all along . . . it’s a staff level
thing. And I think especially . . . [with] pedestrian safety, everybody agrees with the mayor on down” (Informant 13).

During the *Go Boston* planning process, a new position, the Chief of Streets, was created to oversee the transportation and public works departments. The Chief of Streets is part of the mayor’s senior cabinet (Informant 11). The Chief of Streets inserted the ethos of the *Go Boston* plan within the transportation and public works departments: “The person who became Chief of Streets . . . is someone who used [*Go Boston*] to say: ‘These are our goals across both transportation and public works’” (Informant 11).

Indicators were credited by some to encourage coordination between departments, in effect to “force different departments to talk to each other” (Informant 12). For example, developing indicators for *Go Boston* required coordination with Boston EMS, the police department, and the fire department for crash data (Informants 12-13). Because emergency department visits due to asthma were already being measured, it was easy to incorporate it into *Go Boston*. Likewise, *Go Boston* was able to learn from the Vision Zero program, which had already established crash analysis methods.

Coordinating and collaborating on data sources had the benefit of not only being more efficient but also “that Boston could be saying the same thing about the same fact across its planning efforts” (Informant 12).

LiveableStreets reported improvements to the BTD’s project delivery:
(C)hanges to operations within and across departments including a new team-based model, bi-weekly meetings for division managers, the introduction of internal project schedules, and a new prioritization framework for capital funding. These internal structural changes are intended to create shared accountability among staff and speed up project implementation (LiveableStreets, 2020, p. 3).

One of the key factors affecting Boston’s ability to develop, update, and monitor indicators was their financial capacity to do so. In general, the City is well-resourced, with an overall budget of $3.29 billion, making it the second highest budget overall and per capita among my cases (see Table 4). The lack of in-house technical capacity informed the decision to hire consultants to assist with the Go Boston plan: “The City is somewhat limited in its capacity . . . . A consultant has a different set of tools and is . . . paid to think about these things” (Informant 11). The City received funding from the Barr Foundation to complete the plan. Likewise, establishing the Vision Zero program required a significant investment in resources, including the use of consultants:

When we were first getting started, there was a lot of work we had to do to get our data in order . . . to understand where crashes were happening . . . to work with various people to create the systems where the maps get updated, track fatal crashes, track crashes where EMS is called and then to analyze some of that (Informant 13).

After Go Boston was completed, the transportation department was limited in its ability to update the indicators because there are no dedicated data staff. By happenstance, some planners had technical skills and could undertake some of the analysis for the first update of Go Boston indicators (Informant 17). Updating the indicators on an annual basis was predicated on receiving a grant. One informant was hoping that this funding can set up an internal infrastructure for future reporting.
(Informant 17). The lack of staff and reliance on consultants presented something of a barrier to full institutionalization:

The challenge of really institutionalizing [indicators] within the department... it's about leadership, but also, I think, is about staffing and the ability to kind of have ways to keep them up and show them and have them be usable for staff and understandable... the leadership level [in a program]... would love to use them more, but... I have to use [an] outside consultant to do the actual work and so... I know that's been a big barrier for us of institutionalizing a performance measures approach to our work (Informant 17).

On an on-going basis, the Vision Zero program has retained a consultant to provide “research on data analysis and policy decisions, also provides design services for projects in high crash areas” (Informant 13). The Vision Zero program updates data sources and processes through peer learning and discovers new data sources or techniques for analyzing data: “it's very iterative... We're constantly trying to improve” (Informant 13).

5.3.1.3. Boston Conclusion

Different indicator usability characteristics were important to different use cases (see Table 24). Indicator usability was not a large concern for the existing conditions analysis or for project prioritization because the city had plan-related financial and technical resources available to conduct complex analyses and score projects. Data at a useful spatial scale was, however, important for prioritization. Use cases that occur after plan completion—capital improvement programming and systems monitoring—require the institutionalization of indicators. At this point, indicator usability became more important. Because the CIP evaluation criteria development is underway at the time of
writing, it is difficult to ascertain whether indicator usability factors were critical to their use because the organizational factors dominated. For the systems monitoring use case, data that was available, reliable, timely and at a small enough spatial scale was needed to learn and correct undesirable conditions. For indicators to work as accountability mechanisms, indicators need to be measurable at a minimum. Outcome measures were often problematic for assessing progress over time. Some informants were concerned that complex indicators were subject to misinterpretation and might not garner public or elected official support.

While leadership was important for the initial creation of indicators as part of planning efforts, organizational factors were especially important to the on-going institutionalization of indicators (see Table 24). General support for indicators existed from political leadership, but it was departmental leadership that made the decision to include indicators and develop processes for their on-going use. Significant progress had been made to institutionalize indicators, such as restructuring of the Boston Transportation Department to deliver on Go Boston plan outcomes (e.g., make changes in organizational routines, creating the Chief of Streets position). This double-loop learning is imperfect as the new routines and procedures have not yet been fully embraced among all departmental programs. The lack of adoption appears to be from a lack of familiarity and not a result of politically or philosophically motivated opposition. Funding is essential to manage and monitor the indicators over the long-term; BTD succeeded in making use of indicators and prioritizing projects through a funded plan,
but the lack of on-going funding made institutionalization more challenging. Public reporting, especially highly visible progress reports, were important for accountability.
Table 24 Boston Uses, Influences, and Explanatory Factors

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Influences</th>
<th>Indicator Usability</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing conditions</td>
<td>• Drew attention to affordability and travel disparities</td>
<td>- Setting targets</td>
<td>+ Financial and technical resources</td>
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<td></td>
<td></td>
<td></td>
<td>+ Departmental leadership</td>
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<td></td>
<td></td>
<td></td>
<td>+ “Forced” collaboration (Informant 12)</td>
</tr>
<tr>
<td>Prioritization</td>
<td>• Project list in Go Boston 2030</td>
<td>- Spatial scale (health data)</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td>Within plan</td>
<td></td>
<td></td>
<td>+ Departmental leadership</td>
</tr>
<tr>
<td>CIP</td>
<td>• Project list in Go Boston 2030</td>
<td>Not observed</td>
<td>- Financial and technical resources</td>
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<td></td>
<td></td>
<td></td>
<td>- Departmental routines</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>• Improvement to crash location</td>
<td>+/- Reliability, accuracy</td>
<td>+ Departmental leadership</td>
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<tr>
<td>Internal analysis</td>
<td>• Equitable project prioritization</td>
<td>- Outcome measures attribution</td>
<td>+ Departmental culture (safety)</td>
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<td></td>
<td></td>
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<td>- Financial and technical resources</td>
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<td></td>
<td>• Project delivery accountability</td>
<td>- Measurability</td>
<td>- Methodology difficult to replicate</td>
</tr>
<tr>
<td>Reporting</td>
<td>• Attract funding for additional reporting</td>
<td>- Meeting (aspirational) targets</td>
<td></td>
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<td></td>
<td></td>
<td>- Communication, complexity</td>
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Note. “+” indicates a facilitator and “−” indicates a barrier. “Not observed” signifies that informants did not describe influences, barriers, or facilitators.
5.3.2. City and County of Denver

5.3.2.1. Use Cases

Existing Conditions

The existing conditions analysis in Denver Moves Pedestrians highlighted a previously underappreciated problem: It would take 200 years to complete the sidewalk network on the current funding trajectory. Internally staff talked about the need to build sidewalks “in our lifetime” and the gravity of “kicking the can down the road” (Informant 26). In 2019, the voter-approved charter change that created the Department of Transportation (DOTI) contained language to ensure that the department met the needs of pedestrians and cyclists (it also established DOTI’s authority to operate as a transit agency) (Informant 26). Another “big takeaway” from the pedestrian analysis in Denver Moves Pedestrians was that “basically all of the low-income areas of the city . . . include pretty substantial areas of either missing or substandard sidewalk” (Informant 22). This disparity was “very clear to everyone as a part of the process” (Informant 22) and led to a prioritization process that focused on delivering pedestrian infrastructure to the areas of greatest need (Informants 22, 26). This was reinforced through a 2017 bond measure that included language about prioritizing underinvested neighborhoods (Informant 26).

As part of Blueprint Denver, the Denver Department of Public Health and Environment (DDPHE) was involved with public engagement (Informant 24) and assisted with the equity mapping component of Blueprint Denver (Informants 21, 24). The equity map not only helped bring equity to the top of the agenda but also facilitated further
interdepartmental collaboration because DDPHE was enlisted to help update *Blueprint Denver* indicators (Informants 21, 24). Furthermore, during the *Blueprint Denver* process, one organization funded trainings that included conversations about equity:

> It was the dialogue, quite frankly . . . you're sitting in a small group around a table with people who live in this community going, “Whoa, wait a minute here,” and it's like, . . . “Oh, I had not thought about that”. . . . I think there are a lot of people, including many of the staff members, who are like, . . . “This is a lot bigger conversation than we intended” . . . . Equity became a centerpiece of *Blueprint Denver* [and] is really the way that's been sold ever since (Informant 21).

**Project Prioritization**

*Denver Moves Pedestrians* indicators were intended to help prioritize investment by establishing a baseline and “understand how different levels of investment and different ways of prioritizing those investments . . . affected these broader indicators over time” (Informant 22). During the *Denver Moves Pedestrians* engagement process, the planning team brought a list of goals and data to community events, and asked people about how to prioritize investments. For example, schools and grocery stores were considered important destinations to prioritize (Informant 22). Concurrent with the development of *Denver Moves Pedestrians*, *Blueprint Denver* created street typologies with modal priorities; these were also used to identify pedestrian priority areas. The prioritization analysis led to prioritized project lists, organized into three tiers of priority (Denver, 2019b). These priorities, together with the Vision Zero program goals, are the “underlying drivers” when staff asks for funding during the annual capital improvement programming process (Informant 26).
Blueprint Denver did not evaluate, prioritize, or recommend projects for study or funding within the plan itself. Nor does the City have evaluation criteria for capital improvement programming. However, the Department of Community Planning and Development (CPD) used indicators to influence the budgeting process as way to keep the indicators alive (Informant 24). The budgeting process used the:

- vision elements of the comprehensive plan to bucket everything . . . and when . . . the budget goes through CIP . . . the departments are justifying their budget requests on how well they actually are implementing the comprehensive plan (Informant 24).

The draft Denver Moves Everyone plan (underway at time of writing) includes a prioritization tool for DOTI’s capital improvement programming (Informant 24).

**Systems Monitoring**

Denver Moves Pedestrians states it will update some performance measures every two years (Denver, 2019b). Indicator reporting was not required by city council (Informant 26). For Blueprint Denver, CPD committed to systems-level monitoring and has developed an infrastructure to annually update the metrics. The City’s espoused theory of action was that indicator updates would provide feedback for project or program decision-making:

If, after five years, we’ve seen that we’ve had great success with four of the six [indicators] or whatever . . . the intent was like, “okay, what are we not getting done in these other two? . . . Should we just be applying more resources to it? Is there a certain program or project that we need to kick off that would move that needle?” I think it would help us be more strategic about setting our work program going forward. I don’t think it’s influenced it quite yet (Informant 24).
Some Council discussion on the indicators led to further analysis. Reporting to city council generated “a lot of comments on one of the metrics in *Blueprint Denver* on equity,” which resulted in a request that the City measure more equity indicators:

In response, we developed this neighborhood dashboard with this entire interactive GIS map that you can click on an awful lot of different layers on with equity data . . . . One of the comments was like, ‘Great, but this doesn’t go far enough’ . . . and so we've added a lot more to it” (Informant 24).

Because the plan was already adopted, the new indicators are not reflected in *Blueprint Denver*. However, this interest has led the City, in future updates, to “consider how we want to change that metric to better reflect the diversity of what we need to measure” (Informant 24).

As stated in *Blueprint Denver*, “Every year, Community Planning and Development (CPD) will measure outcomes related to the goals, policies, and strategies in the plan . . . CPD will report those findings and share information about progress and overall implementation of the plan” (Denver, 2019a, p. 59). The most recent year is available online via a story map (Blueprint Denver, n.d.). The purpose of reporting was two-fold: “to inform the budget process and to keep those metrics in the community eye” (Informant 24). However, one informant found that the first couple years of these public updates did not generate useful discussion about solutions: It was “a good half-hour of city council just free-associating on their fears and anxieties. It had nothing to do with, like, ‘Are we getting where we're going’” (Informant 25)?
Although some informants felt that indicators offered a way to hold the City accountable to plan goals, “the measurement is done based on backward-looking data that you only collect periodically” (Informant 25). This is:

... not very motivating on a quarter-to-quarter basis, unless you have specific actions that are themselves time-bound ... if we have said we believe these actions are the right ones towards ... [meeting a] goal, we should be holding ourselves accountable for doing those actions. And we really don't (Informant 25).

The exception was the Vision Zero program: “Prior to Blueprint Denver ... Denver committed to the Vision Zero goal with a date and spent a year developing the Vision Zero action plan” (Informant 25). The plan not only listed projects but also identified timelines for their completion, which was appreciated:

They're ... very honest about it ... I actually wish more of our goals had specific actions that were time-bound, that we as a society can look at and say, are we doing the things we said, when we said we'd do them (Informant 25)?

Unexpected Use

Indicators were “being used ... [a] bit more on a site-by-site basis than I expected” (Informant 24). In rezoning cases, particularly in areas identified with affordable housing needs, indicators were used to determine whether it was appropriate to extract more community benefits from developers.

5.3.2.2. Explanatory Factors

Indicator Usability

Finding data sources that were reliable, frequently reported, and at a scale useful to decision-makers were identified problems, particularly for long-term monitoring. Both
Blueprint Denver and Denver Moves Pedestrians relied on existing data sources

(Informants 25, 26), which offered many benefits but also has drawbacks:

There's a real understandable lean towards using data that's going to be available anyway, so the American Community Survey, Census-type data . . . that not only has the credibility, you know, it's also already being collected and can be compared across cities . . . but it's very slow, it's very delayed, it's very infrequent . . . . If there's a course correction needed, will you know it before it's too late (Informant 25)?

An inherent challenge in most systems-level indicators is time lag. This time lag compromises the ability to intervene in a timely fashion but also is an obstacle to assessing success:

[CPD has] been very upfront with this . . . I mean there's only been two years, so [CPD] can’t claim too many victories, right? And in reality, some of the metrics, the data lag . . . can be pretty significant . . . and so some of the data that [CPD] still getting in today, it reflects something that was on the ground before the plan was even adopted (Informant 24).

One informant felt that annual updates to metrics may be too frequent given the time lag. The City’s efforts could be better spent updating the work plan (Informant 25).

In addition to time lag, outcome-based indicators also tend to have attribution challenges, where many factors are influencing the desired outcome. In contrast, output-based indicators offer a greater degree of control:

I can't guarantee that you can . . . affect the mode share . . . [and] there's external forces that will affect the number of fatal and serious injury crashes. So, why don't we compare to some good outputs that you can control, get focused on those and then, you know, hopefully, the outcomes will come over time (Informant 22).

The scale at which the data is collected is also important. While some data tends to be too coarse to be useful for project analysis, data that is too granular can also be
problematic. In *Denver Moves Pedestrians*, Geographic Information Systems (GIS) maps were used to layer socio-economic characteristics to help identify priority areas: “You layer that . . . on top of each other, the result of that . . . was a map of projects that were so granular that it was completely incompatible with how anyone could actually build they improvements” (Informant 22). For example, only certain blocks within a corridor would register as high priority: “In reality, the City's not going to go in and do a capital project to build [a] sidewalk on one parcel” (Informant 22).

Indicator legitimacy was not cited as a concern among informants. The consulting teams and City staff worked closely to develop the indicators and indicators were discussed during advisory committee meetings (Informant 21-22, 24). The community engagement process for *Blueprint Denver* was extensive (Informants 24, 25) as was for *Denver Moves Pedestrians* (Informant 22). However, in the *Denver Moves Pedestrians* public engagement processes certain community members challenged the data presented: “People don’t seem to understand what data means. I’ve had people tell me, ‘Oh, but that’s your data.’ People seem to think that data is something you make up. It’s like gravity—it is exerting a force on you whether you believe it or not” (Informant 26).

While informants did not express concern about the credibility of plan indicators, a validity issue was raised that could also be described as an interpretation problem:

So, if your high-level measurement is the proportion of households that are cost-burdened and therefore at risk of displacement, you want that number to go down. However, displacing people of lower income . . . would also make that number go down. So . . . okay, we agree with the spirit of this measurement. But seeing the direction this measurement [going] . . . in the right direction, doesn’t mean it happened for the right reasons (Informant 25).
The clarity of some of the indicators were another problem for making decisions. In attempt to address questions of equity and equitable development, the City had developed “a synthesis of metrics . . . typically census, ACS [American Community Survey]-type metrics that add up to vulnerability to displacement [and] access to opportunity” (Informant 25) that were difficult to interpret:

It’s these rolled up metrics . . . You're asking yourself, “Okay, this area has a moderately high vulnerability to displacement: Does that mean we should or shouldn't do the thing in front of us?” I don't know, you don't know, nobody knows (Informant 25).

**Organizational Factors**

CPD demonstrated organizational learning by both being curious about what had and had not worked in the previous plan as well as using and adapting indicators over time. While the City had more or less succeeded in meeting the land use goals in the previous Blueprint Denver (Informants 22, 25), there was “a particularly strong feeling that . . . they had not been similarly successful on the transportation side” (Informant 22). At the outset of Blueprint Denver an analysis was undertaken to understand how planning efforts could be more successful (Informants 22, 24):

City staff had learned lessons from previous planning efforts . . . when city staff did a diagnostic on [the previous land use and transportation plan], they found that many of the values and high-level ideas still reflected the community’s vision. However, the strategies were outdated, either because they had been completed or because the city had taken a different approach to addressing the issue (Informant 24).

Consultants set up the initial set of Blueprint Denver indicators, but City staff have adjusted them over time: “It feels like it's always still ongoing because you're
always learning” (Informant 24). This iteration is facilitated by the fact that while the higher-level indicators were formally adopted—and therefore hard to change—the measurement methodology was located in an appendix, which allowed for change over time (Informant 24). The process to adopt Blueprint Denver lasted long enough that the methodologies to calculate the indicators had changed by the time of adoption. As part of the hand-off to CPD, consultants wrote up a methodology detailed enough that staff could replicate it (Informant 24).

The City also had sufficient financial and technical support to develop the Blueprint Denver and Denver Moves Pedestrians. Among my cases, Denver had the third highest budget overall and per capita (see Table 4). CPD had been working with DOTI to secure grant funding to update Blueprint Denver as well as pursue a transit plan, which they did not receive, but realized that by joining “forces [the City] can be more efficient with community outreach and have the plans align from a policy and program and standpoint” (Informant 24). Consultants were hired to assist with the development of Blueprint Denver and Denver Moves Pedestrians. The reason for consultants in Denver Moves Pedestrians was because DOTI did not have the “bandwidth to perform all the functions of this effort” consistent with the “standard practice . . . to outsource planning efforts of this magnitude” (Informant 26).

The City coordinated among several departments, including the DDPHE, to develop Blueprint Denver. Jointly developing plans and indicators across departments helped mitigate against the tendency for City departments to work in silos and
furthermore, helped to streamline communication to the public: “[CPD] want to align [with other departments] as much as possible . . . to measure the same thing different ways across the city departments can be confusing . . . so [CPD] wanted all to be thinking the same way as much as possible” (Informant 24). CPD also realized that shared metrics would generate more organizational cooperation at a policy level: “They would be more likely to help [CPD] update those and keep them relevant on a year-to-year basis and also buy into [CPD] policies” (Informant 24).

The City of Denver has experience developing data-driven management systems. Denver developed program evaluation processes, performance management, and open data systems through its engagement with Bloomberg Philanthropies What Works Cities program; Denver is certified at the silver level (Bloomberg, 2022). Denver was also part of Bloomberg Philanthropies American Cities Climate Challenge (Bloomberg, 2022).

While there was no discussion of active engagement from the executive office during planning efforts, elected leadership supported indicators in principle. Mayor Hancock, now in his third term, is a champion for data-driven management: “The administration here in Denver [is] very, very keen on getting a metric-driven city . . . from a strategic standpoint, [such as] trying to use numbers to budget” (Informant 24). This influenced CPD’s decision to report on Blueprint Denver indicators (Informant 24). Likewise, DOTI intends to be a data-driven department (Informant 26). However, one informant was critical of the reliance on indicators to effect change and instead suggest that the City needed a “culture of action” (Informant 25):
I'm deeply skeptical of anybody who says, you know, run government like a business, but I can see the attraction at times like these. Because you want to believe that there's . . . the hard-driving CEO holding department heads' feet to the fire to achieve the things . . . that story we tell ourselves that may be intermittently true about how business runs . . . yeah . . . it's certainly lacking (Informant 25).

5.3.2.3. Denver Conclusion

The challenges with indicator usability factors were minimal with the existing conditions case and became more important for subsequent cases, especially systems monitoring (see Table 25). In the existing conditions use case for both plans and for the Denver Moves Pedestrians prioritization use case, indicator usability factors were not a major concern. The exception was the scale of data for the Denver Moves Pedestrian prioritization, which might have been a function of methodology rather than the data itself. The existing conditions analysis in both plans highlighted key problems that substantially changed the direction of the plans. In Denver Moves Pedestrians it was sidewalk completeness and geography; for Blueprint Denver, it was equity. In the Blueprint Denver process, one informant emphasized it was not indicators per se that changed beliefs, but the combination of data and story working together: “If you're just talking about access statistics . . . okay, well, let's talk about statistics. When statistics underscore the human experience, that's a different conversation than just looking at graphs and numbers” (Informant 21). The validity of some indicators, particularly when they were composite indicators, was noted as a challenge. Not only were they difficult to communicate, but it was also difficult to interpret them in order to make a policy decision. This difficulty in making decisions based on indicators is a challenge inherent to
indicators, which reside in the problem stream per the MSF—indicators are used to point out problems, not to provide solutions. For those use cases requiring institutionalization, indicator usability factors became more significant. The time lag associated with indicators, especially outcome indicators, was problematic for determining progress over time.

Denver had sufficient funding for both the development of indicators and to monitor the indicators over time. *Blueprint Denver* indicators appear to be used as intended for on-going monitoring and reporting. However, the influence of systems monitoring was limited by lack of a clear use case. Compared to the discrete use case of quantitative evaluation criteria for capital improvement programming, the discussion of indicator performance vis-à-vis annual budgeting was not a tight enough procedural link, particularly when the indicators suffered from time lag issues. See Table 25 for a summary of uses, influences, and explanatory factors.
### Table 25 Denver Uses, Influences, and Explanatory Factors

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Influences</th>
<th>Indicator Usability</th>
<th>Organizational</th>
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</thead>
</table>
| **Existing conditions** | • Drew attention to infrastructure and health disparities  
• Equity-centered prioritization framework | Not observed        | + Financial and technical resources  
+ High collaboration, including health  
+ Elected leadership/culture  
+ CPD culture of learning |
| **Prioritization**   | • Project list in Denver Moves                                              | - Spatial scale     | Not observed  
- Lack of clear use case (Blueprint) |
| CIP                 | • Not observed                                                              | - Spatial scale     | - Lack of clear use case (Blueprint) |
| **Systems monitoring** | Internal analysis  
• Not observed                                                               | - Time lag          | Not observed  
- Outcome attribution  
- Communication, complexity |
| **Reporting**        | • Additional equity analysis  
• Negotiated benefits in rezoning cases                                      | Not observed        | + Elected expectation for indicators  
+ CPD culture of learning  
+ Departmental routines  
+ Well documented methodology |

**Note.** “+” indicates a facilitator and “−” indicates a barrier. “Not observed” signifies that informants did not describe influences, barriers, or facilitators.
5.3.3. City of Indianapolis and Marion County

5.3.3.1. Use Cases

Existing Conditions

Developing a data-driven transparent prioritization process was a key desire for creators of Walkways (Informants 32, 35). The indicators connected to the data sources in the baseline analysis were used as the indicators related to the desired outcomes (Informant 32). Walkways revealed a “massive shortage [of] sidewalks and huge demand for greenways and trails... there's just no way the City will be able to keep up with it” (Informant 36). Planners used Walkways to educate the public about the lack of funding available for projects; the budgeting exercise was one way to help the public understand the trade-off challenges and give them some context for the policy choices they would be faced with later (Informant 35).

As part of the baseline analysis, Walkways described current levels of investment across the system that clearly showed uneven investment throughout the council’s district-based system: “Indianapolis is... a bunch of fiefdoms... classic equity issues, right? Like the... white upper-income places are getting the cherry on top” (Informant 32). In Indy Moves, indicators revealed a previously unidentified problem:

A lot of the shock came from the expense of transportation in the Indianapolis region, because... yeah, housing is cheap here and our wages are super low too, like, but because we lack regional transit... there's a huge gap in regional job accessibility and it makes the combined housing and transportation costs the third highest in the country among our peer metros. And that usually takes people aback (Informant 34).
Project Prioritization

As part of the engagement process, a majority of people preferred a project prioritization process that focused on safety, health, and equity and directed resources to neighborhoods rather than downtown (Indianapolis, 2016, p. 14). Equity was an “important value” in *Walkways* and the City developed a transportation equity index, which was used in the prioritization process (Informant 31). One of *Walkways*’ identified program, policy, and procedure recommendations was to “integrate the Pedestrian Plan’s prioritization process into all selection efforts, particularly for DPW (Department of Public Works) capital and maintenance projects” (Indianapolis, 2016, p. 57).

Many informants felt that the indicators had little impact on transportation decision-making. However, as part of the capital improvement program, the City drew upon the equity findings from the existing conditions analysis and “overlaid the pavement condition index with the median income of capital districts and us[ed] that to help prioritize some of our residential resurfacing programs” (Informant 34).

There was also a shift in the types of projects submitted to the MPO: “The level of support that these two plans [*Walkways* and *Indy Moves*] got for maintenance as opposed to expansion was pretty extreme . . . . After *Indy Moves*, the City was in this moment where they were very willing to cut expansion projects that were planned . . . they came back to the MPO and took out, like, literally dozens of expansion projects to prioritize pedestrian and bike projects” (Informant 36).
Systems Monitoring

The measuring success section of *Walkways* was designed such that “as you build out infrastructure, as you adopt policy, as you . . . design and run programs, you should see an upward or downward trend in these measures” (Informant 32). Indicators served as an accountability measure, as a "signal to the public that . . . [the City] can track these things. And they can connect the dots between performance and where investments are going in” (Informant 32). The public in the engagement process “cared about the higher-level objective but it was almost like a where the rubber hits the road kind of thing . . . these are people that . . . have been pissed off for a long, long time. And so they wanted accountability measures included as part of [Walkways]” (Informant 32).

One area of action resulted from the use of cleaned-up crash data:

[The City] actually started pulling incident reports and looking at, you know, specific stories about . . . what happened [on a street] and they're actually looking to reduce the footprint of that road . . . based on the crash data. So, that's as direct line as . . . I can ever think from performance measures to project selection (Informant 36).

However, the overall sentiment was that the City was not doing a good job of “actually tracking going forward of . . . what matters” (Informant 31). One informant indicated that the City’s monitoring “is maybe a bit of a shortcoming . . . reporting is not great” (Informant 34). Another informant emphasized that the infrastructure was not in place: “Nobody's asking for the data . . . it's nobody's job to collect it each quarter or each month . . . . Again, the system breakdown in the plan looks great . . . [but] there's not a system in place to do what the plan says to do” (Informant 35).
5.3.3.2. **Explanatory Factors**

**Indicator Usability**

The primary concerns about indicator usability were about policy relevance, data availability, spatial scale (especially for health data) and policy-sensitivity (especially for outcome-based measures). Developing indicators was limited by data availability:

“There's . . . only so much to work with . . . it just comes back to some core indicators that to some extent are driven by what we have access to” (Informant 35). While the City had “pretty good data as it relates to income and poverty in the city” (Informant 34), data availability was a problem for bicycle and pedestrian modes, particularly data involving marginalized populations:

It's still really hard to determine where people are walking and biking . . . . A lot of times when we do surveys and or bike counts the most vulnerable populations get missed. Strava data isn't very helpful . . . I was looking at the heat map last week . . . all the lines suddenly disappear . . . I know there's lots of people living there, but surprise, this is like, the lowest income zip code in our entire city, and they're completely left out of the data set (Informant 34).

However, informants did not indicate that data concerns prevented the ability to conduct an existing conditions analysis or project prioritization. Most concerns were related to long-term systems monitoring for internal analysis and reporting. Outcomes-based indicators are difficult to monitor over time, raising questions of their value:

You're not actually going to see change on obesity . . . over one year, three years, or maybe even five years . . . let alone attribute any change to the ped[estrian] plan . . . . It's fine, but . . . what is it really telling us and does it really matter? (Informant 35).
Credibility was not often named as a concern by informants, perhaps because the plans primarily relied on secondary data sets, such as the American Community Survey. However, the reliability and accuracy of crash data was a major problem. The police department “miscoded things all the time and the ability to do [a] deeper analysis was significantly hampered by . . . how they reported crashes” (Informant 32). Improving the credibility of crash data enabled the City to make better decisions:

Finding priority areas . . . was a product of . . . cleaning up the data so that it was reliable. We were showing crash data . . . in, like, the middle of the Pacific, right? It was so, so bad from police departments, but once it was cleaned up, we were able to see like, “Wow . . . there’s a few spots that are a huge problem here where the roads [are] three lanes too wide” and . . .[the City] is talking about addressing those (Informant 36).

The legitimacy of indicators was not a concern. Consultants developed indicators based on the data available and the goals and values that emerged in community engagement (Informants 31-32). Consultants worked closely with the City and key stakeholders to develop the indicators: “They definitely . . . guided that process in terms of how to use data on the front end for the methodology and prioritization and then on the evaluation side as well” (Informant 35).

Organizational Factors

Indianapolis has some organizational structural, leadership, and resource issues that have affected the ability for City departments to use indicators. In Indianapolis’ strong mayor governance structure, project-oriented mayors typically have their own initiatives and operate independently of organizational plans or agendas (Informant 31). Mayors may undertake initiatives that are consistent with the spirit of long-range plans,
although the projects may not be specifically identified within them (Informant 34). One informant recalled only one mayor who worked with the City as an organization and, since then, mayors have not used “the capacity of the enterprise” (Informant 31).

Another organizational factor is the fact that the City does not have a discrete transportation department, relying on the Department of Metropolitan Development (DMD) for planning functions and the Department of Public Works (DPW) for design, operations, and maintenance. One key organizational feature that emerged out of Indy Moves included the creation of a new position, the Administrator for Long Range Transportation (Informants 31, 34), who is charged with implementing the goals, objectives, and project priorities expressed in long range transportation plans.

Indianapolis is under-resourced, particularly relative to cities of a similar size. The Indianapolis overall and per capita budget for 2019 was the second lowest among my case cities (see Table 4). This resource-constraint is well-understood challenge, as noted in Walkways itself:

(C)ity departments are underfunded or understaffed when compared to peer cities—in some cases, Indianapolis lacks positions or entire departments that peer cities rely on to support pedestrian projects and programs. This lack of resources devoted to making Indianapolis walkable is reflected in the city’s public health outcomes, traffic safety gaps, and accessibility challenges (Indianapolis, 2016, p. 39).

Expectations for what could be accomplished with the plan had to be adjusted:

“There were some systemic issues that the project was just not going to solve . . . it was a factor . . . that influenced the direction of the plan” (Informant 32). Even with the
scope of plan adjusted downward to match the capacity of the organization, participants expressed frustration with the City’s ability to make use of the indicators:

We do not have enough staff in our Department of Public Works or our planning department, we just don’t have . . . literally, just the capacity to [manage indicators] from a people power standpoint. I don’t think there’s the technical expertise among current staff to do it. And then there’s not the like, a standard operating procedure—kind of step one, step two, step three, step four (Informant 35).

The *Plan 4 Health* grant enabled *Walkways* leaders to hire consultants to help develop *Walkways*. The City relied on consultants to develop indicators, both in terms of data methodologies for their development and also the prioritization process (Informant 32, 35-36). Despite the fact that consultants had written guidance for follow-up work (Informant 32), City staff still struggled with indicator maintenance and therefore, use. In an attempt to recreate the baseline data that informed the indicators one informant noted “the city's computers couldn't run the program because they were so old . . . . I think it got fixed, but does anybody actually know how to run the program now? Does anybody run the program” (Informant 35)?

This resource constraint created a work environment where “every day there are hundreds of things on fire, and everybody is dealing with putting out fires, lots of fires, every day from the moment they clock into the moment they clock out . . . . It's nobody's job, nobody's responsibility to step back and say like, ‘How do we keep the fires from starting’” (Informant 35)? The inability to make use of indicators, or more generally address pressing transportation issues, was a concern for City staff, who could not dedicate time to problem-solving: “The engineers . . . know the problem, they see the
problem, they feel helpless almost, and like, it got kind of emotional for them” (Informant 32).

Informants emphasized the high degree of coordination between departments, granting that there was room for improvement (Informants 31, 34): “If Indianapolis does anything well, it’s that we work together” (Informant 31). In fact, one participant suggested that being capacity-constrained translated into an interdepartmental need to leverage the other, with engineering and planning more “in sync” than in most cities (Informant 32). However, “the police might be the exception . . . it takes an act of God to get a traffic ticket in Indianapolis . . . traffic enforcement is just not a priority at all” (Informant 31). In contrast to the concern displayed by engineering staff, one informant met with the police department about traffic safety and left “thinking like, ‘Wow, these people don’t care’” (Informant 32).

Collaboration took the form of day-to-day interaction among staff but also policy coordination among documents. Indy Moves, for example, absorbed elements of other plans, such as the greenway plan or the land use plan that had some “active living hooks” (Informant 31). Planning staff were attempting to consolidate plans so they “talk to each other” and “reinforce” each other (Informant 31). One informant credited a complete streets policy for building relationships: It “brought together . . . the key planners and engineers and transportation enthusiasts . . . a few times a year to talk” (Informant 31). Despite the high degree of collaboration among City agencies (Informants 31-35), the City struggled to organize itself to make strategic decisions. For
example, the city’s Department of Business and Neighborhood Services collects fees associated with permits, but they are not spent in a “data-driven or logical way” and never leveraged utility work, such as fiber optic upgrades, as a way to improve the streetscape (Informant 32). Collaboration may be necessary but insufficient condition for using the indicators to inform decision-making: “There's a commitment to the partnership . . . . Relationally it's all generally very good. That does not translate into the change we need” (Informant 35).

Like the other case cities, Indianapolis participated in the Bloomberg Philanthropies What Works Cities program; Indianapolis worked on performance management and contract management (Bloomberg, 2022). However, unlike the other cities, Indianapolis is not a certified What Works City (Bloomberg, 2022). The City has engaged with other smart city efforts, such as a smart cities program with Transportation for America in 2018 and as part of Bloomberg Philanthropies American Cities Climate Challenge, which supported their transit-oriented development policy (Informant 31).

By most accounts, City staff were open to the use of indicators in decision-making: “I think that there's a lot of support for it at almost every level. We’re really trying to shift gears into a series of agencies that are a lot more data-driven” (Informant 34). However, it appears that staff might not be fully supported to develop the institutional infrastructure necessary to make use of data:

The day-to-day staff wants [data-driven planning]. I don't think they're largely empowered to do it on their own though . . . . Not everybody wants—particularly politically appointed people—not everybody wants this level of transparency (Informant 35).
Implementing those structures and systems “is all about leadership’s commitment to doing it” (Informant 35). In order for the indicators to be useful, there needs to be demand for them: “At the end of the day like, there's . . . no process in place, nobody's . . . asking for [the indicators]. So we can come up with all of this at any given time, but for what” (Informant 35)?

**5.3.3.3. Indianapolis Conclusion**

Although informants expressed concerns with indicator usability, particularly the reliability and accuracy of crash data, organizational factors were the largest barriers to institutionalization: “I don't think it's because the data isn't usable or available. It's because of the systems. We do not have the systems in place to use the data in the way they're intended to be used” (Informant 35). Indicator usability was not a problem for the existing conditions analysis or for project prioritization because the city had plan-related financial and technical resources available to conduct complex analyses and prioritize projects within the plans. However, all use cases post-plan completion required the institutionalization of indicators. The City had not undertaken the necessary steps to integrate indicators into routines, with the exception of using indicators for residential resurfacing prioritization. The key organizational factors included: Mayors do not typically engage with City departments to deliver projects (i.e., use indicators or data-driven project lists to champion projects) or demand updates on indicator progress; departmental leadership had not developed the internal infrastructure necessary to make use of the indicators; and political and/or departmental leadership had not
secured additional funding to build the necessary data infrastructure. The lack of a fully staffed transportation department severely impacted the City’s ability to make use of indicators. One consequence of separating transportation planning and engineering functions is that implementation decisions were disconnected from planning goals and core values. Planners attempted to influence engineering decisions, although the decisions were outside of their authority: “Of the money you . . . are going to spend, here's the most impactful ways you can spend it based on these core values, which are defined by these sets of data” (Informant 31). See Table 26 for a summary of indicator uses, influences, and explanatory factors.
Table 26 Indianapolis Uses, Influences, and Explanatory Factors

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Influences</th>
<th>Indicator Usability</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing conditions</td>
<td>• Drew attention to affordability, equity, and safety</td>
<td>Not observed</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Equity-centered prioritization framework)</td>
<td></td>
<td>+ High collaboration, including health</td>
</tr>
<tr>
<td></td>
<td>• Equity-centered prioritization framework)</td>
<td></td>
<td>+ Staff leadership</td>
</tr>
<tr>
<td></td>
<td>• Equity-centered prioritization framework)</td>
<td></td>
<td>+ Nonprofit leadership</td>
</tr>
<tr>
<td>Prioritization</td>
<td>• Project lists</td>
<td>Not observed</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Projects submitted to MPO</td>
<td></td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Equity-focused residential resurfacing</td>
<td>Not observed</td>
<td>+ Departmental structure (new position)</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>• Safety improvement</td>
<td>+/- Reliability, accuracy (crash data)</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Safety improvement</td>
<td>- Measurability</td>
<td>- Elected leadership/culture</td>
</tr>
<tr>
<td></td>
<td>• Safety improvement</td>
<td>- Outcome attribution</td>
<td>- Departmental routines</td>
</tr>
<tr>
<td></td>
<td>• Safety improvement</td>
<td>- Time lag</td>
<td>- Plans adopted at Metropolitan Development Commission level</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>• Safety improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>• Safety improvement</td>
<td></td>
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<td>Systems monitoring</td>
<td>• Safety improvement</td>
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<tr>
<td>Systems monitoring</td>
<td>• Safety improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reporting</td>
<td>• Not observed</td>
<td>Not observed</td>
<td></td>
</tr>
</tbody>
</table>
5.3.4. City of Memphis

5.3.4.1. Use Cases

Existing Conditions

During Phase One engagement efforts, participants shared Memphis’ strengths, weaknesses, and opportunities. Based on this feedback, the Office of Comprehensive Planning (OCP) undertook an inventory of existing conditions. Key issues that emerged from the existing conditions analysis included blight, vacancy, and access to employment conditions. In response, City staff produced employment accessibility analysis, showing how many jobs could be reached within a certain radius. Limited transportation options and poor transit service were also raised as key issues, which relates strongly to access to employment (Memphis, 2021, p. 34). Ten years ago, transit wasn’t “even on the radar” . . . “but now is an actual issue” (Informant 45). These joint concerns eventually led to the creation of a new transit component of Memphis 3.0, which had not originally been on the Memphis 3.0 agenda. The “transit component of the plan was almost exclusively about how can we connect people to jobs better . . . . It’s how they visualized everything” (Informant 46). The transit plan brought a diverse coalition together to advocate for transit improvements, including the chamber of commerce, because of the concerns around access to employment (Informant 44).

Growth Scenarios

Memphis was the only case city to undertake scenario planning as part of its process. The City framed three growth scenarios: existing growth trends, growth along
the core and major corridors, and growth around neighborhood centers. Participants rejected the option for following existing growth trends and were split between the latter two options (Memphis, 2021, p. 35). At the point in the engagement process when the City had just completed the vision and were beginning to establish goals and priorities, they received the commissioned market analysis report. It revealed how most of the commercial activity was “based around a key commercial corridor, highlighting the pattern of disinvestment in the city to the north and south of that corridor” (Informant 41). As a result, rather than pursuing the core and corridor scenario, the City adopted a neighborhood centers approach to improve equity outcomes (Informant 41).

**Project Prioritization**

*Memphis 3.0* did not contain a list of transportation projects in the plan. However, priority actions were listed for each district. Rather than named projects, these actions were more conceptual, such as creating an attractive gateway or conducting a walkability study. These actions were organized according to the degree of public intervention required (as compared to following market trends): nurture, accelerate, or sustain (Memphis, 2021).

**Systems Monitoring**

Systems monitoring includes internal tracking and analysis as well as public reporting. The Office of Performance Management (OPM) manages the data for the indicators and updates them to the performance dashboard (Informant 41). The OPC has been attempting to track progress against the indicators. The “division is having a hard
tracking and measuring because . . . the outcomes and indicators . . . are not linked directly to actions” (Informant 41). Furthermore, staff noticed that they weren’t “visiting [the indicators] often” (Informant 41). The OPC staff has recognized the indicators need to be updated because “a lot of those indicators really don’t make sense for what [the OPC] is doing” (Informant 41). The OPC was discussing a need to “create a system” to source better data for the indicators or “change some of our measurements” if that indicator is not serving their needs (Informant 41). Every quarter, the OCP asks each Division to review their associated actions and determine if Memphis 3.0 actions were completed, in progress, or had not been started (Informant 41).

5.3.4.2. **Explanatory Factors**

**Indicator Usability**

The City undertook primary data collection through surveys through the district planning process (Informant 46). During the planning process, planning participants did not express concern with the use of secondary data, although one informant acknowledged American Community Survey data was “not the most useful thing” for active transportation indicators (Informant 46). Determining appropriate units of geography generated minor debate. Because the City had not undertaken a planning effort in decades, they were “out of practice when it came to planning—that’s an understatement” (Informant 46). The City had lost touch with neighborhood-oriented groups and their changed understanding of neighborhood boundaries. Creating
indicators that reflected the diversity of the planning districts was somewhat challenging (Informant 46).

After approval of Memphis 3.0 by City Council, the OPM was brought in to help determine which data would best suit the indicators. Some indicators seemed “pretty straightforward” and others were not (Informant 43). The OPM “steered [the OPC] . . . away from the Census data, just because [the OPC] wanted to drill down into the planning districts themselves, which make up a bunch of census tracts” (Informant 43). Instead, the City “brainstormed more . . . granular-level proxy measures” and looked for “local data sources” (Informant 43). Attribution issues were also a concern because the City would not “see the impact of . . . small government program on the Census numbers” (Informant 43). Data for transportation indicators was “sorely lacking,” so the City often relied on national data sets, such as Walk Score (Informant 43).

Credibility was something that indicator developers considered in developing the indicators. City staff asked themselves “what data source accurately conveys the indicator or measurement” (Informant 41). When prompted about the credibility of indicators, one informant could only mention one of concern, which had generated discussion about its use for decision-making: “Is that even worth using? Like, is that an accurate measure?” (Informant 41). Conversations between the producers and users of the indicators suggest that creating credible indicators was a key aim.

Legitimacy of the indicators were not specifically challenged. The City made extensive use of community partners for engagement: “with 44 citywide and
neighborhood organizations and enlisted over 60 Memphis 3.0 Ambassadors who volunteered to assist in event coordination and recruitment during the Comprehensive Plan” (Memphis 3.0, 2019, p. 33). Many of the indicator concepts “came directly from discussions . . . with community members,” with further development by stakeholders and working groups (Informant 41). As the OPM and the OCP worked to identify appropriate data sources to match the indicators, their challenge was to develop indicators that “honor what people are saying” and then build a “system” to measure them (Informant 41). *Memphis 3.0* included recommendations for the “transparency and accessibility of the data itself,” (Informant 46), primarily through improved access and timing of City communications (Memphis, 2019, p. 241).

However, city council questioned the legitimacy of the plan as a matter of process and delayed adopting the *Memphis 3.0*. The position taken by the city council was: “Well, they only talked to 15,000 out of 650,000” people (Informant 46). However, “on the planner side, we’re like, ‘That’s amazing that we got 15,000 people [in] 18 months’” (Informant 46). Informants described the debate as “performative” (Informant 46) and as political maneuvering by council, who were acting in opposition to the mayor, who had championed the plan (Informant 41).

**Organizational Factors**

The City is generally resource-constrained and “relies heavily on partnerships in the nonprofit sector,” (Informant 46). Memphis’ 2019 budget, overall and per capita, was the lowest among my cases. The City has been able to garner funding from philanthropy
for city planning and management efforts. During the previous mayoral administration, Memphis had been chosen as one of five cities to have “Innovation Teams to work with local city government . . . addressing various civic issues and bring about sustainable change” (Informant 44). Memphis is also a gold-certified What Works City (Informant 43).

Even though indicators had been used within the City of Memphis prior to the current mayor, it was a key part of the current mayor’s platform (Informants 42, 43): “Maybe not invented, [that’s] a strong word [but] . . . emphasize, prioritize, reinvented even” (Informant 42). When the current mayor was elected to office in 2016, he brought in a “C-suite” (Informant 45), modeling the executive office after a corporate structure. The OPM is located in the executive office. The OPM’s performance dashboard is used in monthly meetings when the mayor “meets with city leadership to review recent performance, recognize goals that have been achieved, and identify any roadblocks to success” (Memphis, 2023b). This “Mayor’s dashboard review” has occurred monthly for at least the past five years. These meetings were not used to discipline department leaders, “instead it was more, ‘We’ve seen this issue over and over and over again . . . What can we do to fix it? What do you all need’ (Informant 43)? Because people “knew they weren’t going to get in trouble,” it encouraged them to “ask more questions” (Informant 43). In fact, a “friendly competition” emerged between some divisions, which prompted division leadership to ask the OPM to “dig into the data more.” Leadership
made changes based on that information, reported the changes at the next monthly meeting and “then other divisions were like, ‘Oh, cool, I want that too” (Informant 43).

It has taken the OPM several years to build out the data infrastructure to a point where it is useful for decision-making. The OPM’s performance dashboard has been “modified, . . . expanded, revamped, several times . . . [OPM has] . . . worked with . . . divisions to . . . get their data up to snuff and build out their metrics” (Informant 43). A catalogue of data sets first became publicly available in 2018 and have since been slowly adopted into institutional routines, beginning first with the division staff that approached the OPM to collaborate. Even now, some City staff may still not realize that the City has a data hub (Informant 43). Because Memphis 3.0 related indicators are posted to the performance dashboard, staff from the OPC does not interact much with staff at the OPM (Informant 41).

Developing a new comprehensive plan for Memphis was an early idea of the OPM (Informant 41). The City received a grant from the Kresge Foundation, among other (primarily local) philanthropies, to fund the comprehensive plan (Informant 41). This included funding for the creation of the OCP (Informant 41), as the planning functions of the City previously had been underfunded (Informant 45). The City’s Information Technology Division had Geographic Information Systems (GIS) analysts that were available to help with developing indicators; the OPM has also recently hired staff with GIS experience (Informant 43). The work of the OPM is supported by a contract with a
company to help with the data hub, so there is no limit on the number of indicators the City can develop (Informant 43).

One informant felt that City staff initially resisted indicators because they did not want to “lose power” or “lose control over the work” (Informant 47). At the time of Memphis 3.0’s adoption, “there was a lot of . . . pushback from the City to adopt this plan, because of what it would actually mean and how . . . [the City] would be held accountable” (Informant 47). Another informant cited novelty as the source of the institutional resistance to indicators: “Advanced data use . . . it's kind of a foreign concept in . . . city government” (Informant 43). The OCP leadership supported indicators and staff was not hesitant to use the performance dashboard, but they struggled to figure out exactly how to use quarterly or annual indicators: “like, ‘What's the audience for that? Where does that fit? How [does the City] use that’” (Informant 43)?

5.3.4.3. **Memphis Conclusion**

Indicators were used for the existing conditions analysis, for growth scenarios, and systems monitoring (see Table 27). They were not as influential in the existing conditions analysis, primarily because it was community feedback that provided new information about community needs. Memphis is also unique among the cases because it did not fully develop the indicator metrics until after the adoption of Memphis 3.0, although the plan’s growth scenarios indicators provided a conceptual foundation. A downside of developing the indicators separately from the plan is that plan actions are
not clearly connected to the indicators (Informant 41). Indicator progress reporting, via the performance dashboard, was the responsibility of the OPM. The OCP also reported to the mayor, but the focus was on projects completed (Informant 41).

In terms of indicator usability, the City primarily struggled with data availability at a useful spatial scale. In some cases, this prevented indicator use in decision-making. However, rather than indicator usability factors, the factors that limit influence of the indicators over the long-term were organizational. OPC staff found it difficult to connect actions to the indicators as part of their work. There are two reasons for this: one is that an indicator “gives you an indication of the current state . . . What you do with [it] is another question” (Informant 42). That is, indicators are part of the problem stream, not the policy stream. A related issue is that the internal analysis use case was not clear. The City did not establish criteria for capital improvement programming or develop organizational processes for internal monitoring. Finally, because the OPM reports on indicator status to the mayor, it relieves the OPC from directly monitoring the indicators. Indicator accountability mechanisms for the indicators were clear for the OPM, but not the OPC staff who are working on Memphis 3.0 activities. However, the OPC was accountable to the mayor for reporting via project progress reporting. See Table 27 for a summary of indicator influences, barriers, and facilitators.

Indicator institutionalization differed between the OPM and OPC. The OPC staff were in the middle of a double loop learning process in which they were reflecting on how to better integrate indicators into decision-making and were project-focused in the
meantime. Indicators were embedded into the work of the OPM to the point where OPM staff were addressing more advanced data and indicator management issues. For example, the OPM was examining the attribution issues associated with indicators through project-level evaluation: The “next step . . . with the data program as a whole is expanding . . . into . . . evaluations to figure out what's working, what's not, and where we can make those changes” (Informant 43). They also suggested moving away from output measures that “just show . . . how fast we did things or how slow we did things” (Informant 43).
### Table 27 Memphis Uses, Influences, and Explanatory Factors

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Influences</th>
<th>Indicator Usability</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing conditions</strong></td>
<td>• Drew attention to transit and employment access (limited)</td>
<td>Not observed</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Elected expectation for indicators</td>
</tr>
<tr>
<td><strong>Growth scenarios</strong></td>
<td>• Market and equity data informed plan</td>
<td>Not observed</td>
<td>Not observed</td>
</tr>
<tr>
<td><strong>Prioritization</strong></td>
<td>Within plan</td>
<td>Not observed</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Not observed</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td><strong>CIP</strong></td>
<td>• Not observed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Systems monitoring</strong></td>
<td>Internal analysis</td>
<td>• Not observed</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td>• Process improvements (other departments)</td>
<td>- Availability</td>
<td>+ Elected expectation for indicators</td>
</tr>
<tr>
<td></td>
<td>• Not observed</td>
<td></td>
<td>+ Required reporting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental culture/ culture of learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+/- Departmental routines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Indicators developed separately from plan process</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Lack of clear internal use case (OCP)</td>
</tr>
</tbody>
</table>

*Note.* “+” indicates a facilitator and “−” indicates a barrier. “Not observed” signifies that informants did not describe influences, barriers, or facilitators.
5.3.5. City of Seattle

5.3.5.1. Use Cases

Existing Conditions

Within the Seattle plans studied, indicators did not appear to draw attention to new issues. The existing conditions in the *City of Seattle Bicycle Master Plan (BMP)* were the starting point for indicators, which were then carried through to prioritization (Informant 55). Only one informant found the analysis results novel; otherwise, informants did not indicate that indicators revealed new or underappreciated conditions. New aspects of both plans included an increased focus on equity, expressed sometimes as health equity, which was informed less by indicators and more from a general shift in public conversation. Data and indicators could be helpful in these conversations, even if they did not initially provoke the shift in focus: “there's a lot of assumptions about who lives where in the city of Seattle, which isn't always true, and so having that data is a really good tool for facilitating those conversations” (Informant 52).

Project Prioritization

The *City of Seattle Pedestrian Master Plan (PMP)* and *BMP* have associated implementation plans and progress reports which are updated annually (see below). How projects are scored and placed into priority tiers for funding are described in detail within the implementation plans, demonstrating that indicators are used to prioritize projects. A list of projects to be implemented is also included (Seattle, 2021a, 2021b).
The prioritization process is intended to select projects that will make progress on plan outcomes and if the outcomes are not being achieved, “that's a signal . . . to step back and evaluate the plans’ effectiveness overall” (Informant 53). In both plans, the prioritized projects undergo review by the City’s standing advisory committees. Some criteria work against each other and require adjudication. For example, in the BMP, prioritizing improved connectivity can come at the expense of equity because underserved areas may have poorly connected networks (Informant 52). The final project list is justified in a “narrative that will go along with [the project list] as [the City] reports on successes . . . . [The City] is very thoughtful about what projects [the City] implements. It’s not, ‘oh, it’s ranked number one, so let’s go’” (Informant 52).

**Systems Monitoring**

The Seattle Department of Transportation (SDOT) has changed course based on feedback from the on-going monitoring of indicators. The 2017 PMP reported that 79% of “SDOT-built pedestrian projects have been directed to [the 2009] PMP high priority areas” (Seattle, 2017a, p. 34). However, only 2% of the top-tier roadway projects and 4% of top-tier roadway crossing projects were constructed between 2009 and 2015. As a result, the 2017 plan focuses more narrowly on priorities and better aligns with funding opportunities, accomplished in part through the creation of a Priority Investment Network (Seattle, 2017a, p. 34, 47).

Public reporting, including reporting to City Council, were required as part of the PMP and BMP. City Council Resolution 31743 required an annual implementation plan
and progress reports for the pedestrian program (Seattle, 2017b). The resolution required implementation plans to have “a prioritized list of SDOT’s pedestrian capital investments, a cost and funding summary, a summary of pedestrian-related initiatives, and cost-sharing opportunities with utilities and private investment” (SDOT, 2021b, p. 6).

Similarly, City Council resolution 31515 required annual updates on the BMP implementation plan and a progress report to City Council (SDOT, 2021a). SDOT also reports every six months to the Seattle Bicycle Advisory Board (SBAB) and City Council (SDOT, 2021a).

The SBAB and the Cascade Bicycle Club, a nonprofit organization, monitored progress regarding how many miles of greenways or protected bicycle lanes had been completed (Informant 51). Some saw reporting as a “big change” (Informant 51) that sometimes garnered attention by City Council: “there were certain council members who would hold a staff’s feet to the fire and say that ‘you missed the April 1 deadline’” (Informant 51). Within the SBAB, the annual updates to the plan could be “contentious because not everything gets done the way that it should . . . but . . . it’s an important opportunity for . . . readjusting, redirecting . . . . You really can’t predict how things are going to be ten years down the road (Informant 54). Public attention tended to be directed toward project completion and less toward the indicators: “when [SDOT] actually report[s] on [the] metrics . . . for the most part, outside of collisions and . . . ridership numbers, people are not paying that much attention” (Informant 52).
5.3.5.2. **Explanatory Factors**

**Indicator Usability**

Indicator usability issues that arose during the BMP plan process had to do with availability and the spatial scale of data, although these were not major concerns. Based on the new focus on “all ages and abilities,” the SBAB wanted the City to conduct surveys about perceived safety, which the City felt they could not commit to on a regular basis owing to unpredictable funding (Informant 57). The City found that data at the scale of census tract was not that useful evaluating where facilities need to be constructed, particularly with a fairly built-out bicycle network (Informant 52). Due to an increased interest in the relationship between the built environment, health, and equity, the BMP team sought new data to develop measures that captured these connections. Spatial scale was the greatest barrier because of data availability and privacy requirements; in the end, the team manually coded King County health data (Informant 55). Staff resisted using direct health outcomes for systems monitoring indicators because it is difficult to attribute change to a bicycle facility (Informant 57).

In general, global and local changes in data systems provided the City with better data in the 2014 BMP: “There was a huge change in . . . data availability and how data was collected and stored” (Informant 55) between 2007 and 2012, which is when the 2014 BMP planning process began. In addition, “SDOT started a count program . . . They had much more robust bicycle counts . . . . Safety data and reporting had undergone a revolution at that time as well” (Informant 55). SDOT is satisfied with the plan’s final
indicators: “everyone feels like the indicators that [the BMP has] are doing pretty well . . . There’s no momentum to really change . . . those indicators at this time” (Informant 52).

The primary concern with indicators in the 2017 PMP was that the previous plan had too many: “The principal conversation around measures [was] really trying to pare them down to the most fundamental and basic measures” (Informant 53). The previous plan had measures that were redundant and difficult to measure, “so [the City] really tried to pare these down to a list of measures . . . [the City] could actually track and monitor;” this reduction was not a concern to anyone involved (Informant 53).

The value of a clear, compelling metric was raised by one informant, who noted its ability to resonate with the voting public. The Transit Master Plan¹ had developed an “access to transit” indicator, which was a “very simple measure for people to understand . . . access to 10-minute frequency transit service” (Informant 56). “A voter-approved initiative drove [the City of Seattle’s] purchase of . . . service hours” from King County, who manages the transit system (Informant 56). The measure was able to “stave off doomsday scenarios of potential cuts in transit service” and instead nearly achieved the transit service goal “5 or 6 years ahead of schedule while continuing to use the transit access measure as a key reporting metric” (Informant 56).

¹ I did not review the Transit Master Plan as part of this research.
Setting and meeting meaningful targets was also raised as an issue. For example, one of the BMP’s targets is to quadruple bicycle ridership. In the context of thousands of people moving to Seattle, the City’s goals are to increase transit frequency and bicycle ridership rather than expand roadway capacity (Informant 57). However, the ridership numbers have not “come along” with the level of investment in bicycle facilities (Informant 52). Targets are both aspirational and ambitious, although City staff are expected to deliver on targets as though they are “real” (Informant 52). “I understand the importance of setting those targets and they're challenging for me on a day to day level” because it encourages investments that “don’t always make sense with [SDOT’s] other priorities” (Informant 52).

The inflexibility of output indicators and whether they were useful for meeting plan goals was also discussed. The movement within SDOT was toward adopting outcome-based measures “rather than kind of widget counting measures . . . . Because . . . the measures really needed to tie very closely . . . to the goals of the plan themselves” (Informant 53). This was a departure from the past, where SDOT . . . [was] more concerned with counting the things that [SDOT was] doing [rather] than saying . . . ‘here's the measure that we're trying to achieve and how are we doing on that?’” (Informant 56). There is no “guiding principle” built into an output indicator and target; for example, how does the City decide which 10 miles of bicycle lanes to build within 10 years (Informant 56)? Instead, outcome-based measures require staff to reflect whether “are we, in the big picture, getting to where we want to be” (Informant 56)?
SDOT encouraged outcomes-based measures in conversation with the Levy to Move Seattle oversight committee, although it has adopted primarily output-based measures in the end: “A voter-approval accountability structure is very focused on: ‘Are you doing the things you promised, which are about outputs, not outcomes. Not, ‘Are you doing the most important things’” (Informant 56)? The lack of staff discretion made it difficult to negotiate decisions that would better meet plan outcomes:

[Staff] were very reluctant and/or stressed to . . . deviate from what they had programmed, because if they did, they may not hit their deliverable goals that were output focused. And so it became really hard to . . . align those things . . . with the rest of the program that was not levy-funded, because the levy was such a big, dominant thing in what the city was delivering (Informant 56).

Organizational Factors

The idea of data-driven planning and management is embedded within the culture of SDOT. A city-wide culture of data-driven planning may have been nurtured through other City data-driven management experiences, such as participation in Bloomberg Philanthropies What Works Cities program; Seattle is certified at the gold level (Bloomberg, 2022). The statewide commute trip reduction ordinance may have also helped familiarize the City with outcomes-based planning. The transportation demand program, Commute Seattle, has been working since 1991 to reduce single occupancy vehicles trips to downtown, using biennial surveys to inform their strategies (Informant 56).

Because the 2007 BMP included indicators, SDOT has had years to institutionalize indicators into internal routines. The 2014 BMP included an assessment of the progress
made on the 2007 plan and found that SDOT had not collected data on several metrics (Informant 55). However, the indicators were emphasized in the 2014 BMP:

[It] was [the] first of its kind at the time. Their scope was very the first . . . [where] they stated the words “data-driven process.” They wanted everything to be completed through a data-driven process. By the end of that we were very tired of the words “data-driven process” (Informant 55).

Another informant discussed the agency expectations of including indicators for the PMP: “I would have been called out internally for having an incomplete plan if I didn't have performance measures to report on” (Informant 53). No informants described organizational resistance for indicator use. One credited the “prevalence and influence of Vision Zero,” which embraces data-driven decision-making, as well as safe routes to school, for increasing the familiarity of indicators (Informant 53).

SDOT is also well-resourced. The transportation budget and the citywide budget overall and per capita were the highest among my cases (see Table 4). After the 2007 plan, SDOT had invested in its bicycle and pedestrian count program (Informants 52, 55). SDOT also has sufficient technical staff internally, such as geographic information systems (GIS) specialists, that update indicators (Informant 52). Furthermore, SDOT benefits from the voter-approved ballot initiative, a property tax measure called the Levy to Move Seattle. This was the second levy voters had imposed upon themselves. The substantial funding, $930,000,000, also enabled the City to “leverage outside grant opportunities” (Informant 56). As this levy sunsets in 2024, SDOT is preparing a new citywide transportation plan which will ideally launch a new funding strategy (Informant 52).
The Levy to Move Seattle is structured such that programs, not projects, are funded. As a result, “there's less capital project competition between programs with that structure,” which helps pedestrian, bicycle, and transit projects get implemented (Informant 53). A complete streets policy bridges multiple programs, so the bicycle program will sometimes pay for pedestrian improvements along with a bicycle facility investment and vice versa (Informants 53, 57). At least within these active transportation programs, there appears a high level of coordination and alignment, particularly on the issue of safety (Informant 57). However, another indicated that the silos between departmental sections created some barriers to implementation (Informant 55).

Several organizational factors enable the prioritized projects (from indicator use) to move forward into implementation. One is that indicators help SDOT to “point back to why we’ve made decisions, why certain projects have risen to the top . . . . It makes a lot of our work a lot more defendable, especially when they become controversial as bike projects like to become” (Informant 52). Another organizational factor that affects the influence of indicators is the structure of the local political system, which lends itself to implementation of output-related measures but not for outcome-related measures:

A strong mayor system is helpful in getting some of those output measures achieved . . . a strong mayor system has some downsides in terms of generational type of projects or things that take a long time and . . . [requires] a lot of mental engagement and political engagement from somebody that's running a large city . . . . A four-year cycle of delivery makes it challenging to do some really big things (Informant 56).

In addition, the levy helps to deliver projects because of its nine-year time frame: “Now this is . . . the third mayor since the levy was adopted—in some ways [project
delivery is] sort of insulated from the day-to-day of politics, because you've got to deliver on the levy” (Informant 56).

5.3.5.3. **Seattle Conclusion**

Seattle is the case city with the longest use of indicators, which has given SDOT time to institutionalize the use of indicators. There is evidence that SDOT learned and changed its routines to better manage data over time. As an organization, SDOT may have also benefited from the growing visibility of the Vision Zero data-driven approach, such that departmental staff is accustomed to working with indicators as management expected. Critically, SDOT also has the resources to invest in data collection (i.e. pedestrian and bicycle counts), retain technical staff, and fund projects.

Indicators were used in the plan-making process as part of baseline conditions and developing plan project lists. Detailed descriptions of the prioritization methodologies are included in the *PMP* and *BMP*, which clearly inform project lists. Informants were thoughtful about the prioritization process, and recognized the limit to data-driven decisions: “the data and the policy, how do all of these things interact? . . . How do we use this data to further our own purposes and not be beholden to it? . . . How do we make the data work for us” (Informant 55)?

SDOT also used indicators as part of systems monitoring activities, which were focused on accountability. SDOT’s data-driven culture was established prior to Council direction, although the Council resolutions underscored the need to monitor and update indicators. In addition, the levy created pressure to report and deliver on projects.
However, the levy was primarily oriented to outputs, which created some tension around meeting plan goals. SDOT has been moving from output-based indicators that can inhibit staff from addressing the most “important” things (Informant 56) and toward outcome measures that “help tell us if we are moving closer to our stated goals or not” (Informant 53). While SDOT struggled with the inflexibility of output measures, the general public and nonprofit organizations tended to focus on outputs or project lists rather than outcome measures. However, one instance of an outcome measure demonstrated the power of a resonant goal—access to 10-minute frequency transit—in capturing the attention of the voting public.

Seattle is the only case where informants did not describe an extensive level of community engagement in developing the PMP and BMP. Rather than creating ad hoc plan advisory committees, SDOT relied on existing standing advisory boards to guide the development of the plan and assist with project prioritization. Unlike other case plans that were new (i.e., the city’s first pedestrian plan, the city’s first comprehensive plan since 1981) or otherwise considered innovative by informants, SDOT updated existing plans. Given SDOT’s level of experience and comfort with these modal plans and indicators, it may be that extensive community engagement did not feel warranted—which may also signal a higher level of acceptance and/or institutionalization of modal planning. See Table 28 for a summary of uses, influences, and explanatory factors.
Table 28 Seattle Uses, Influences, and Explanatory Factors

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Influences</th>
<th>Indicator Usability</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing conditions</strong></td>
<td>• Reinforced equity conversations</td>
<td>+ Better data for BMP compared to 2007</td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Availability</td>
<td>+ Elected leadership/culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Spatial scale (health data)</td>
<td>+ Departmental culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental routines</td>
</tr>
<tr>
<td><strong>Prioritization</strong></td>
<td>Within plan</td>
<td>• Project lists</td>
<td>Not observed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental routines</td>
</tr>
<tr>
<td><strong>CIP</strong></td>
<td>• Project lists clearly justified</td>
<td>Not observed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Systems monitoring</strong></td>
<td>Internal analysis</td>
<td>• Not observed</td>
<td>- Meeting (aspirational) targets</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Tension between outputs and outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Financial and technical resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Elected leadership/culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Required reporting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental culture/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>+ Departmental routines</td>
</tr>
<tr>
<td><strong>Reporting</strong></td>
<td>• Council pressure to make progress, although a stronger focus on projects</td>
<td>Not observed</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* “+” indicates a facilitator and “−” indicates a barrier. “Not observed” signifies that informants did not describe influences, barriers, or facilitators.
5.4. Discussion

In this chapter, I described how indicators were used in transportation plans, their influence, and whether they were institutionalized into agency routines. Below is a synthesis of findings across all cases. After this synthesis, I address the dissertation propositions and rival propositions. Finally, I share other notable findings that I observed outside my research questions and propositions.

5.4.1. Use, Influence, and Institutionalization

For the most part, indicators were used in the sense that they were discussed, calculated, or reported as part of transportation planning processes. Indicators were used as intended within the existing conditions and prioritization use cases especially. Denver had an unexpected use with site-level planning decisions. The systems monitoring use cases had less consistent use over time. In particular, Boston and Indianapolis city staff were not updating the systems monitoring indicators due to financial and/or technical capacity. Having sufficient funding to use indicators was a key difference between the use cases that were fully funded (i.e., existing conditions, plan prioritization) and those that were not (i.e., capital improvement programming and systems monitoring). One of the most telling ways to determine if indicators were being used is if they had been updated. Indianapolis was the only case that had not revisited the indicators adopted in their plans. The iteration of indicators is not as much a critique of the quality of the original indicators as it is a sign that the indicators are being actively used.
Influence, as defined by administrative decision-making, depended on the degree to which the indicators were embedded into organizational processes. Seattle illustrated how clearly defined organizational routines and leadership expectations for indicator use enabled indicators to influence administrative decisions. Other cases illustrated the difficulty of integrating indicators into agency routines. For example, while Boston had prioritization indicators in Go Boston, it did not originally recommend indicators for capital improvement programming. After plan adoption, Boston needed to modify indicators and create new methods for that specific use case. Boston had made some changes to administrative structures and routines but was still in the process of building the data infrastructure and an agency culture accustomed to using indicators. Another example is Denver, which was using system monitoring indicators during capital improvement programming, but the procedural link from reporting on indicator status to informing a policy decision was not clear enough to be influential. Indicators need to be associated with “action proposals” to be influential (Contandriopoulos et al., 2010). Table 29 summarizes the influence indicators had on administrative decision-making as well as noting where indicators drew attention to issues.
### Table 29 Summary of Indicator Uses and Influences

<table>
<thead>
<tr>
<th>Use case</th>
<th>Specific use</th>
<th>Influences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing conditions</td>
<td></td>
<td>- Drew attention to new problems, 3 of which involved equity (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Informed equity-centered prioritization framework (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Limited influence drawing attention to transit and access to employment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Limited influence on new transit plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reinforced issues brought up in public conversations, especially equity</td>
</tr>
<tr>
<td>Growth scenarios</td>
<td></td>
<td>- Market and equity data informed direction of plan</td>
</tr>
<tr>
<td>Project prioritization</td>
<td>Plan project list</td>
<td>- Informed prioritized project list (4 plans)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Informed equity framework</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Changes in projects submitted to MPO TIP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Conceptual project list informed by growth scenarios</td>
</tr>
<tr>
<td>Capital improvement</td>
<td>Capital improvement program</td>
<td>- Recommended projects for funding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Residential resurfacing program with an equity overlay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Prioritized list used in CIP process</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>Internal analysis</td>
<td>- Improvement to crash location (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- More equitable project prioritization, on-going basis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Changed strategy to achieve outcomes</td>
</tr>
<tr>
<td>Public reporting</td>
<td>Public reporting</td>
<td>- Project delivery accountability mechanism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Attracted funding to progress reporting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Further analysis with additional equity metrics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Negotiate benefits agreements in rezoning cases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reports to mayor and used in dashboard review meetings; bigger focus on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>projects</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Council pressure to make progress on outcomes; bigger focus on projects</td>
</tr>
</tbody>
</table>

*Note. Numbers refer to multiple observations of indicator influence; no number signifies that it occurred only once.*

#### 5.4.2. Indicator Usability Factors

According to Cash et al. (2002), key indicator usability characteristics include the salience, credibility, and legitimacy of the indicator. Salience was typically the top concern among the case cities: data availability, the measurability of indicators, the technical and policy difficulties in setting targets, and the complexity of the indicator in terms of how to clearly communicate them to the public or decisionmakers. The
accuracy and reliability of crash data was frequently mentioned as a credibility concern. The legitimacy of indicators was not expressed as a problem in any city; as a result, this research can make no claims around whether the legitimacy of indicators facilitated or was a barrier to use because there is no counterfactual. Whether an indicator could be forecasted was not mentioned as important by any informant.

The main concern about indicator usability for the existing conditions use case was data availability, which prevents a certain metric from being used. However, in practice, alternate indicators or proxies were used instead to meet the indicator construct. Staff also had difficulty setting targets for some indicators at the time of their development, although the question of meeting targets actually arises in the systems monitoring use case. The influence of indicators at the existing conditions stage are drawing attention to problems (conceptual), providing a data foundation for subsequent stages of the process (indirectly instrumental), and informing plan strategies (indirectly instrumental).

For prioritization within the plan or as part of on-going capital improvement programming, the primary indicator usability issue was the spatial scale of data. This sometimes limited use, in the sense that the indicator was rejected as part of the plan. When an indicator with data at an unhelpful spatial scale was included, it could not influence geographically specific decisions. While a frustration at later stages of the process, the time lag associated with some data sources or types of indicators was not
important for the existing conditions and plan prioritization use cases because those analyses only require data for one point in time.

Most of the indicator usability challenges occurred within the systems monitoring use case. Timely, accurate data at the right spatial scale were important for the *internal use* of indicators. In cases where crash data became more timely, accurate, and at a useful spatial scale, the City could take action. This is consistent with findings by Pineo et al. (2019) that neighborhood scale data was more useful than city-wide scale data in their study of urban health indicator tools. The attribution and time lag issues associated with outcome measures was challenging for informants. However, output measures also had shortcomings in preventing agencies in redirecting resources to meet their plan goals. The systems monitoring of indicators did not provide feedback for the success of specific projects or strategies.

Timely data was also important to the *public reporting* associated with systems monitoring. Many informants expressed concerns with the time lag associated with indicators, which could be due to the frequency of secondary data collection and reporting of the indicator data or could be related to measuring an outcome, which tend to be slow to change and/or may not reflect change from one project or program. Other concerns associated with public reporting were measurable indicators, the complexity of the indicator and how well it is understood by the public and decisionmakers. While targets were set during indicator development, typically the existing conditions stage, the struggle to meet targets occurred during systems monitoring.
Table 30 summarizes the facilitators and barriers to indicator influence. Despite these challenges, indicator usability was also not perceived as the primary barrier to their use and influence by most informants.

**Table 30 Summary of Indicator Usability Factors**

<table>
<thead>
<tr>
<th>Use case</th>
<th>Facilitators</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing conditions</td>
<td>- Communication/complexity</td>
<td>- Setting targets</td>
</tr>
<tr>
<td></td>
<td>- Generally better data in 2014 compared to 2007</td>
<td>- Spatial scale (health data)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Availability</td>
</tr>
<tr>
<td>Prioritization</td>
<td>Not observed</td>
<td>- Spatial scale (health data) (2)</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>- Reliable data (crash data)</td>
<td>- Meeting targets (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Measurability (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Reliable data (crash data) (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Communication/complexity (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Outcome measure attribution (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Time lag</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Availability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tension between meeting outputs and outcomes</td>
</tr>
</tbody>
</table>

*Note.* Numbers refer to multiple observations of indicator influence; no number signifies that it occurred only once.

5.4.3. Organizational Factors

Most informants indicated that the primary barriers and facilitators associated with the use and influence of health-related indicators were organizational (see Table 31). I examined the following organizational factors as potential barriers or facilitators: formal institutions, organizational culture (e.g., leadership and openness to learning), administrative routines, collaboration and communication, and technical and financial capacity. Of these, leadership, financial capacity, and administrative routines were the most critical.

Environments with departmental coordination, with open communication, and a willingness to talk about mistakes facilitate double-loop learning (Argyris & Schön, 1996).
Indicators were credited for helping to bridge across departments and sometimes help align policy objectives. Informants in Boston and Denver, for example, found that developing indicators brought agencies together to discuss data and helped coordinate policy. Informants in Indianapolis also discussed an open, collaborative environment among agencies. Some Indianapolis policy actors also tried to find ways to coordinate policies between departments, given the division of transportation planning and engineering functions. The Indianapolis case, however, demonstrates that collaboration alone was not sufficient to institutionalize indicators.

A willingness to learn from mistakes and re-examine administrative routines was necessary to institutionalize indicators. Boston adapted Go Boston indicators for use as evaluation criteria and had also created a new Chiefs of Streets position. Denver had examined the implementation results from the previous Blueprint Denver in order to make improvements. Memphis staff were in the habit of questioning data sources and frequently updating indicators. Indianapolis had also started examining routines, by creating a new transportation administrator position, and had succeeded in using equity evaluation criteria within its surfacing program. Perhaps this structural change will help institutionalize indicators over time, but reports from other informants suggested that more internal change was needed.

Leadership is one aspect of organizational culture and was among the most significant organizational factors that affected use, institutionalization, and influence. Within the plan-making process, leadership for developing indicators can come from
multiple actors: Elected officials, departmental managers, and nonprofit organizations all provided the leadership necessary to drive the vision that included indicators in the plan. However, in order to institutionalize the indicators into routines for on-going use, agencies need to undertake reflexive processes (i.e., double-loop learning) to change routines. This required departmental or elected leadership to drive change.

I was unable to determine if the form of government impacted use and influence, as all cases had a strong mayor system, which is a typical form of government in large cities. What did matter is whether executive leadership had adopted a data-driven management paradigm. The mayors operating with this paradigm encouraged City agencies to use indicators, either overtly, as in Denver or Memphis, or tacitly in Boston. This support did not require executive leadership to be engaged with the plans or indicator management specifically; in most cases, mayors were not involved. As described by informants, the Mayor of Memphis was the only mayor highly engaged in on-going monitoring of indicators. However, the more attention elected leadership paid to indicators through public reporting, the greater the pressure to deliver on outcomes. Required reporting to the mayor and/or city council was an especially effective accountability mechanism, as demonstrated in Memphis and Seattle. In addition to agency-produced reports or indicator dashboards, reports by nonprofit organizations also generated attention, such as those produced in Boston and Denver. However, in all cases, the focus on the reporting was on projects completed, with less attention toward progress on outcome-based indicators.
Funding was critical for all use cases. Funding was available for developing plans, usually through external grant funding (which underscores how vital leadership is for securing support). Philanthropic organizations were especially engaged in Boston, Indianapolis, and Memphis; their role as policy actors is further discussed further in Chapter 6. Technically, because funding for plan development was available in all cases, I cannot claim that funding is necessary for the plan-related use cases (e.g., existing conditions), as there was no counterfactual for comparison. However, because the discrepancies of use and influence for the on-going use cases (e.g., systems monitoring) are clearly connected to funding, it is fair to assume that it is a crucial facilitator of use and influence in the plan-related use cases. For agencies that were actively learning and changing internal routines to accommodate new use cases, sufficient funding was necessary to facilitate these changes. Cities that were attempting to change routines but did not have sufficient funding struggled to put the proper data infrastructure in place. Sufficient funding did not require the cities to be high-income. Although Boston, Denver, and Seattle were high-income cities, Memphis, a low-income city, had garnered financial support through external funding. Funding was largely a function of leadership, which in Memphis’ case came primarily from the executive office.

In the MSF, policy solutions are “softened up” by policy actors through debate and testing before they advance to the policy window as a preferred solution (Kingdon, 1995). Indicators as a policy solution appear to have also been softened up through previous data-driven planning work. Participation in data-driven programs such as What...
What Works Cities did not signal whether a city is more or less likely to use and institutionalize indicators, given that all cities participated in these programs. However, cities with a What Works Cities certification had higher levels of use and institutionalization, which may signify that certification reflects a greater commitment to data-driven management. Memphis and Seattle had the highest certifications among the case cities (gold-certified) and also had higher levels of institutionalization. Indianapolis, the case city with the lowest level of institutionalization, was the only city that did not have a certification. Vision Zero programs, which are inherently data-driven, were also credited for making indicators more familiar to transportation agencies. In Seattle, the statewide commute trip reduction program may have also softened up data-driven planning. Table 31 below summarizes the organizational facilitators and barriers.
### Table 31 Summary of Organizational Facilitators and Barriers

<table>
<thead>
<tr>
<th>Use case</th>
<th>Facilitators</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing conditions</td>
<td>- Financial and technical resources (all plans)</td>
<td>Not observed</td>
</tr>
<tr>
<td></td>
<td>- Elected official expectations for indicators (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Departmental culture (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Departmental leadership</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Staff leadership</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Nonprofit leadership</td>
<td></td>
</tr>
<tr>
<td>Prioritization</td>
<td>- Financial technical resources (for plans) (all plans)</td>
<td>- Financial and technical resources (for CIP) (2)</td>
</tr>
<tr>
<td></td>
<td>- Departmental leadership</td>
<td>- Departmental leadership</td>
</tr>
<tr>
<td></td>
<td>- Departmental culture</td>
<td>- Departmental culture</td>
</tr>
<tr>
<td></td>
<td>- Departmental routines</td>
<td>- Departmental routines</td>
</tr>
<tr>
<td>Systems monitoring</td>
<td>- Departmental culture/ culture of learning (3)</td>
<td>- Lack of clear use case (CIP)</td>
</tr>
<tr>
<td></td>
<td>- Departmental routines (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Financial and technical resources (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Elected official expectations of indicator use (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Required reporting to elected officials (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Well documented methodology (2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Departmental leadership</td>
<td></td>
</tr>
</tbody>
</table>
| Note. Numbers refer to multiple observations of indicator influence; no number signifies that it occurred only once. A well-documented methodology for on-going monitoring facilitated monitoring and reporting in two cases. However, in a third case, a well-documented methodology had no impact on monitoring and reporting. In a fourth case, the lack of a clear methodology hindered on-going monitoring.
5.4.4. Propositions

**Proposition 1: Use depends on the degree to which indicators are organizationally embedded**

Based on research findings within the STS, organizational science, and communicative planning theory literatures, I expected that indicators would be used (i.e., handled) when they were embedded within organizational routines. My findings provide more nuance to this proposition. Indicators were used in the use cases where they could readily be integrated into organizational routines; that is, no changes in routines were needed. This was the case for all existing conditions and plan-related prioritization, which did not require institutionalization. In these cases, indicators were not only used but they were influential as well, in that they accomplished what they intended to do, such as inform project recommendations.

However, indicators were also used in the use cases that required some level of institutionalization. For example, Denver used indicators within on-going capital improvement programming processes, which was a new routine. Also, Memphis OPC staff were using indicators in internal discussions but were unclear how to make use of the information—there was not a routine or a specific analysis that accommodated them. Rather, indicators were only influential when the use case was clear and routines accommodated them. This supports assertions that indicators do not inform decisions unless there is a specific action proposal associated with them (Contandriopolous et al., 2010).
The Seattle case illustrates how a high level of institutionalization can help increase an indicator’s influence. Seattle successfully institutionalized project prioritization on an on-going basis—thanks to administrative and elected leadership that had, over many years, promoted data-driven management. Because the indicators could be readily integrated into Seattle’s routines, they were influential in developing project lists that could withstand some degree of political pressure. This proposition is therefore revised: Indicators are influential depending on the degree to which they are organizationally embedded, which includes the clarity of the use case.

**Proposition 2: Influence depends on the presence of an influential champion or effective coalition of advocates**

This proposition was based upon policy process theories that suggest that policy entrepreneurs (MSF) or advocacy coalitions (ACF) are integral to policy change. The MSF suggests that policy entrepreneurs use their rhetorical skills and political connections to advance a policy solution that solves the problem highlighted by the indicator. Within the ACF, indicators can be used to either promote learning among different advocacy coalitions or, in high-conflict systems, can be used to mobilize supporters.

For plan-making processes, an influential champion or successful advocacy coalition were important for certain outcomes. Policy actors, particularly city staff, helped frame important issues through the selection of indicators for study and facilitating social learning through communicative processes (see Chapter 6 for further discussion on social learning). In some cities, non-profit organizations could place
pressure on the City to make progress via public reports. However, the focus on advocacy efforts was generally on project completion, not on the indicators. Despite the role these policy actors played, advocacy coalition influence was less important to administrative decision-making than technical and financial resources, departmental or elected leadership, and indicator institutionalization within the organization.

This proposition is likely better suited to implementation activities. Recommended projects are subject to capital improvement programs and budgeting processes before they are implemented. It is possible that influential policy actors are important during this aspect of the policy process; however, it does not appear that indicators are central to the strategies these policy actors employ during implementation activities. As my research design did not include the study of implementation activities, I cannot fully confirm this proposition as it best applies to the entire policy process.

Rival Propositions

**Rival Proposition 1: Use is strongest in cities with highly valid indicators**

Given the focus on the “intrinsic quality” of indicators in certain indicator literatures (Lehtonen et al., 2016, p. 1), I offered that highly valid indicators—those with plausible causal pathways (Contandriopoulos et al. 2010; Joumard et al., 2011)—would be more likely to be used. However, because I examined indicator usability, not indicator “quality,” I did not independently assess the technical merits of indicators, including their validity. Assessing indicator validity would have required developing a causal chain between causes (e.g., transport) and outcomes (Joumard et al., 2011) for all the
indicators. For example, for their indicator framework, Badland et al. (2014) conducted a literature review to generate a causal pathway of livability inputs (e.g., transport) and their effects on intermediate outcomes and final health and wellbeing outcomes.

However, the larger question is whether the intrinsic quality of indicators is what matters to their use. Much research has found that legitimacy is an important component of indicator acceptance by users, which then can translate to use. In my research, all the indicators were considered legitimate, so I cannot claim that legitimacy was a key component to use as I do not have a counterfactual. My research found that organizational factors were considered more significant barriers or facilitators to indicator use. Indicator characteristics are not unimportant, but their impact on use was not as important as organizational factors. However, certain aspects of indicators were important to influence (i.e., administrative decision-making), particularly the spatial scale of data for prioritization and the reliability and accuracy of crash data for making spot improvements.

**Rival Proposition 2: Influence depends on city characteristics and context**

Cradock et al. (2009) found that counties with certain socio-demographic characteristics and travel behaviors were associated with the funding and implementation of active transportation projects. These findings suggest that context may be significant in planning and implementation decisions. Partly to address this rival proposition, I selected a diverse set of case cities to increase representativeness within the bounds of a large metropolitan area (population size 600,000 to 900,000), varying
the characteristics of population density, population growth, median household income, and race and ethnicity.

Some of these characteristics can be interpreted as a proxy for the cultural or political support of healthy transportation. For example, cities with highest numbers of traffic fatalities are located in the southern U.S. (SGA, 2022), suggesting that cities like Memphis may not support healthy transportation. (In fact, Memphis was rated as the most dangerous place to walk in 2019 (Informant 42; Short, 2019)). Older cities with higher population densities and pre-1950s street networks tend to have better pedestrian infrastructure, which could position Boston and Seattle as leaders in healthy transportation.

City characteristics did not fully explain the use, institutionalization, and influence of health-related indicators. As an illustration, Memphis\(^2\) and Seattle had high levels of indicator institutionalization, made possible by sufficient funding for indicator management, executive and/or council leadership, and the use of reporting as an accountability mechanism. These two cities represent the opposite ends of the spectrum in terms of population density, population growth, race and ethnicity, and median household income (Table 32).

\(^2\) Memphis’ Office of Performance Management had a high level of indicator institutionalization; institutionalization was a work in progress within the Office of Comprehensive Planning.
Table 32 City Characteristics of Memphis and Seattle

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Memphis</th>
<th>Seattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>651,073 (smallest)</td>
<td>753,675 (second largest)</td>
</tr>
<tr>
<td>Population density per square mile</td>
<td>2,053 (lowest)</td>
<td>7,251 (second highest)</td>
</tr>
<tr>
<td>Population change from 2010 to 2019</td>
<td>-0.1% (only city with decline)</td>
<td>+24% (highest)</td>
</tr>
<tr>
<td>Percent white, not Hispanic</td>
<td>25.7 (lowest)</td>
<td>63.8 (highest)</td>
</tr>
<tr>
<td>Median household income</td>
<td>$41,228 (lowest)</td>
<td>$92,263 (highest)</td>
</tr>
</tbody>
</table>

Note. All data in Table 37 is from the 2019 American Community Survey’s 1-Year Data Estimates, U.S. Census Bureau.

What appears important is not the culture and characteristics of the population living within the city but the culture of the City as a corporate entity. My findings support the assertion that organizational culture better explains use, influence, and institutionalization. Although relating to implementation specifically, Laurian et al. (2017) found that agencies with sustainability overtly described within their mission statements had greater levels of sustainable project implementation. The importance of mission was echoed by an informant: “What sets an agency up for success to use indicators . . . is, I think, having clear agency goals” (Informant 53).

There are two caveats to this conclusion. First, Seattle and Memphis have high levels of institutionalization of indicators, but Memphis’ previous experience with indicators may not be oriented toward those that address SDOH. Seattle embraced not only indicators as a management strategy (minor policy learning/change, discussed further in Chapter 6) and SDOH-oriented indicator content (major policy learning/change, discussed further in Chapter 6). That is, city characteristics were not important for the institutionalization of indicators, but they may play a role in the adoption and institutionalization of health indicators. Other aspects of city
characteristics may affect the support of healthy transportation. For example, the perceived public mood may influence the kinds of decisions made by departmental or elected leadership. These kinds of questions are best explored using policy process theories, discussed further in Chapter 6.

Secondly, it must be acknowledged that Seattle had the highest level of indicator institutionalization among my case cities as well as a substantially higher level of funding. Although funding levels do not fully explain how indicators are institutionalized within an agency, they could very well explain implementation levels. That is, the City of Seattle has substantially more resources to implement transportation investments that support healthy transportation compared to the City of Memphis.

5.4.5. Other Observations

Although my dissertation did not include a review of transit plans, an increased focus on transit was mentioned in all cases. Transit was among the top issues raised by community members within the Go Boston engagement process. This posed a challenge for the City of Boston as they do not control the transit system but nonetheless included indicators about transit access (Informants 11, 16). In both Indianapolis and Memphis, transit was at the center of major community organizing efforts. Compared to other transportation modes, the coalitions that formed around transit initiatives contained more diverse actors, such as active participation from business interests (Informants 13-14, 44, 47). The Denver Department of Transportation and Infrastructure was created out of the former public works department and granted new authority as a transit
provider (Informant 26). Seattle passed a voter-approved measure to purchase more bus service from the transit agency (Informant 56).

I also found that metropolitan planning organization (MPO) indicators had little influence on the development and use of municipal indicators as well as little influence on administrative decisions. I interviewed representatives from MPOs in four of the case cities. MPOs were somewhat engaged with the development of a given city’s plans and indicators; they are limited in their attention in part because they serve a large number of local governments (Informant 27). In connection to the transportation plans under study, the MPOs provided baseline data, presented to an advisory committee, and/or served as representatives on an advisory committee (Informants 23, 27, 36, 42). Through federal legislation, most recently the FAST ACT, MPOs are required to have a performance management program for the long-term monitoring of their regional transportation planning goals and indicators. MPOs may also have evaluation criteria that they use for project selection as part of their transportation improvement program. MPOs were reluctant to tie performance to funding in part because connecting project outcomes to systems outcomes is difficult. But more importantly, the voluntary participation by local governments in MPO planning and activities meant that MPOs used “carrots” rather than “sticks” to encourage policy alignment (Informant 27).

While political use of indicators was not the subject of my dissertation, comments from informants suggest that indicators are rarely directly used in this process. The political use of indicators, as described by Weiss (1979, 1991), involves the
justification of projects. Indicators can have limited political influence, where a staff member can argue:

This is important because we've said as a city, “we want to . . . get to this level of access” . . . but that only is as good as the political will there is . . . to stand behind that and say “yeah, we're [going] to remove parking from this street to make protected bike lane” (Informant 56).

Without elected leadership supporting staff decisions, “the indicator . . . doesn't matter in some ways” (Informant 56). At best, indicators indirectly influence the process by informing the prioritized project lists, when staff “makes the case” (Informant 26) during capital improvement programming or make projects more defensible when they become controversial (Informant 52). Evidence from Seattle suggests that well-institutionalized indicators buffer to political influence but does not eliminate it:

In terms of how we decide which projects we move forward with and what our targets are [indicators are] really helpful . . . Otherwise . . . it just allows it to become much more political . . . Having data to lean back on just . . . simplifies the whole process . . . . It doesn't allow the loudest voice in the room to always get the project (Informant 52).

5.5. Conclusion

My research determined that indicators are typically used as intended and that their influence depends on both indicator and organizational factors. The specific explanatory factors varied on the type of indicator use case. Indicator usability characteristics were of least concern within the existing conditions use cases and were most important in the systems monitoring use case. A key organizational factor was how well indicators could be integrated into existing routines; departmental and executive leadership was an important facilitator for creating organizational learning environments
and driving administrative routine change. This chapter focused on how indicators influence administrative decisions, such as when staff undertake analysis internally and respond with corridor or spot improvements, although the research also shows that indicators have conceptual influences as well (see Chapter 6).

This research contributes to the literature on transportation indicators in several ways. I have explored an understudied area of transportation indicators by focusing on municipal transportation plans, rather than indicator development and use at the metropolitan or state level. In addition, I have studied not only the development of indicators, which is frequently examined, but also how they are used, institutionalized, and what influences they have in decision-making. In a similar vein, I examined the organizational factors that affect use, institutionalization, and influence rather than relying only on the technical qualities of indicators as explanatory factors.

My case study findings are limited in their applicability to cities with a population between 600,000 and 900,000. Because pioneering cities tend to be middle-sized or large cities with sufficient financial resources (Marsden & Stead, 2011), the findings here may represent the leading edge of urban governance. The findings do not apply to smaller cities, which points to the need to better understand how smaller cities, which often have fewer technical and financial resources, use health-related indicators. Within the selected case cities, I varied the city characteristics—population density, population change, household income, and race and ethnicity—in order to increase representativeness. That is, a city with a similar population size should be able to “see”
some aspect of itself within the data. However, there may be other variables that affect
the use and influence of health indicators in transportation plans. Further research on
this subject should explore more diverse socio-demographic, organizational, and political
characteristics as explanatory factors.

Additional research on the use of indicators should pay closer attention to the
organizational and political contexts in which they operate, such as the 4 “I”s noted by
Weiss (1995): prior information, ideology, interests, and institutional context. My
research design involved the study of indicator development and institutional use and
did not study the process beyond plan adoption. I suggest flipping the research question
such that the research begins with a specific decision and indicators are operationalized
as one of the explanatory factors. It is difficult to trace the influence of indicators from
their origins to unspecified decisions because pathways for their influence are diffuse.

Some opportunities for further study include whether indicators can be used to
facilitate policy alignment and organizational coordination between agencies and
whether and how indicators are used to promote transit policy solutions. Further
research in plan implementation could involve the study of budgets, city council
discussion, interviews with elected officials, and media content analyses to understand
the factors that contributed to whether indicators were referenced in discussion to
proceed with certain projects. However, indicators were rarely the focus of attention
during implementation processes. In addition, the planning and the implementation
policy subsystems appear to be a different phase or aspect of the policy process (see the
overall conclusion). Adopting a policy or plan implementation perspective for this research would be beneficial (cf. Laurian et al., 2010, 2017; Talen, 1996).

One area of implementation worth further study is capital improvement programming (CIP), an influential avenue for translating plan goals into funded and implemented projects. Indicators can influence the CIP process through prioritization criteria that resulted in a recommended project list or as evaluation criteria within the CIP process itself. Many factors are in play in this CIP decision-making process: the indicator characteristics (e.g., appropriate spatial scale), organizational processes (e.g., sufficient institutionalization), and political forces (e.g., competing demands among neighbors, councilors, and the mayor). Policy process and plan implementation frameworks would be helpful for conceptualizing and operationalizing the full breadth of explanatory factors in this complex process. The CIP process is a link from planning to implementation, potentially bridging two different phases of the policy process. One way to explore this relationship is to identify the percentage of projects from transportation plans that are placed on capital improvement programs (cf. Miller et al., 2008). As projects completed represent an output of the planning process, not an outcome (Miller et al., 2008), further research could examine the relationship between capital improvement programs and outcomes such as safety (cf. Hendren & Niemeier, 2006).

The connection between local government and MPOs is worth additional study, particularly because MPO influence was limited. MPOs work with indicators primarily in two ways. More relevant to the influence on municipal decision-making, MPOs may use
evaluation criteria for the projects submitted by municipalities in a transportation improvement program. MPOs also have their own performance management program, which is intended to help guide MPO decision-making, including policy recommendations to the local governments they serve. One difference between municipal transportation planning and regional transportation planning is the nature of their policy subsystems and level of conflict within. For example, one political dynamic is that suburban cities may define themselves in opposition to the principal city in a metropolitan region (Informants 35-36, 56). The voluntary nature of municipal participation in regional governance is another factor affecting MPO influence. Typically, local policy must adhere to the policy and regulations of the higher level of government, enabling the higher level of government to influence local policy (Liu et al., 2010). However, the same degree of policy conformance does not occur with MPOs (Liu et al., 2010), which is likely connected to the voluntary nature of municipal participation.

Practitioners can take from this research key lessons on how to best use indicators to integrate health concerns into transportation planning processes. One of these lessons is to play closer attention to the process by which indicators are developed and not only the technical merits of indicators themselves. The opportunity to draw attention to problems through indicators is best accomplished within indicator development and community engagement processes (the social learning associated with these are discussed in Chapter 6). Regarding the technical adequacy of indicators, the most significant data concerns reside in the systems monitoring use case. This use case is
when indicator developers should attend to indicator measurability, accuracy, reliability, relevant spatial scale, and time lag concerns. The spatial scale of data is also important for prioritization purposes. In addition, practitioners should focus on the ways to encourage institutionalization of indicators within agencies: if elected leadership is not driving data-driven management, then administrative leadership can promote the necessary changes in cultures and routines. Absent leadership internal to the agency, non-profit organizations can keep attention on indicators through progress reports or other accountability mechanisms. Securing funding (e.g., levies, grants) is necessary to have the technical resources to build the data infrastructure to ensure that indicators are used over time.
6. The Role of Health Indicators in Social Learning and Policy Change: A Case Study of Municipal Transportation Plans

6.1. Introduction

The social determinants of health are the places in which people live, work, play, and age, and which affect people’s health status (CDC, 2022). Transportation, as a health determinant affects public health through a variety of pathways, such as whether people can access the services and resources they need, can travel actively and safely, and through exposure to air and noise pollution (Frank et al., 2019). Recognizing transportation’s impact on public health, researchers and practitioners have called for health indicators as one way to integrate health into transportation decision-making.

How do health indicators affect transportation decision-making? Transportation indicator literature often focuses on the instrumental use of indicators, in which indicators are used directly as an input to a decision. However, research repeatedly confirms that the instrumental use of technical information, such as indicators, in a policy process is limited (Fishman, 1991; Gudmundsson & Sørensen, 2013; Hoppe, 2005; Innes & Booher, 2000; Weiss, 1995). An alternative approach is to examine the conceptual use of technical information that can inform the beliefs of policy actors and affect policy change (Sabatier, 1987; Weiss, 1979, 1991). In this chapter, I explore this use of indicators, drawing from several literatures that acknowledge that indicators can serve as more than instrumental tools: knowledge utilization, multiple streams framework, and literatures that address social learning, including communicative
planning theory and the advocacy coalition framework. Because many of the indicators studied in this dissertation could be framed as health or as part of other goals, such as livability or economic development, I also explored whether public health was a frame used to influence policy beliefs and build coalitions.

6.2. Literature and Concepts

An early and influential observer of the variety of uses of research (a.k.a. evidence, technical information) was Carol H. Weiss (1977), who described how the “enlightenment” function of research slowly changes beliefs and attitudes over time. Weiss (1979, 1991) elaborated on the three general types of evidence utilization: instrumental, conceptual, and political. The instrumental use of evidence is when research has a direct application to policy problem, which reflects a rationalist perspective. The use of evidence in this manner is rare—so much so that it spurred the reconceptualization of evidence use in program evaluation (Fishman, 1991; Weiss, 1991). One is likely to underestimate the frequency of evidence utilization if this is the one kind of evidence use considered (Ness, 2010). The conceptual use of evidence expresses a long-term role for evidence, where evidence shapes how policy makers understand an issue, even if it cannot be cited as part of a particular decision. Research can also be used politically to advocate for policy solutions, justify decisions, mobilize allies, or argue against opponents (Ozawa, 1991; Sabatier, 1988; Weible, 2008). This perspective has been adopted by other researchers who have explored how indicators, as a form of technical information, are used in policy-making processes. Rather than a
diminished role for indicators, the conceptual use of indicators can have lasting effects by informing the beliefs of policy actors or shaping narratives for policy change. These literatures are described below.

6.2.1. Social Learning

Social learning encompasses a broad set of ideas around policy learning, communicative learning, and organizational learning, and ranges in scale from individual level to group learning and organizational learning. This chapter is particularly concerned with the role of indicators in individual learning, because it is the foundation for other forms of learning, and group learning, because participatory planning processes are purported to facilitate learning among groups. I draw from theories of social learning, particularly the advocacy coalition framework’s (ACF) policy-oriented learning, and social learning as expressed by communicative planning theory (CPT). Both have explored the role of scientific information and/or indicators in policy processes. I have also included the conceptual use of indicators as described in the multiple streams framework (MSF), which does not identify learning as an outcome per se, but it is a useful framework for describing indicators as ideas within the agenda-setting process. Combining policy process frameworks, such as the multiple streams framework and the advocacy coalition framework, have been recommended to incorporate each framework’s benefits and complement their shortcomings (Bandelow et al., 2019; Howlett et al., 2016; Mukherjee & Howlett, 2015; Ritter et al., 2018). I first describe each framework in general terms and
then explain the role of indicators in a decision-making process, as conceptualized by the framework.

6.2.1.1. *Multiple Streams Framework*

The MSF envisions the decision-making process as serendipitous and opportunistic (Herweg et al., 2018; Smith, 2013). Key assumptions that undergird the MSF include ambiguity (i.e., many interpretations of the problem and solution), time constraints, and fluid participation by key actors (e.g., elected officials cycle on and off) (Herweg et al., 2018). The MSF describes how three streams—the problem stream, the policy stream, and the political stream—must converge to set the agenda. Indicators reside in the problem stream and are used “to assess the magnitude of the problem and to become aware of the changes in the problem” (Kingdon, 1995, p. 91). Indicators are one of the elements in the problem stream that can open a policy window. Policy entrepreneurs are skilled political and social actors who take advantage of an open policy window to match policy problems to policy solutions. They can also build coalitions around particular policy solutions (Béland & Katapally, 2018). Policy ideas are “softened up” in debate within the policy community and successful ideas rise to the top when they meet the criteria of technical feasibility, value acceptability, and resource adequacy (Dudley, 2013; Kingdon, 1995) Elaborating on MSF policy window dynamics, Dudley (2013) asserts that a successful narrative can help open or close the policy window, enabling certain policy ideas to be placed on a policy agenda. A rhetorical frame
appeals to a broad group of people, while the narrative itself tells a story and helps policy actors make meaning of events (Dudley, 2013).

6.2.1.2. Advocacy Coalition Framework

The advocacy coalition framework (ACF) includes actor-centered variables and structural variables such as actor coalitions, policy beliefs, power resources, formal institutions, and political developments (Sotirov & Winkel, 2016). Beliefs “provide the ‘glue’ of politics” (Sabatier, 1987, p. 663) in the ACF although they are also “the most intractable concept to study” (Jenkins-Smith et al., 2018, p. 151). There are three levels of belief. Deep core beliefs reflect normative values, are not policy-specific, and are difficult to change. Policy core beliefs relate to the issues of the policy subsystem while secondary beliefs address the instrumental means to achieve the policy core belief goals (Jenkins-Smith et al., 2018, p. 140-141). Coalitions are composed of actors with shared policy core beliefs; several coalitions can exist within a policy subsystem (Mukherjee & Howlett, 2015). The success of a coalition depends on external factors, such as the nature of policy paradigms, and internal factors, such as knowledge, and political skill (Mukherjee & Howlett, 2015; Sabatier, 1987).

Policy learning in the ACF refers to changes in thought or intention with respect to public policy goals as opposed to organizational objectives (Sabatier, 1987, p. 654). Policy learning includes a change in the understanding of the problem and associated solutions (Jenkins-Smith et al., 2018, p. 151). Policy learning as a path to policy change is a confirmed ACF hypothesis (Weible, 2018) although it is likely to happen incrementally
unless it occurs in conjunction with an internal or external shock (Jenkins-Smith et al., 2018; Sabatier, 1988).

Knowledge or information is introduced to members of a coalition, integrating with their beliefs and assumptions, resulting in a change in their policy preferences (Bandelow et al., 2019, p. 170; Sabatier, 1987). New technical information that identifies a problem and probable cause can result in government action, provided there are minimal political costs. However, new information that challenges conventional wisdom is generally not readily accepted by all policy actors and generates analytical debate (Sabatier, 1988). Research suggests that technical information tends to change secondary policy beliefs (Weible et al., 2009), resulting in minor policy change, but it is possible technical information can affect core beliefs, resulting in substantial policy change (Holden, 2008; Moyson et al., 2017; Ritter et al., 2018; Sabatier, 1987, 1988).

6.2.1.3. Communicative Planning Theory

Although it is not as explicit as other social learning frameworks (Holden, 2008), communicative planning theory (CPT) also espouses social learning as an outcome of planning. In this paradigm, information is gradually absorbed by planning participants through collective processes (Innes, 1998), similar to Weiss’ (1977, 1979) idea of the enlightenment function of research. Social learning in a communicative planning process, or communicative learning (Holden, 2008), occurs at individual and collective levels. It is not only an individual change of belief but also produces agreement among participants (Deyle & Schively Slotterback, 2009). Dialogue is a primary mechanism by
which social learning occurs (Scholz et al., 2014). Innes and Booher (1999) borrow from Argyris & Schön’s (1996) organizational learning to differentiate between learning about new ways to solve a problem (single-loop learning) and learning that re-assesses the goals of the group (double-loop learning). Learning through the collaborative development of indicators legitimizes the indicators and influences decisions “when they become part of the thinking and ordinary decision making of the players” (Innes & Booher, 2000, p. 177). Similarly, Cash et al. (2002) argue that the collaborative development of indicators between users and producers is essential for creating salient, credible, and legitimate indicators.

Other research suggests that rigorous consensus-seeking communicative processes recommended by CPT are not necessary for producing social learning (Deyle & Schively Slotterback, 2009; Kinzer, 2016). Deyle and Schively Slotterback (2009) note there is little empirical evidence on this subject because researchers have inferred, not measured, that learning occurred. Furthermore, the study of social learning within planning is complicated by three interpretations of learning:

First, social learning is understood as an inevitable process resulting from interaction among actors. Second, social learning is seen as an agenda that should be embedded in planning practice. Third, social learning is considered as a process that intrinsically leads to desirable and constructive outcomes (von Schönheld et al., 2019, p. 412).

This confusion of analysis and communicative ideals has led to criticism that CPT has lost its analytical edge (Fainstein, 2000). Note that the ACF offers no guidance for
strengthening democracy through policy learning processes (Weible, 2018; Weible & Cairney, 2018; cf. Innes & Booher, 2004), as it is not a normative framework.

6.2.1.4. Measurement

Researchers have attempted to measure social learning in a variety of ways. Measuring social or policy learning is challenging because it requires access to individual and group cognitive processes. Scholz et al. (2014) draw from psychology to understand and operationalize social learning an environmental management context:

[T]o be considered ‘social learning,’ a process must: (1) demonstrate that a change in understanding has taken place in the individuals involved; (2) demonstrate that this change goes beyond the individual and becomes situated within wider social units or communities of practice; and (3) occur through social interactions and processes between actors within a social network (Reed et al., 2010, p. 1, as cited in Scholz et al., 2014).

Some scholars have measured belief change through before-and-after surveys (Deyle & Schively Slotterback, 2009; Weible & Sabatier, 2009), although this requires researchers to anticipate on which topic the learning will occur (Deyle & Schively Slotterback, 2009). Other scholars have measured learning by proxy. For example, Lee and van de Meene (2012) operationalize “learning as a process comprising information seeking, adoption and policy change, and focus on information seeking as the foundation step in the learning process” (p. 199). Hall (1993) describes three degrees of learning, based on changes in the three variables involved in policy change—the policy goals, the policy instrument, and the setting or threshold of the instrument. Social learning that results in changes to policy instrument settings or the policy instruments themselves represent modest policy changes but that changes in policy goals create a
new policy paradigm, reflected by a change of discourse and rhetorical framing (Bennett & Howlett, 1992; Hall, 1993). That is, the nature of policy change signals the type of learning that occurred.

My research design did not support the measurement of social learning with the criteria described by Scholz et al. (2014) above. As a result, I can only infer where social learning has occurred based on informant descriptions of how their policy beliefs, and their perception of the beliefs of other actors, changed based on the information imparted by indicators. To a limited degree, I assess minor or major policy change, and therefore social learning, as reflected by policies and goals in the transportation plans; see policy change in 6.2.3 below.

6.2.2. Policy Learning

I rely on the ACF to operationalize policy learning variables because it offers clear hypotheses and explanatory factors for policy learning. Furthermore, because the ACF has synthesized aspects of other theories and models regarding social learning, such as knowledge utilization and institutionalism, it distills a wide range of thought on social learning. The ACF hypothesizes that policy-oriented learning is most likely to occur within the same coalition. Learning can also occur across coalitions when conflict is at a low or intermediate level, within a consensus-building forum, and when discussion focuses on secondary beliefs, not core beliefs (Weible, 2008).

There are two types of policy beliefs or policy paradigms that are relevant for this dissertation. First is the transportation paradigm. Actors may subscribe to a conventional
transportation paradigm that is focused on reducing auto congestion (e.g., “automobility,” Sheller & Urry, 2008; “motonormativity,” Walker et al., 2022) often recommending strategies to increase roadway capacity to accommodate auto travel. The alternative transportation paradigm can be described as people-centered and instead focuses on strategies such as improving the safety and comfort of pedestrians, bicyclists, and transit users. The second paradigm relates to governance or management. In the conventional governance approach, emotive appeals, access to politically influential actors (e.g., “somebody powerful got the ear of somebody . . . an elected or whatever,” Informant 13), and territoriality (e.g., “cash grab” Informant 36) characterize transportation decision-making. The alternative management paradigm can be described as “data-driven” and is typically focused on accountability. The values and beliefs of both transportation and management paradigms are reflected in vision and goals statements on agency websites, within planning documents, and informant perceptions.

6.2.2.1. Explanatory Factors

The four explanatory factors for policy learning in the ACF are 1) the attributes of actors, namely their “belief systems, resources, strategies, and network contacts” (Jenkins-Smith et al., 2018, p. 152), 2) level of conflict between coalitions, in which intermediate levels of conflict are best for learning, 3) the attributes of forums (e.g., degree of openness), 4) the type of information to which the actors are exposed (Jenkins-Smith et al., 2018).
Attributes of Actors

Policy actors’ beliefs, activities, and resources all affect whether policy learning occurs. As the name suggests, a central feature of the ACF is the advocacy coalition. Note that “coalition” is a metaphor for the actions of individuals bound together by shared core policy beliefs; that is, it is individuals who learn and are the agents of change (Jenkins-Smith et al., 2018). Coalitions share beliefs, coordination patterns, and resources, such as the formal authority to make decisions, mobilize support, financial resources, and skillful leadership (Jenkins-Smith et al., 2018, p. 150-151). Coalition members use their knowledge to argue with opponents or mobilize supporters, especially in policy subsystems with a high degree of conflict (Mukherjee & Howlett, 2015; Weible, 2008).

Other key actors in the ACF are policy brokers, who work among coalitions to find a policy compromise in order to reduce conflict (Sabatier, 1987). Policy brokers also facilitate learning among opponents (Jenkins-Smith et al., 2018). An ACF learning hypothesis states that technical information can be influential by informing the views of policy brokers, even if it does not “change the views of the opposing coalition” (Jenkins-Smith et al., 2018, p. 153). Policy communities and policy entrepreneurs are key actors in the MSF. Policy communities are the bureaucrats, researchers, consultants, and interest groups who develop policy solutions; they are the agents who further the activities in the policy stream (Herweg et al., 2018). They “soften up” policy ideas by testing and debating them (Cairney & Jones, 2016; Kingdon, 1995; Reardon, 2018). Policy
entrepreneurs frame issues as a collective problem to justify public intervention (Béland & Katapally, 2018) and act more as power brokers than policy brokers (Reardon, 2018). In Baker et al.’s (2018) narrative review, policy entrepreneurship was found to be a critical factor for advancing a health equity agenda. One strategy involved framing health equity in a way that was consistent with the ideologies of those in power (Baker et al., 2018).

CPT shares with the ACF framework the idea of having an actor who minimizes conflict and promotes learning (i.e., the policy broker in ACF, the planner in communicative planning theory). However, CPT assumptions about actors’ beliefs and strategies differ from the ACF, particularly the goals of argumentation. In CPT, which draws primarily from the American pragmatism of John Dewey and Richard Rorty and the communicative rationality of Jürgen Habermas (Fainstein, 2000; Sagar, 2013), argumentation is more than “talk” but is a communicative action that shapes collective meaning and learning (Innes, 1998). The ACF assumes that new information is used to “win political battles with opponents” (Sabatier & Weible, 2007, p. 2003).

Within the ACF, advocacy coalition members use technical information to convince others of the validity of their position (Sabatier, 1988). The ACF also discusses how policy actors can build compelling narratives to frame problems and recruit new members to the coalition (Jenkins-Smith et al., 2018). Like the ACF, the MSF and CPT address dialogue and argumentation as a key part of framing problems and/or social learning. In the MSF, problem brokers or policy entrepreneurs use knowledge, values,
and emotion to frame problems in a way that is compelling to policymakers (Herweg et al., 2018; Knaggård, 2015). CPT primarily relies on consensus-seeking participatory processes as the primary factor that facilitates social learning.

**Level of Conflict**

Policy subsystems, which are the unit of analysis within the ACF, can be characterized by their level of conflict. ACF studies strongly suggest that the level of conflict in the policy subsystem drives the use of science (Weible, 2008). This is consistent with STS research on the politicization of science in policy-making processes (Jasanoff, 1990; Ozawa, 1991). Unitary policy subsystems have a single dominant coalition and tend to maintain the status quo (Weible, 2008). Collaborative policy subsystems have cooperative coalitions with some level of coordination, shared access to the decision-making authority, the presences of a consensus-based institution, and policy designs that have win-win solutions. Cross-coalition coordination is likely in a collaborative policy subsystem (Weible & Sabatier, 2009, p. 197). Adversarial policy subsystems have competitive coalitions with polarized beliefs who seek policymaking venues that give them the upper hand, and policy designs with clear winners and losers (Weible & Sabatier, 2009, p. 197). Government agencies or a powerful interest group anchor an adversarial subsystem. Competing coalitions have sufficient resources to challenge each other (Weible, 2008).
Attributes of Forums

In adversarial systems, coalitions seek policy-making venues that are sympathetic to their beliefs or otherwise place their rivals at a disadvantage. These “include courts, legislatures, traditional agency rulemaking, elections, and political appointee processes” (Weible & Sabatier, 2009, p. 197). In collaborative policy subsystems, consensus-based institutions play an important role in “building trust, goodwill, and mutual understanding of the different values” (Weible & Sabatier, 2009, p. 198). The characteristics of consensus-based institutions involve “face-to-face communication, open entry rules, fair rules of negotiation, decision rules based on consensus, and joint-fact-finding procedures that integrate scientists and nonscientists in decision-making” (Weible & Sabatier, 2009, p. 198). While the characteristics of ACF consensus-based institutions do not correspond directly to the CPT standards of authentic dialogue, they do share some characteristics such as diverse stakeholder participation and consensus-based decision-making (Innes & Booher, 1999; Deyle & Schively Slotterback, 2009). Therefore, I include the CPT’s concept of participatory processes within this explanatory factor (which includes consensus-building forums), rather than creating a separate explanatory factor. The CPT is focused primarily on collaborative, communicative forums and therefore, does not define the characteristics of adversarial systems.

Type of Information

The ACF has developed two hypotheses about the type of information related to policy learning. One states that problems with “accepted quantitative performance
indicators” are more likely to facilitate policy learning than those performance indicators that are qualitative and subjective (Sabatier, 1988, p. 156). An additional hypothesis is that problems in natural systems (e.g., ecosystems) are more likely to produce learning because in social systems the potential targets of policy, the people themselves, are “active strategists” (p. 156). Also, natural systems allow for controlled experimentation in a way that is not possible with social systems (Sabatier, 1988). Whether indicators are quantitative or qualitative is not a concern within CPT; it is how indicators are developed. Indicators are a tool for learning when they are developed through collaborative processes, see above (Innes & Booher, 2000). This is also consistent with research by Rydin et al. (2003) and Pineo et al. (2019) that found that indicators developed within inclusive processes are more likely to be used than those that are developed externally.

6.2.3. Policy Change

Learning can be considered an outcome of the policy process as well as a variable that explains policy change (Dunlop & Radaelli, 2020). That is, learning can be considered an intermediate outcome as a result of using indicators, which may lead to a subsequent outcome: policy change. However, documenting this “link between learning and policy change is often tenuous, largely because of empirical challenges in measuring learning and then linking it to changes in policy” (Weible et al., 2009, p. 131).

Policy change is not clearly defined in the policy process literature (Jenkin-Smith et al., 2018). In this dissertation I have defined policy change as the adoption of transportation plans; specifically, the policy goals expressed in the transportation plans.
Transportation plans are a particular form of policy change in that they embody policy goals but also direct further action, such as changing other city policies. Furthermore, transportation plans also have a spatial component (Talen, 1996). Some policy change explanatory factors may not be as relevant to the planning process. For example, external shocks to the policy subsystem are one pathway for policy change, assuming that a crisis prompts decision-makers to adopt or revise a policy. However, most transportation plans, which are long-range in nature, are not made to respond to a crisis. In many cities, they are regularly updated as part of routine planning practice (e.g., an administrative routine) or else they are created as part of a change in governance. For these reasons, translating the construct of policy change as found in policy change literature to transportation plan goals and adoption in the planning literature is imperfect (Talen 1996). In the overall conclusion, I discuss additional ways to conceptualize the plan-making within the policy process.

Following the ACF and institutional thought, I treat changes in belief around policy problems and solutions (specifically, the type of policy instruments or settings) as modest or incremental policy change (Bennett & Howlett, 1992; Hall, 1993). This is consistent with how Innes and Booher (1999) interpret single-loop learning. A change in beliefs around policy goals indicates a major policy change. It can be considered a change in the policy paradigm, which is reflected by a change of discourse and rhetorical framing (Bennett & Howlett, 1992; Hall, 1993). Innes and Booher (1999) interpret double loop learning as a re-assessment of group goals, a similar concept.
6.2.3.1. **Explanatory Factors**

Policy change explanatory factors involve stable parameters, dynamic parameters, short-term and long-term constraints and resources of policy actors. An ACF hypothesis is that change in stable system parameters creates fundamental change in the policy subsystem. Stable parameters are slow to change and may be internal or external to the policy subsystem. One of the stable parameters includes the basic attributes of the problem area that lend it to public intervention. A problem area’s attributes may affect the degree to which policy learning can take place. If the problem cannot easily be measured, for example, it limits the ability for actors to assess (i.e., learn from) performance gaps (Sabatier, 1987). Cultural values and the social structure of the policy subsystem is another stable parameter. Because the values and norms in a subsystem may take decades to change, they constrain the types of policy alternatives available for a given policy problem. Dudley (2013) describes how policy actors employ a rhetorical frame, which has been constructed with cultural values, to create a compelling narrative. Another parameter, the basic legal structure of policy subsystems, is “quite resistant to change” (Sabatier, 1987, p. 656). This is especially the case with policymaking at a national scale; however, local governments have greater flexibility with regard to changes in its rules and regulations. This experimentation can facilitate greater policy learning (Sabatier, 1987).

Dynamic parameters include the ACF’s external shocks to the policy subsystem include changes in governing coalitions, public opinion, and socio-economic conditions,
and the impact of policy decisions from other policy subsystems. These affect policy change by shifting the political support of advocacy coalitions or otherwise change their plans and strategies (Sabatier, 1987). Internal shocks can also cause policy change. Internal shocks, something of an internal crisis for the coalition, confirm policy core beliefs among the minority advocacy coalition while generating doubt in the dominant coalition (Sabatier & Weible, 2007, p. 205). Both internal and external shocks are described as “focusing events” within the MSF (Bandelow et al., 2019; Sabatier & Weible, 2007). Because policy core beliefs are difficult to change, major policy change is unlikely to occur “as long as the advocacy coalition that instituted the program remains in power” (Jenkins-Smith et al., 2018, p. 145). This also relates to Hall’s (1993) assertion that a change in authority is a precondition for the institutionalization of paradigmatic policy change.

The timing and context of the political process impact policy change. A strength of the MSF is in capturing these situational dynamics (Bandelow et al., 2019; Herweg et al., 2018). Among the most important events in the MSF is the policy window, which represents a convergence of the three streams. The policy window typically opens from the problem or political stream (Bandelow et al., 2019; Kingdon, 1995; Reardon, 2018). Examples of policy windows opening in the political stream include changes in the national mood (translated here to public mood), elections, and focusing events. The public mood reflects the public’s mood swings as perceived by policymakers; it is the change in public opinion that prompts officials to act on agenda items. Public mood is
the most “empirically elusive” of the political elements in the MSF (Herweg et al., 2018, p. 24). Using both the ACF and MSF, Bandelow et al. (2019) found that policy learning combined with a window of opportunity in the problem stream created policy change.

The ACF describes two sets of factors that mediate between the stable and dynamic subsystem parameters and policy change. In the short-term, the constraints and resources of policy subsystem actors mediate their ability to affect policy change. A lack of resources may prevent certain groups from being effective champions and realizing their policy goals (Sabatier, 1987). Long-term opportunity structures refer to the characteristics of the political system that affect resources and constrain subsystem actors. They affect both external subsystem events and the short-term constraints and resources of policy actors. Long-term opportunity structures include the degree of consensus needed for major policy change; this addresses the differences in pluralist (e.g., the U.S.) and corporatist governance structures (e.g., Western Europe), where consensus-seeking structures provide greater incentive to be inclusive and share information. Another component of the long-term opportunity structure is the openness of the political system. In the U.S. there are a number of decision-making venues with a high degree of openness compared to other systems that are more centralized and have restrictions on access; the latter system encourages prominent roles for policy brokers (Jenkins-Smith et al., 2018; Sabatier & Weible, 2007).
6.2.4. Propositions

Drawing from the ACF, MSF, CPT and other literatures, I developed the following propositions about how health-related indicators affect social learning and policy change:

1. Health indicators produce policy learning during transportation plan development when:
   
a. A policy actor frames problems using values (ACF, MSF);
   
b. Within communicative processes and open forums (CPT, ACF); and
   
c. Low to intermediate levels of conflict exist in the policy subsystem (ACF)

2. Policy learning will generate minor policy change when there are no shocks to the policy subsystem

3. Policy learning will generate major policy change when there are shocks to the policy subsystem

6.3. Findings

These results are drawn from the study of transportation planning processes in five case cites: Boston, Denver, Indianapolis, Memphis, and Seattle. Within each case city, I first describe how indicators either draw attention to issues or change actor policy beliefs (i.e., social learning). Because I did not directly measure beliefs, I rely primarily on informant descriptions of learning (i.e., I infer that learning occurred). I identify how the explanatory factors—actor attributes, forum attributes, policy subsystem level of
conflict, type of information—contribute to the results. In addition, I note whether a public health frame was used to draw attention to an issue or otherwise influence the policy beliefs of others.

Policy change is based on informant descriptions of the change of policy compared to previous plan efforts. I discuss which changes in stable or dynamic parameters facilitated this policy change. Opportunity structures mediate an individual or advocacy coalition’s ability to effect policy change. The two aspects of opportunity structures, actor/coalition resources and the nature of forums, are also explanatory factors for policy learning. As such, I discuss these characteristics of opportunity structures within policy learning and do not repeat them in discussion about policy change.

6.3.1. City of Boston

6.3.1.1. Social Learning

Within Go Boston, indicators drew attention to issues that could be framed as problems. One indicator particularly caught people’s attention. Research from Northeastern University found that Black commuters spend an extra 66 hours a year waiting and riding transit compared to white bus riders (Moskowitz, 2012). The Boston Transportation Department (BTD) performed its own data analysis as part of the assessment within Go Boston: “Non-white families use transit more often relative to their populations and experience longer commutes” (Boston, 2017, p. 46).

It takes thinking outside the box to measure things that people don't know about yet, and then [it] changes the conversation . . . the fact that black Bostonians
spend so many more hours a year commuting than white bus riders was shocking to people . . . to actually put a number on it made people go, “Whoa . . . that’s a big deal” (Informant 16).

The engagement forums within the Go Boston process were relatively open and consensus oriented, which are considered ideal learning environments within the ACF and CPT. Nearly all informants, both internal and external to the City, described the Go Boston public engagement process as “extensive” (Informants 11-12, 14, 16-17) or “unprecedented” (LiveableStreets, 2020), although one informant lamented that it was too “pie-in-the-sky” (Informant 16). BTD spent as much on public engagement for Go Boston as they did for the development of the plan (Informant 12). Go Boston was also structured with an advisory committee that was created by the mayor at the time (Mayor Walsh) to provide input on Go Boston. The co-chairs of the Go Boston committee were close to the mayor (Informant 11). While a variety of stakeholders served on the committee—including the state department of transportation, MassDOT, neighborhood and business associations, the Mayor’s Youth Council, universities, the Boston Disabilities Commission, and transportation advocacy organizations—representation consisted of “a small group of relatively vocal people” who frequently worked with the city (Informant 16). The city coordinated with other departments and agencies outside of the advisory committee process, including the public health department and the Massachusetts Bay Transportation Authority (MBTA) (Informant 11).

The engagement process was key to the development of Go Boston indicators, which were connected to the goals that emerged from the process. Consultants worked
closely with city staff to create the indicators. One informant acknowledged that some metrics were “unmeasurable” but worth including in the plan (Informant 11). The “[consulting] team, basically said, you know, we can only really do a good metric on nine of the many aspirational targets” (Informant 11, original emphasis).

The planning process for Vision Zero Boston Action Plan, on the other hand, did not involve an extensive engagement process, although City staff did engage with communities about the nature and location of crashes and undertook project-level community engagement. The public did not provide input about which indicators or data to use; this is partly because there was not an extensive engagement process to develop the plan itself, but also the indicator target was already established for Vision Zero; i.e., zero fatalities and serious injuries. The immediacy and clarity of the indicator in general was quickly understood by community members, generating public support for speed reduction and traffic calming (Informant 13).

In general, Boston is well-resourced; Boston had the second highest city budget and transportation department among my cases (see Table 4). In addition, the City was able to garner funding from Barr foundation to complete Go Boston. The Vision Zero program retains a consultant to assist with technical work (Informant 13).

The primary policy actors (i.e., city staff, non-profit organizations) involved in Go Boston and Vision Zero Boston shared a belief in a people-centered transportation paradigm. City departmental cultures largely supported the people-centered transportation paradigm, although within the Department of Public Works “there are a
couple engineers there who are still more pro-car than their counterparts” (Informant 11). While Mayor Walsh created the opportunity to develop Vision Zero Boston, an informant felt that Vision Zero was supported within the organization: “I would say that it was pretty bottom up all along . . . it's a staff level thing. And I think especially . . . [with] pedestrian safety, everybody agrees with the mayor on down” (Informant 13).

The non-profit organizations active in developing Go Boston shared similar policy beliefs regarding people-centered transportation (see 4.1 for mission and goal statements) and even shared funding from the same sources as the City, such as the Boston-based Barr Foundation (Boston Cyclists Union, 2023). One informant felt these organizations were key to Go Boston’s success:

It's super important that Boston's advocacy, I would call it ecosystem, was where it was . . . LivableStreets transitioned its director during the Go Boston period and so did the Bicyclists Union, so they're both sort of like maturing to the place where they're becoming more robust organizations . . . WalkBoston had already been around for 30 some odd years [and they] reached next level advocacy (Informant 11).

The Go Boston and Vision Zero Boston policy subsystems could be characterized as unitary, in the sense that the government actors and coalition members shared the same beliefs, but advocates would like the City to “move faster” (Informant 13). Unitary subsystems tend to be low in conflict. However, unitary systems also tend to protect the status quo, and both the City leadership and advocates were seeking change. There was no evidence of organized opposition to the plan. Informants indicated that resistance from individuals and businesses often occurs during project implementation as compared to the plan-making process (Informants 13, 17).
Generally, local elected officials were not actively engaged in the planning process and cannot be characterized as policy entrepreneurs. The only elected official mentioned as a champion for Go Boston was a state house representative, who served on the advisory board: “He would . . . speak at events where the plan was being presented and . . . try to translate to community members why it was a good thing for them” (Informant 12). City staff had a good working relationship with the house representative and ensured that he understood and accepted the plan as it was developing (Informant 12). City council members were more likely to block projects that their constituents oppose (and state representatives were more likely to fight for transit investments) (Informant 11).

The role of policy entrepreneur instead rested with staff. Staff advocated for the extension of a MBTA rail line, which is not within the city’s jurisdiction, as a policy solution by embedding it into Go Boston: “We should . . . extend the orange line—because we should extend the orange line—but she’s, like, ‘I’m not doing it,’ and [I’m] like, ‘Yeah, okay, we’re gonna put it in anyways’” (Informant 11). While policy entrepreneurship may adequately characterize the activity of City staff, their role as policy brokers is also an apt description. City staff mediated among diverse stakeholders (e.g., “behind the scenes coordinating,” Informant 12) to develop workable policy solutions. Furthermore, City staff developed engagement processes to promote learning, which is a characteristic of policy brokers.
I found little evidence for other members of a policy community that existed separately from policy entrepreneurs, as per the MSF assertion that policy and politics streams exist independently. This was confirmed by an informant: “I don’t think that these are two different buckets” (Informant 11). That is, if actors were engaged in policy conversations, they were also engaged in political activity. However, it is possible that I missed other policy community activity, particularly given that I interviewed highly engaged informants. For example, some members of the Go Boston advisory committee may have debated policy options but did not engage politically.

6.3.1.2. **Argumentation and Health Framing**

Within the Go Boston engagement process, BTD specifically addressed public health:

We asked: “What does a healthier city look like?” People said: “How can transport options make residents healthier? How can we make it easier to get hospitals and healthcare centers? How can reduce kids’ exposure to air pollution? How would you create more pedestrian zones?” So those are tied to metrics, right (Informant 11)?

*Go Boston* included an explicit health theme with associated indicators, such as “all health centers in Boston will be within a 5-minute walk of bus stop, shuttle, train station, *and* protected bicycle facility or shared use path” (see Table 6, original emphasis). However, the social determinants of health (SDOH), as a concept, was not raised as a conversation topic in the advisory committee (Informant 16). SDOH-related measures were nested under goals that were not explicitly about health. For example, increasing walking and bicycling was not listed as a health measure but titled as “How
we get around” and reducing greenhouse gas emissions was listed under “Building Resiliency.”

However, the growing visibility of Vision Zero, which is grounded in public health concepts, brought a greater awareness of public health to Go Boston transportation conversations:

Vision Zero was . . . exploding as a thing to talk about and care about, right in the middle of [the Go Boston] process. So it went from being like, ‘Yeah, Healthy Streets, that's cool’ . . . to . . . ‘Oh, people are dying on our streets, like, literally dying, because they’re getting hit by cars, and then also people are literally dying, but slowly, from air quality’” (Informant 11).

LiveableStreets and WalkBoston found that “Vision Zero was a way to redefine the conversation” (Informant 11).

Even if Vision Zero contains an easy-to-understand public health message, it was still difficult to frame traffic deaths in way that promoted policy or practice change:

I have . . . talked about Vision Zero, you know, people are dying on the streets and had people really not get excited . . . about that approach . . . I don’t want to put too much weight on fear, fear-based arguments. But . . . it’s part of the context and understanding. Like, we know this street, we want to make it more pedestrian-friendly, we want to make it more accessible for people of all ages and abilities . . . that’s really compelling (Informant 13).

Although public health as a frame was being increasingly used by policy actors, it was not a primary message in communication with the general public. One organization discussed public health in conversation with funders but tended not to use it frequently in general communication. They instead talked “to people about how they get around” (Informant 14). Policy actors with a transportation background were more likely to engage in transportation policy compared to actors with a public health background
Another informant felt that public health was a useful frame for building relationships with the public health and health care organizations, many of whom had more financial resources:

Many of our partners are coming from the public health side . . . we're actually now starting to do some work with the healthcare side of the world as well, which is brand new for us . . . we've been trying to get them engaged for many, many years, because that's who's got all the money (Informant 16).

A public health frame may not be used as a primary message but can be an effective way to increase coalition membership:

They're trying to continuously figure out how to get more people on board. And they have discovered that the environmental argument doesn't get a lot of new folks to the table, but the health argument has a bunch of allies that they were ignoring and are, like, excited to have at the table (Informant 11).

Public health was sometimes conceptualized as an equity concern. For example, Go Boston's air quality indicator has health and equity dimensions: “Rates of emergency department visits due to asthma among Black and Latinos across all ages will be reduced by 10%.” One informant thought incorporating health into equity might be the “best messaging” to “get people to care . . . about environmental justice . . . by focusing on that health aspect . . . because it's everybody understands and cares about it, at least in . . . their own lives” (Informant 15).
Table 33 Boston Social Learning Explanatory Factors

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Mostly measurable indicators developed from plan goals within communicative processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Health and equity focus of several indicators</td>
</tr>
<tr>
<td>Attributes of forums</td>
<td>Engagement processes open to the public</td>
</tr>
<tr>
<td></td>
<td>City-selected advisory committee members</td>
</tr>
<tr>
<td>Level of conflict</td>
<td>Low level of conflict during plan development</td>
</tr>
<tr>
<td>Attributes of actors</td>
<td>City staff as policy brokers</td>
</tr>
<tr>
<td></td>
<td>Highly organized people-centered transportation advocacy coalition during plans development</td>
</tr>
<tr>
<td></td>
<td>Shared beliefs among plan documents, departmental mission, City staff, and advocacy coalition</td>
</tr>
<tr>
<td>Argumentation</td>
<td>Public health directly addressed in Go Boston</td>
</tr>
<tr>
<td></td>
<td>Public health a secondary message in public communications</td>
</tr>
<tr>
<td></td>
<td>Public health used to expand coalitions and attract resources</td>
</tr>
</tbody>
</table>

6.3.1.3. **Policy Change**

By most accounts, *Go Boston* and *Vision Zero* Boston represented a policy shift compared to previous plans (i.e., policy change). This policy shift was supported with the introduction of a new position, the Chief of Streets, to oversee the transportation and public works departments. The Chief of Streets is part of the mayor’s senior cabinet (Informant 11). The Chief of Streets inserted the ethos of the *Go Boston* plan within the transportation and public works departments: “The person who became Chief of Streets . . . is someone who used [Go Boston] to say: ‘These are our goals across both transportation and public works’” (Informant 11). Another key innovation within *Go Boston* was the use of indicators (Informant 11). Whereas the shift in focus to people-centered transportation represents a change in policy goals, the use of indicators is a means to accomplish the goals; i.e., a change in policy instruments or minor policy change (and learning).
One change in the stable parameters of the policy subsystem was the cultural values of the larger public. The public expressed significant support for transit (Informants 16, 17), speed reduction, and pedestrian safety (Informant 13). The opportunity to change transportation policy came through a governance change. An informant’s description of an upcoming election (2020) illustrated how Boston’s strong mayor system opens policy windows:

There's going to be a mayoral election in November. So, it's probably a good time to . . . update our Vision Zero action plan and really kind of take stock of what we've done . . . and you know, create an agenda for . . . the next phase of Vision Zero, but really allow the new mayor to put their stamp on it (Informant 13).

Rather than discussion of an internal or external shock that prompted policy change, one informant described a general sense that the timing was right for the development of Go Boston:

It was sort of just . . . in the air . . . . While the city was doing like an arts plan and the housing plan and a climate plan . . . to have not done this plan would have looked weird. And then, we probably have the best ecosystem to lean into to help us write and build this great plan, because all these things are coming together (Informant 11).

See Table 34 for a summary of policy change explanatory factors.

Table 34 Boston Policy Change Explanatory Factors

<table>
<thead>
<tr>
<th>Policy learning</th>
<th>Learning through engagement processes, particularly within existing conditions analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in stable parameters</td>
<td>Change in public values about the role of transportation (e.g., safety, equity, and transit)</td>
</tr>
<tr>
<td>Change in dynamic parameters</td>
<td>Change in elected leadership</td>
</tr>
</tbody>
</table>
6.3.1.4. Boston Conclusion

As conceptualized by CPT, indicators can generate social learning when they are discussed in communicative processes. Go Boston indicators were directly informed by the goals set in an inclusive community engagement process. One informant expressed that an indicator defined a new problem, which possibly led to social learning.

The ACF hypothesizes that measurable indicators are more likely to produce policy learning. Indicators were quantitative for the most part, although some were general (e.g., “by half”) and others were not measurable at all. Whether or not they were measurable did not affect the policy direction of the plans although unmeasurable indicators frustrated advocates. The ACF also suggests that new information will be weaponized in debate by competing coalitions. This did not materialize, likely because the policy subsystem was low in conflict. In fact, it appears that it was a unitary subsystem because the City and other policy actors (e.g., non-profit organizations, funders) shared the same policy beliefs.

The increased emphasis on people-centered transportation represents a shift in policy goals, which is considered a sign of major policy learning. It can even be considered a paradigmatic policy change, which Hall (1993) suggests requires a change in governance, which did occur in Boston. Rather than a change in dynamic system parameters, it appears that cultural values, a stable system parameter, have changed to emphasize people-centered transportation, rather than mobility, as a key aim of transportation. The other policy learning involved the using indicators to set targets and
achieve goals, which is fundamental to *Vision Zero Boston* and was also a feature of *Go Boston*. This represents minor policy learning regarding data-driven planning and governance.

The influence of public health framing on potential problems and solutions was varied. Public health was directly addressed within *Go Boston* and informed the *Vision Zero Boston* approach. However, public health was not a top message in public communication. Employing a public health frame was more likely to be used to build a broader coalition to support people-centered transportation.

### 6.3.2. City and County of Denver

#### 6.3.2.1. Social Learning

Data and indicators played a role in framing the problem and generating a shift in understanding among staff and stakeholders during *Blueprint Denver*. However, one informant noted it was not indicators per se that changed beliefs, but the combination of data and story working together: “If you're just talking about access statistics . . . okay, well, let's talk about statistics. When statistics underscore the human experience, that's a different conversation than just looking at graphs and numbers” (Informant 21). The social learning that occurred within the *Blueprint Denver* process centered on issues of racial equity. One organization funded trainings that included conversations about equity, which provoked deeper thinking about it:

It was the dialogue, quite frankly . . . you're sitting in a small group around a table with people who live in this community going, “Whoa, wait a minute here,” and it’s like, . . . “Oh, I had not thought about that”. . . I think there are a lot of...
people, including many of the staff members, who are like, . . . “This is a lot bigger conversation than we intended” (Informant 21).

One challenge on relying on collaborative processes and dialogue to produce learning is that the learning is limited by who is in the metaphorical room:

So again we’re inching towards a collection of actions that we all agree that we should take. The problem is: How deep is that agreement? Was it the type of people who would . . . spend six months on the Climate Action Committee and respond to online surveys—which were, you know, really super cool—but what portion of the high voting propensity, older, high privilege, high political influence electorate was that? Not very (Informant 25).

The community engagement process for Blueprint Denver was extensive (Informants 24, 25). The fact that multiple plans occurred at the same time enabled the City “to maximize stakeholder audience and minimize touchpoints to alleviate out-reach fatigue. It allowed us to appeal to a diverse range of interest groups and public audience” (Informant 26). City staff developed the Blueprint Denver indicators with consultants; these were presented to the task force for review. The task force vetted the indicators, although did not always dive into the details of each metric (Informant 24). Indicators were measurable and addressed a range of environmental and social topics. The task force for Blueprint Denver was active and had members representing diverse subject matter expertise (Informant 24) with “an above-average proficiency of navigating city government and having one's voice heard” (Informant 22). In addition, two city council members served on the task force (Denver, 2019, p. 3; Informant 22).

Like Blueprint Denver, indicators within Denver Moves Pedestrians highlighted issues that were framed as problems. The baseline analysis in the Denver Moves
Pedestrians revealed that, on the current funding trajectory, it would take 200 years to complete the sidewalk network. Internally staff talked about the need to build sidewalks “in our lifetime” and the gravity of “kicking the can down the road” (Informant 26). The idea of completing the sidewalk network was popular with the public; it was more compelling than using a traffic safety frame (Informant 26). Another “big takeaway” from the pedestrian analysis in Denver Moves Pedestrians was that “basically all of the low-income areas of the city . . . include pretty substantial areas of either missing or substandard sidewalk” (Informant 22). This disparity was “very clear to everyone as a part of the process” (Informant 22).

Denver Moves Pedestrians' indicators were created as part of a broader community engagement process, involving two rounds of public meetings, surveys, and outreach to key stakeholders (Informant 26). One informant felt an extensive process was necessary given that Denver Moves Pedestrians was updating an older plan (2004) and the Department of Transportation and Infrastructure’s (DOTI) culture was not drawing from a legacy of planning-style community engagement (Informant 22). During the Denver Moves Pedestrians engagement process, the planning team brought a list of goals and data to community events, and asked people about how to prioritize investments (Informant 22). Like Blueprint Denver, the Denver Moves Pedestrians task force was highly engaged and sophisticated about city governance; it also had two city council members on the committee (Informant 22, 26).
In terms of the resources available to policy actors, the City had sufficient financial and technical support to develop the *Blueprint Denver* and *Denver Moves Pedestrians*. The Department of Community Planning and Development (CPD) had been working with DOTI to secure grant funding to update Blueprint as well as pursue a transit plan, which they did not receive, but realized that by joining “forces [the City] can be more efficient with community outreach and have the plans align from a policy and program and standpoint” (Informant 24). Consultants were hired to assist with the development of *Blueprint Denver* and *Denver Moves Pedestrians* because DOTI did not have the “bandwidth to perform all the functions of this effort” consistent with the “standard practice . . . to outsource planning efforts of this magnitude” (Informant 26).

City departments and plan documents embraced a people-centered transportation paradigm (see 4.2 for mission and goal statements). The “idea of access to all your daily needs was a big driving factor” in *Blueprint Denver* (Informant 24). “*Blueprint [Denver]*’s . . . ambitious” and has “all the . . . catch phrases in it that you would expect from a progressive land use-transportation plan” (Informant 22). A strong advocacy coalition was present in Denver’s subsystem, realized as a formal coalition in the Denver Streets Partnership. The creation of Denver Streets Partnership involved the merger of a pedestrian and bicycle organization and became the “the meetup, the place where all these advocacy groups shared with each other what they’re up to, to find common cause, reinforce each other on overlapping goals” (Informant 25). This advocacy coalition had transportation groups “that were mode-specific like, Bike Denver,
Walk Denver, Bicycle Colorado [and] then there are other groups that are interested in transportation and . . . advocacy [such as] the Inter-Neighborhood Cooperation” (Informant 25). Organizations like the American Heart Association, the Colorado Cross-Disability Coalition, and the Downtown Denver Partnership also served on the steering committee (Denver Streets Partnership, n.d.-b.). Based on the description of their activities, the group is well-coordinated: “The approach with the Denver Streets partnership is to coordinate and help amplify important topics but not to speak, instead of those two to encourage everybody to speak so we know that the more people speaking, the better data” (Informant 25).

The coalition was an active player in the subsystem: “Transportation or mobility advocacy groups, particularly the Denver Streets Partnership . . . looked at the plans very closely and gave us a lot of input and I think supported . . . the performance measures that we have” (Informant 24). The policy subsystem could be characterized as unitary, in the sense that the government actors and coalitions members more or less operated from the same page, although advocates could sometimes be adversarial: “We understand [Denver Streets Partnership] need to take an advocacy tone. Sometimes that means they are critical, sometimes that means they are supportive. I don’t lose sleep over it” (Informant 26).

Some City staff served as problem brokers by framing the planning analysis and undertaking health equity mapping within *Blueprint Denver*. Actors involved in problem framing were also often policy entrepreneurs. Working through a non-profit
organization, one informant was able to provide funding for the equity workshop (Informant 21). One informant believed that policy entrepreneurship among staff was key to policy change: “I’ll tell you how change occurs: Change occurs because you have the staff who get who get it” (Informant 21). Other City staff played a role as a policy broker, undertaking a high degree of coordination, convening, and general project management activities.

One informant credited the mayor for the idea of using indicators to drive policy: “I don't know what a previous administration or future administration will think about metrics, but the current administration has been very high on them. So . . . leadership change . . . definitely drives the conversation here” (Informant 24). I found little evidence for other members of a policy community that existed separately from policy entrepreneurs; within the Denver Moves Pedestrians process, “most of the stakeholders that provided guidance related to policy were also politically active” (Informant 26). However, it’s possible I might have missed other policy community activity based on my choice of informants.

6.3.2.2. Argumentation and Health Framing

Some policy actors recognized that indicators were communication tools: “It's about understanding performance measures, data, whatever you want to say, in the context of the story, and think about it in those kinds of terms” (Informant 21). From this informant’s perspective, health was a “powerful” framing device because “health is a common experience” (Informant 21). As a result, “health becomes this really interesting
point at which you can have these human conversations, and therefore when you start looking at health as the basis of planning policies” (Informant 21).

Prior to *Blueprint Denver*, CPD had a relationship with the Denver Department of Public Health and Environment (DDPHE). DDPHE was highly involved with public engagement (Informant 24) and assisted in the equity mapping component of *Blueprint Denver* (Informants 21, 24). *Comprehensive Plan 2040* had a vision element for health and equity, “reduce health inequities between Denver neighborhoods,” and included associated measures such as access to prenatal care and life expectancy (see Table 7). Health was an explicit goal area within *Denver Moves Pedestrians* with an associated indicator relating to the sidewalk completeness in areas of high child obesity rates (see Table 9). Public health was also implicitly connected to the planning concepts in *Blueprint Denver*:

> We have this concept of a city of complete neighborhoods . . . and each neighborhood can be unique, but we want . . . them [to] have greater access to shopping and educational opportunities and their jobs within a short distance . . . the underlying basis of the whole idea of the city of complete neighborhoods is . . . tied into health (Informant 24).

However, health was not the leading message for *Blueprint Denver*; livability was typically how planning issues were discussed (Informant 24). Public health was not a primary driver for *Denver Moves Pedestrians* either (Informant 22). However, Denver’s Vision Zero program, which was launched around the same time as the above plans, had placed health in the center of their messaging by “viewing fatal and severe injury crashes as a health epidemic . . . and . . . why wouldn't you want to end that” (Informant
22)? One informant explained why health was not a lead message for public consumption in other planning efforts:

In the transportation space we're often in the position of needing to sell the benefits of our projects . . . [so] that when we communicate about projects benefits . . . we try . . . to pander to the needs and issues that are . . . at the forefront of people's thinking . . . . For better or worse, I think a lot of health indicators . . . fall into the bucket of delayed gratification rather than instant gratification . . . we need to sell people on the things that will instantly gratify them (Informant 22).

The health message was used within the advocacy coalition to have a “bigger tent of advocates” (Informant 25) but was generally not employed in other ways:

[The Denver Streets Partnership has] the American Heart Association, AARP, and groups who are worried about renters’ rights and displacement . . . the YIMBY’s [Yes in my back yard] learn how to speak health and the transit people learn how to talk land use. I don't hear the health indicators, other than perhaps Vision Zero, from anyone else (Informant 25).

For a summary of which explanatory factors contributed to social learning, see Table 35.

**Table 35 Denver Social Learning Explanatory Factors**

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Measurable indicators developed from plan goals within communicative processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health equity focus of several indicators</td>
<td></td>
</tr>
<tr>
<td>Attributes of forums</td>
<td>Engagement processes open to the public</td>
</tr>
<tr>
<td></td>
<td>City-selected task force members</td>
</tr>
<tr>
<td>Level of conflict</td>
<td>Low level of conflict during plan development re: transportation issues</td>
</tr>
<tr>
<td>Attributes of actors</td>
<td>City staff as policy broker; other City staff as policy entrepreneur</td>
</tr>
<tr>
<td></td>
<td>Highly organized people-centered transportation advocacy coalition during plans development</td>
</tr>
<tr>
<td></td>
<td>Shared beliefs among plan documents, departmental missions, City staff, and advocacy coalition</td>
</tr>
<tr>
<td>Argumentation</td>
<td>Public health directly addressed in the Comprehensive plan</td>
</tr>
<tr>
<td></td>
<td>Recognition by policy actors of using data to tell stories for change</td>
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<tr>
<td></td>
<td>Public health not the primary message in public communication; livability lead message</td>
</tr>
<tr>
<td></td>
<td>Public health used to expand the advocacy coalition</td>
</tr>
</tbody>
</table>

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6.3.2.3. **Policy Change**

The primary policy shifts that occurred within *Blueprint Denver* and Denver *Moves Pedestrians* involved equity. The social learning in *Blueprint Denver* that resulted from an equity workshop with City staff and community members were reflected in the thinking of staff: City staff “were totally on board . . . and asking themselves . . . hard questions about equity” (Informant 21). One key issue was gentrification (Informant 21), which featured prominently in planning efforts (Informants 21, 24):

Some of these communities . . . a few years before [had] been saying: “We need sidewalks in our community because we’re waiting in mud puddles for buses to come pick us up” . . . And . . . in the context of *Blueprint [Denver]* . . . displacement became so much of a thing in Denver, they were saying, “Well, maybe we don’t want that after all . . . we’re going to be displaced . . . you’re improving our neighborhood for the people who are going to be there after we’ve been forced out” (Informant 21).

The *Blueprint Denver* health equity mapping undertaken by CPD and DDPHE also helped create a “pivot point” (Informant 21). According to one informant, those who work in bureaucratic environments tend become accustomed to the routines of the organization, “and therefore . . . have a specific way of looking at things,” so it “takes something really jarring” to move them “into a larger world view, if you will” (Informant 21). Policy actors need to leverage these moments in the policy process:

The inflection point is critical. You know, when you talk about COVID and social justice³ you’re talking about major national, and even international inflection point, but an inflection point can be local too. So you, you always look at those

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³ The COVID-19 pandemic and social justice movement that emerged after the death of George Floyd occurred after the adoption of *Blueprint Denver*.
things . . . there's always an inflection point, you just have to figure it out what it is, right? (Informant 21).

In addition to community conversations about gentrification and equity, one informant credited a planning profession shift to a “people-first approach” in facilitating the adoption of health-related policies and practices (Informant 24):

We actually have a policy in *Blueprint Denver* that states that pedestrians are priorities on every street in Denver . . . and being more inclusive in our processes so we better understand the needs of those communities [so] we don’t have unintended consequences of policy that might actually be resulting in things like gentrification and having programs to actually guard against that . . . it's a complete[ly] new . . . way you go about business to be more responsive to people (Informant 24).

The decision to include indicators within the plans also represents a change in policy. While the City had more or less succeeded in meeting land use goals in the previous *Blueprint Denver* (Informants 22, 25), there was “a particularly strong feeling that . . . [the City] had not been similarly successful on the transportation side” (Informant 22). At the outset of 2019 *Blueprint Denver* an analysis was undertaken to understand how planning efforts could be more successful (Informants 22, 24):

When City staff did a diagnostic on [the previous land use and transportation plan], they found that many of the values and high-level ideas still reflected the community’s vision. However, the strategies were outdated, either because they had been completed or because the City had taken a different approach to addressing the issue (Informant 24).

Equity was also a focus within *Denver Moves Pedestrians*. The social learning about sidewalk disparities led to a prioritization process that focused on delivering pedestrian infrastructure to the areas of greatest need (Informants 22, 26). This was reinforced through a 2017 bond measure that included language about prioritizing
underinvested neighborhoods (Informant 26). Including indicators within *Denver Moves Pedestrians*, which was considered planning best practice (Informant 26), also signifies a minor policy change.

**Table 36 Denver Policy Change Explanatory Factors**

<table>
<thead>
<tr>
<th>Policy learning</th>
<th>Learning through engagement processes, particularly within existing conditions analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in stable parameters</strong></td>
<td>Change in planning values about the role of transportation (i.e. people-centered)</td>
</tr>
<tr>
<td><strong>Change in dynamic parameters</strong></td>
<td>Change in public mood regarding equity due to gentrification concerns</td>
</tr>
</tbody>
</table>

6.3.2.4. **Denver Conclusion**

The primary social learning centered on racial and health equity, which had been furthered through an equity workshop among staff and other stakeholders. The health equity mapping analysis helped inform the direction of *Blueprint Denver*, but one informant emphasized that the dialogue was essential for learning. Similarly, key findings in the *Denver Moves Pedestrians* existing conditions analysis informed the direction of the plan, which involved prioritizing pedestrian improvements in underserved communities. Indicators within the plans were measurable. Contrary to ACF expectations, the indicators were not weaponized in debate. The nature of learning aligns with CPT concepts of communicative learning, in which dialogue and inclusive processes facilitate learning. The policy subsystem appears to be unitary in that the City and advocates shared similar values; tensions between the two were focused on follow-through and accountability.
Informants did not describe a substantial departure in policy direction in the plans studied with the exception of greater focus on racial equity. In terms of stable parameter change, one informant described shift a larger change in the planning profession that prioritized people-centered transportation. Concerns about gentrification helped drive the focus on racial equity; this may be part of a shift in cultural values (stable parameter) or could represent a change in public opinion (dynamic parameter). Introducing indicators represented a change in the means to achieve policy; the mayor’s focus on data-driven management encouraged this approach.

Improving public health was an implicit goal in the plans but not a leading message in public communication. Public health was more central to discussions of racial equity; disparate health outcomes illustrated how transportation and planning decisions affected low-income communities and people of color. Among advocates, public health concepts were something that was used to help bring more diverse partners to the coalition.

6.3.3. City of Indianapolis and Marion County

6.3.3.1. Social Learning

Indicators produced social learning during indicator development and community engagement processes. The Walkways existing conditions analysis, upon which several indicators were built, seemed to produce the greatest policy learning within the Walkways process. Walkways revealed a “massive shortage [of] sidewalks
and huge demand for greenways and trails . . . there's just no way the City will be able to keep up with it” (Informant 36). One goal of the Walkways engagement process was to help people understand how the City worked and help them better navigate the system (Informant 35). Walkways “had a really extensive community engagement process, where” the City and consultants developed measures that reflected community concerns:

[Community members] might not be thinking in terms of data and performance metrics but the language that they were using suggested that there are certain things that they really . . . wanted the city and the county to actually track and monitor, that [the consultants] translated . . . into the measures (Informant 32).

City staff identified diverse members for the Walkways stakeholder committee that “represented different interests/organizations/communities affected by the topic and had some previous association with it” (Informant 31). The Walkways stakeholder committee provided feedback on the draft plan and indicators. The City and consultants included a list of data sources for feedback, although the consultants were more engaged with detailed indicator development, such as determining which unit of analysis to use. The steering committee was also engaged in prioritizing projects toward the end of the process (Informant 36).

Like Walkways, Indy Moves had a stakeholder committee representing diverse interests (Informants 31). Engagement processes involving conversation produced learning opportunities within Indy Moves as well: “Indy Moves had an existing conditions report where we consolidated lots of info about our transport network that people didn’t know” and public conversations with staff “were usually teaching moments that
people learned from, even if they didn’t like the explanation” (Informant 31). A transportation and housing costs indicator within *Indy Moves* revealed a previously unidentified problem:

A lot of the shock came from the expense of transportation in the Indianapolis region, because . . . yeah, housing is cheap here and our wages are super low too, like, but because we lack regional transit . . . there’s a huge gap in regional job accessibility and it makes the combined housing and transportation costs the third highest in the country among our peer metros. And that usually takes people aback (Informant 34).

Indianapolis is under-resourced, particularly relative to cities of a similar size, and has the second lowest city budget and public works budget among my cases (see Table 4). The City does not have a separate transportation department and relies on the Department of Public Works for transportation project implementation and street operations and maintenance (Indianapolis, n.d.-b.). That Indianapolis had not added a streetlight in 30 years, owing to the financial expense, illustrates the size of the problem (Informant 31). This resource-constraint is well-understood challenge, as noted in *Walkways* itself:

(C)ity departments are underfunded or understaffed when compared to peer cities—in some cases, Indianapolis lacks positions or entire departments that peer cities rely on to support pedestrian projects and programs. This lack of resources devoted to making Indianapolis walkable is reflected in the city’s public health outcomes, traffic safety gaps, and accessibility challenges (Indianapolis, 2016, p. 39).

This resource constraint created a work environment where “every day there are hundreds of things on fire, and everybody is dealing with putting out fires, lots of fires, every day from the moment they clock into the moment they clock out . . . . It's nobody's
job, nobody's responsibility to step back and say, like, 'How do we keep the fires from starting’” (Informant 35)? The inability to make use of indicators, or more generally address pressing transportation issues, was a concern for City staff, who could not dedicate time to problem-solving: “The engineers... know the problem, they see the problem, they feel helpless almost, and like, it got kind of emotional for them” (Informant 32).

Perhaps due to this resource constraint, a local non-profit organization pursued funding for *Walkways*. The nonprofit organization was awarded a Plan 4 Health grant from the American Planning Association to develop *Walkways*. The City had been taking steps toward improving planning for greater walkability and transparency in decision-making, so when the grant opportunity arose, policy actors were ready to create a pedestrian plan (Informant 35). Key city agencies involved in *Walkways* and *Indy Moves* include the Department of Metropolitan Development (DMD) and the Public Works department. The visions of the DMD and plans do not conflict with each other, although the Department of Metropolitan Development (DMD) does not specifically address transportation and the Public Works Department describes only activities, not underlying values (see 4.3 for mission and goal statements).

A loose coalition of individuals and organizations that represent people-centered transportation paradigm supported plan efforts, consisting of Indy Strong Towns members, a “niche urbanist and bike twitter population” (Informant 31), and organizations such as Health by Design, community development corporations
(Informant 34), and the Central Indiana Community Foundation (Informant 31). The Central Indiana Community Foundation has been instrumental in developing the Indianapolis Cultural Trail and other trail efforts (Informants 31, 36). Indianapolis has “strong public, private, and philanthropic partnerships” (Informant 33) who weigh in on policy, often without engaging in political activity (Informant 31). There was no organized group that opposed the plans (Informant 35).

Where the broad base of support really solidified was in the coalition that developed for a transit initiative (Informants 33, 35-36):

Transit became a huge issue for the Chamber and the business community, as our workforce mobility tool . . . [transit] means so many different things to so many different people and so many different constituencies. So we have very large, diverse coalition . . . the business community and the labor unions, the environmentalists, and the developers . . . the K-12 system, the community colleges, the hospitals, the anchor institutions . . . AARP was a huge, huge part of this. So, this idea . . . of aging in place and . . . to connect people to jobs and opportunity [galvanized a broad set of interests] (Informant 33).

Some City staff saw themselves as policy brokers, whose “job was to provide the best recommendation in the public interest and the political conversation came later” (Informant 31). However, there was also evidence that staff acted as policy entrepreneurs who worked to influence decisions in other departments: “[The prioritization process] was [an] attempt at telling public works, like, if you . . . want to make the most impactful use of your limited resources . . . here's the 10 projects [where] you can't go wrong” (Informant 31). One policy entrepreneur was a representative from a local non-profit organization, who was a “a very influential voice at the table”
(Informant 31) and walked the line between a partner and critic of the City (Informants 32, 35).

Although one informant thought the current mayor had helped promote data-driven planning and the use of indicators (Informant 34), other informants felt that support from the mayor or city council was lacking and was in fact, a significant obstacle to structuring the organization to make use of the indicators (Informant 35). One informant said: “If you had the Mayor of Indianapolis and the City-County Council say, ‘We're adopting these three measurements’ . . . I think that would go a long way” (Informant 31). For a summary of the explanatory factors that contributed to social learning, see Table 37.

6.3.3.2. Argumentation and Health Framing

Informants noted that data and indicators need to be connected to narratives to make change (Informants 35, 36):

I think where you can use the data and the indicators . . . not just the numbers . . . but the point, the narrative, the messaging around that, when you can use that with a broader audience, that includes not just the public, but civic leadership, community stakeholders, or . . . organizational type partners . . . I do think that can push leadership (Informant 35, original emphasis).

People who are “both fluid in interpreting data, understanding data, and also storytelling” were considered highly valuable by one informant (Informant 36). Using data that reflects community values was a strategy that planners used to advance change: “The data that you showed pushes your agenda . . . . The fact that we are calling
out and even researching how expensive it is to travel in Indianapolis and the disparity . . . I mean, that conveys a value” (Informant 31).

Health was not a specific goal within Walkways, although rates of obesity was an indicator that was nested under the goal “build walkable places for all” (see Table 10). “Health and safety” was a goal in Indy Moves, under which were indicators relating to active travel infrastructure and crashes (see Table 11). During Walkways, the public expressed an interest in including a health metric for obesity, because “they were making the connection . . . ‘We don't walk because it's unsafe’” (Informant 32). However, the idea of building communities to promote better health outcomes was generally not well understood (Informant 31). This was partly ascribed to the politics of the state where there are beliefs that “it’s a personal choice, it's not a product of your [environment]” (Informant 31). Even those who work directly with public health were “not talking about obesity and diabetes and really even physical activity . . . as a general rule, [public health actors] have not talked about obesity for 10 years . . . So it really becomes more about access, connection, quality of life . . . the buzzwords . . . like vibrancy, thriving . . . and that's people and community” (Informant 35).

In addition, high-level concepts like public health might not hold the public’s attention, which is tends to be drawn to projects instead:

For the most part, the vast majority of the people that we encountered on the ground in like neighborhood meetings are more project focused . . . We would go through presentations that talked about the values and about health and the things we're trying to do, but at the end of the day, they're like, “Fine—am I going to get sidewalks or not” (Informant 31)?
While one informant didn’t think that Indianapolis’ elected officials rallied around health (Informant 32), another thought that the region’s “mayors talk a pretty good game on health,” although acknowledged that “it doesn't move them as much as economic development” (Informant 36). That said, health is a “much bigger driver of policy than it ever has been” (Informant 36). However, whether an elected official is aware of the built environment’s effect on public health may not be critical:

I don't really care if they care about health if they're doing the right things, right? I don't need you to understand the benefit to physical activity rates or chronic disease rates or whatever. I just want you to build a complete street... If you... build a complete streets because you think it's going to increase property values or because the business owner who's a big campaign donor gives you money and says to do it, good, I don't care, do the right thing (Informant 35).

A public health message didn’t resonate with all actors, but it was useful when pulling together a coalition of diverse interests:

Mobility means different things to different people and the ability to have this very diverse coalition that can speak very authentically to their constituency about the benefits of building trails... And so having different motivations is all right... there are... so many benefits... that I don't know that it was one dominant thing... the beauty of it was you had all these benefits that you can talk about” (Informant 33).
Table 37 Indianapolis Social Learning Explanatory Factors

| Type of information | Measurable indicators developed from plan goals within communicative processes  
|                     | Public desire for accountability  
| Attributes of forums | Engagement processes open to the public  
|                     | City-selected advisory committee members  
| Level of conflict   | Low level of conflict during plan development  
| Attributes of actors | City staff as policy brokers  
|                     | Active policy entrepreneur in a community-based organization  
|                     | Loosely organized people-centered transportation advocacy coalition during plans development  
|                     | Diverse and organized advocacy coalition for a transit initiative  
|                     | Shared beliefs among plan documents, City staff, and advocacy coalition  
|                     | Ambiguous beliefs for departmental mission  
| Argumentation       | Indicator selection driven by beliefs and serve a narrative  
|                     | Public health not a primary message; livability lead message  

6.3.3.3. Policy Change

The fact that *Walkways* was Indianapolis’ first pedestrian plan signifies a major change in transportation policy. In fact, “back [when] most of Indianapolis was built . . . we had a mayor who banned the building of sidewalks, I mean it was that permeated” (Informant 31). In planning processes, City staff discovered that the “desire for walkability was almost universal,” which had not previously been identified as a community or planning priority (Informant 31). A people-centered transportation paradigm had emerged in the face of a “mindset of ‘Our goal is to get people into the city as fast as possible and get them out as fast as possible and our major thoroughfares are for cars.’ But there is a different culture now where the people are pushing back
saying ‘No, we want traffic calming; we don’t want our seven-year-olds getting killed’ . . . as they cross the street for school because they don’t have a lot of pedestrian infrastructure’’ (Informant 33).

No informants described an acute crisis or key political moment that drove this shift in policy direction. Rather, they tended to describe how cultural values, planning efforts and funding pieces came together, including a decade of crafting partnerships, work on a Complete Streets policy, and the Plan 2020 effort (Informants 31, 33, 35). Informants credited demographic change for shifting the policy paradigm such that walkable neighborhoods were more desirable (Informants 31, 33):

Our suburban neighborhoods that were built without sidewalks are now seeing their competitors being built across the county line and they’ve got amazing infrastructure, they’ve got trails and pools and all kinds of stuff. And they’re like, “Why would you buy a house in my neighborhood?” I think you’re starting to see people realize that the values were changing. People were demanding different types of neighborhoods and those are not the neighborhoods that we have in [Indianapolis’] stock (Informant 31).

According to one informant, these changes in community values are mirrored by changes in the planning profession. In a “generational shift,” Indianapolis planners are changing their role from a community “note-taker” to an “agenda sort of planner, for a lack of a better word” (Informant 31).

Successful active transportation projects also demonstrated the value of people-centered transportation. The push for bicycle infrastructure, in the form of the

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4 In 2021, a seven-year-old was killed crossing the street with her mother and a crossing guard. This occurred after the adoption of Walkways and Indy Moves.
Indianapolis Cultural Trail and Rebuild Indy—an “initiative to restore the infrastructure in Indianapolis” (Rebuild Indy, n.d.)—“had a big cultural shift and impact . . . on the City thinking about mobility beyond the car” (Informant 33). Even before the Indianapolis Cultural Trail was the Monon Trail, which extends north of Indianapolis, “was very much a proof of concept on the impact that . . . protected pedestrian and bike infrastructure can play in . . . community health and . . . property values” (Informant 33).

Indicators also represent a change in policy instruments or minor policy change. One motivation for including indicators within the plans was to have a process to prioritize projects within a highly financially constrained environment. Noting how the lack of safe places to walk limits economic opportunity for families and makes it difficult to attract residents looking for walkable neighborhoods, Walkways states “Indianapolis must use data-driven strategies to prioritize limited funds and target pedestrian improvements in the places where they will have the most impact” (Indianapolis, 2016, p. 2). Another motivation for using indicators was to challenge the traditional governance paradigm:

> The approach that has been used historically . . . has been a . . . non-linear, non-transparent, non-data-driven approach to where projects get done and which projects get done . . . . It’s not equitable. It’s largely based on power and community dynamics and that kind of thing (informant 35).

Indicators were also considered an accountability mechanism. One informant’s perspective was: “What gets measured gets done. And so to me, measurements are a form of accountability” (Informant 31). Within the engagement process, the public “cared about the higher-level objective but it was almost like a where the rubber hits the
road kind of thing . . . these are people that . . . have been pissed off for a long, long time. And so they wanted accountability measures included as part of [Walkways]” (Informant 32).

A list of policy change explanatory factors is provided in Table 38.

**Table 38 Indianapolis Policy Change Explanatory Factors**

<table>
<thead>
<tr>
<th>Policy learning</th>
<th>Possible learning through engagement processes, particularly within existing conditions analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in stable parameters</strong></td>
<td>Change in public values about the role of transportation (e.g., safety and equity)</td>
</tr>
<tr>
<td></td>
<td>Change in planning values about the role of transportation (i.e., people-centered)</td>
</tr>
<tr>
<td><strong>Change in dynamic parameters</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

6.3.3.4. **Indianapolis Conclusion**

Indicators helped facilitate social learning about transportation inequities, such as the high transportation costs in Indianapolis. Indicators were measurable and did not produce controversy. Because City staff and advocates shared the same values, the plan development policy subsystem could be called unitary. However, departmental and elected leaderships’ commitment to implementing projects based on those values was questioned by some informants. The City’s ability to advance people-centered transportation projects was further compromised by its financial condition. Based on informant descriptions, the people-centered advocacy coalition within Indianapolis generally was not highly coordinated at the time of Walkways and Indy Moves. However, a diverse coalition pulled together for a transit initiative.
The major policy changes within Walkways and Indy Moves were facilitated by the actions of policy actors, social learning from some indicators, and further supported by changing cultural values about the purpose of transportation. Introducing indicators represented new policy learning about the means to accomplish policy goals; however, informants questioned whether this approach was being realized in decision-making. Although health was often recognized as an important aspect of transportation plans, informants did not rely on a public health message to convince the public or elected officials of the plans' value.

6.3.4. City of Memphis

6.3.4.1. Social Learning

During the Memphis 3.0 engagement process, community members raised issues of concern; that is, residents framed the problems. Phase One of the community engagement process involved public discussions regarding Memphis’ strengths, weaknesses, and opportunities; these conversations informed the “inventory of current conditions” undertaken by the Office of Comprehensive Planning (OCP), which included concerns about blight and the lack of transit (Memphis, 2021, p. 34). Unlike other plans in my dissertation, Memphis 3.0 included high-level systems monitoring indicators, but the specific metrics had not been finalized.

The City had “a pretty rigorous approach to community engagement” (Informant 41) for Memphis 3.0, with four phases of engagement effort over the course of two years, reaching 15,000 people. The City made extensive use of community partners to
undertake engagement activities: “with 44 Citywide and neighborhood organizations and enlisted over 60 Memphis 3.0 Ambassadors who volunteered to assist in event coordination and recruitment during the Comprehensive Plan” (Memphis, 2021, p. 33).

The OCP contracted with a non-profit community-based organization, BLDG Memphis, to lead the community engagement work. BLDG Memphis, in turn, contracted with other community-based organizations for community engagement activities (Informant 46). 

*Memphis 3.0* also had a “high-level” executive steering committee, consisting of executive level representatives from City divisions, consulting firms, community organizations, and businesses (Informant 46). The executive advisory committee was not highly engaged in the *Memphis 3.0* process but they “were supposed to turn around and champion this to city Council to make sure that it actually got adopted” (Informant 46).

A land use and transportation-focused advisory committee had community advocates, developers, representatives from nonprofit organizations as well as City transportation and planning staff (Informant 45).

Memphis has the lowest city budget and public works budget among my case cities (see Table 4). Memphis “relies heavily on partnerships in the nonprofit sector,” (Informant 46). The City has been able to garner significant funding from philanthropy for planning and city management efforts. During the previous administration, Memphis had been chosen as one of five cities to have “Innovation Teams to work with local city government . . . addressing various civic issues and bring about sustainable change” (Informant 44). This Bloomberg Innovation grant enabled the creation of the Office of
Performance Management (OPM) (Informant 41). The City received a grant from the Kresge Foundation, among other (primarily local) philanthropies, to fund the comprehensive plan (Informant 41). This included funding for the creation of the OCP (Informant 41), as the planning functions of the City previously had been underfunded (Informant 45). The City’s Information Technology Division had Geographic Information Systems (GIS) analysts that were available to help further develop indicators and metrics after plan adoption; the OPM has also recently hired staff with GIS experience (Informant 43).

The Division of Planning and Development’s (DPD) mission, in which the OCP is located, the Memphis 3.0 vision, and community-based organizations share similar values (see 4.4 for mission and goal statements). BLDG Memphis, Innovate Memphis, and the Memphis Center for Independent Living are among the organizations who work on transportation issues, although the Memphis Center for Independent Living did not engage politically (Informant 42). Innovate Memphis was essentially the first Office of Performance Management. After the Bloomberg Innovation Team “grant cycle ended, people were excited about [the Innovation Team’s] work—they still wanted to see it in the community of Memphis” and a separate non-profit organization was formed (Informant 44). BLDG Memphis was highly involved in public engagement during the plan and since the plan’s adoption their role has been to “keep the document alive essentially, so people don’t forget about the plan” and use it to make decisions about the community (Informant 47).
Those who advocated on transportation issues during the *Memphis 3.0* process were a relatively small group and that were focused on transportation: “It's very niche . . . like, I know them all by name” (Informant 47). The transit plan, which emerged after community members raised transit as an issue early in the engagement process, garnered more organized and diverse support (Informant 44). Informants did not report any organized opposition to the plan (Informants 45, 46). Among the advisory committee, one informant indicated that there were “definitely differences of opinion” but not camps of competing interests (Informant 45).

**6.3.4.2. Argumentation and Health Framing**

Policy actors within the City were aware that using data effectively involved argumentation. City staff were aware that certain neighborhoods had a higher level of disadvantages and use data to help demonstrate it. This was complemented by “people’s stories at the meetings [that] were able to give . . . greater insight and context . . . that the data alone couldn’t tell” (Informant 41). The mayor’s office frequently uses the OPM online performance dashboard and creates narratives from the data (Informant 46).

Health was not a specific goal in *Memphis 3.0*. Issues such as “food . . . and sustainability, like climate, mitigation, disaster preparedness, the workforce housing” were in discussion during *Memphis 3.0*, which addressed some of the “social determinants of health” (Informant 41). Although the “connection” to health “could definitely be made” (Informant 44), transportation conversation was primarily “about access to jobs and opportunity” (informant 46). The “transit component of the plan was
almost exclusively about how can we connect people to jobs better . . . . It’s how they visualized everything” (Informant 46). In general, the City did not typically use a health frame for City transportation projects and instead discussed the “mobility benefits . . . maybe the economic development benefits” (Informant 45). However, the general public often brought up health, specifically physical activity, as a rationale to build safe streets (Informant 45).

Public health was seen as a possible option for messaging the benefits of people-centered transportation, depending on the context (Informant 44). In City of Memphis planning efforts, there is a “willingness to talk about race, and its influence . . . on development and equity and health,” but it is still framed “in terms of . . . what are the economic consequences of that?” (Informant 46). One informant felt that a racial equity frame does not always “resonate” because it turns into “have and have-not issue.” Including a public health message could provide “more traction” in getting people to understand the consequences of a “car-centric city” (Informant 47). However, there was some public skepticism about positioning transportation as a solution to the health problems in the community: “There are negative health indicators in the African American community, and your solution to that is just giving them bike lanes? Like, how does that help” (Informant 45)?
Table 39 Memphis Social Learning Explanatory Factors

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Indicators without metrics developed from plan goals within communicative processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributes of forums</td>
<td>Engagement processes open to the public City-selected advisory committee members</td>
</tr>
<tr>
<td>Level of conflict</td>
<td>Low level of conflict during plan development Some controversy for plan adoption</td>
</tr>
<tr>
<td>Attributes of actors</td>
<td>City and residents were problem framers Small people-centered transportation advocacy coalition during plan development Diverse and organized advocacy coalition for the transit plan Shared beliefs among plan documents, City staff, and advocacy coalition</td>
</tr>
<tr>
<td>Argumentation</td>
<td>Mayor used data to tell stories for change Public health not a primary message; economics is lead message</td>
</tr>
</tbody>
</table>

6.3.4.3. Policy Change

Memphis 3.0 is the first comprehensive plan for the city since 1981. The direction of Memphis 3.0 was radically different from past policy (Informant 42). The overall strategy for the plan is “build up, not out,” which distinguishes it from the historical model of development that centered on land annexation and was accompanied by flat population growth (Memphis, 2021). City staff produced employment accessibility analysis, showing how many jobs could be reached within a certain radius. Limited transportation options and poor transit service were raised as key issues within the engagement process, which relates strongly to access to employment (Memphis, 2021, p. 34). These joint concerns eventually led to the creation of a new transit component of Memphis 3.0, which had not originally been on the Memphis 3.0 agenda. The transit plan brought a diverse coalition together to advocate for transit improvements, including the chamber of commerce, because of the concerns around access to employment (Informant 44).
The public’s transportation preferences had shifted toward people-centered strategies. During the *Memphis 3.0* engagement process, the issues of housing and access to opportunity were voiced in “all of our meetings” (Informant 41). Reducing crashes was another key issue (Informant 41). Transportation-related goals that were set during the community engagement process included transportation choices and improvements to transit reliability and frequency (Memphis, 2021). Ten years ago, transit wasn’t “even on the radar” but had emerged as a major theme (Informant 45). Relative to pedestrian and transit investments, bicycle infrastructure had lower levels of support (Informants 45, 46), although placing bicycle infrastructure in the context of first mile-last mile made sense to most people (Informant 46). In 2019, Memphis was the highest ranked city for pedestrian deaths, making safety an issue that was “top of our minds” (Informant 42). It is not clear if this specifically influenced *Memphis 3.0* or affected the public’s attitude toward traffic safety more generally.

**Table 40 Memphis Policy Change Explanatory Factors**

<table>
<thead>
<tr>
<th>Policy learning</th>
<th>Possible learning through engagement processes, particularly within existing conditions analysis Residents brought issues to the attention of the City (e.g., blight, transit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in stable parameters</td>
<td>Change in public values about the role of transportation (e.g., safety, access to opportunity)</td>
</tr>
<tr>
<td>Change in dynamic parameters</td>
<td>Memphis ranked high for pedestrian deaths in 2019</td>
</tr>
</tbody>
</table>

**6.3.4.4. Memphis Conclusion**

Rather than members of the public learning from elite policy actors (e.g., policy brokers, policy entrepreneurs), an open engagement forum enabled residents to bring forward issues of concern, such as transit, to the City’s attention. Regarding transit, City
then undertook further analysis on access to employment to understand the problem more clearly. The systems monitoring indicators within *Memphis 3.0* were not measurable at the time of plan adoption and their later refinement seemed disconnected to plan actions, which may have prevented OPC staff from using them effectively (Informant 41). Because City staff and advocates of a people-centered transportation paradigm shared policy beliefs and because there were no organized opposing interests, the policy subsystem was likely unitary. There were some policy actors who engaged in policy debate but did not overtly participate in the political process, resembling the MSF concept of the policy community. The inverse was also true; the executive advisory committee’s role was primarily political.

Given that the previous comprehensive plan was from 1981, any new transportation plan would have likely represented a major policy change. That a people-centered and equity-focused transportation plan emerged, however, was made possible by a shift in cultural values. It is possible that the high number of pedestrian deaths within Memphis also boosted this policy change but this connection is not clear.

Although the inclusion of indicators within the *Memphis 3.0* was a first, the City had been working with indicators for some time. This minor policy change was not new to the City but was new in the context of the plan.
6.3.5. City of Seattle

6.3.5.1. Social Learning

The major learning within the City of Seattle Bicycle Master Plan (BMP)—“the heart and soul of the conversation” (Informant 51)—was about creating an all ages and abilities bicycle infrastructure network. Rather than focusing on the needs of vehicular cyclists, an all ages and abilities approach emphasizes younger, older, and disabled riders (Informants 51, 54). In addition, “a lot of that discussion has been around [re-] directing inequitable investment and making sure that the parts of the city that are underserved are getting” an all ages and abilities network (Informant 54) as well as equitably distributing infrastructure in low-income communities and communities of color (Informant 51, 54). There was also some learning about the data, particularly with health data. (Informant 55). At the time of the BMP, the state of the practice linking health and built environment data was “new and rapidly evolving” (Informant 55). In addition, there were changes in data availability, collection, and storage between 2007 and 2012 as well as changes in standards in bicycle infrastructure and facilities. This learning was reflected in the plan and indicators (Informant 55).

The primary concern with indicators in the 2017 City of Seattle Pedestrian Master Plan (PMP) was that the previous plan had too many: “The principal conversation around measures [was] really trying to pare them down to the most fundamental and basic measures” (Informant 53). The existing conditions in the PMP were the starting point for indicators, which were then carried through to prioritization (Informant 55).
Only one informant found the analysis results novel; otherwise, informants did not indicate that indicators revealed new or underappreciated conditions. New aspects of both plans included an increased focus on equity, expressed sometimes as health equity, which was informed less by indicators and more from a general shift in public conversation.

Seattle is the only case where informants did not describe an extensive level of community engagement in developing the PMP and BMP. Rather than creating ad hoc plan advisory committees, the Seattle Department of Transportation (SDOT) relied on existing standing advisory boards to guide the development of the plan and assist with project prioritization (Informant 52-53). For example, the Seattle Bicycle Advisory Board (SBAB) provided feedback on the plans and have continued to serve as “stewards” of the BMP (Informant 52). SBAB was highly engaged in developing plan goals and provided input on indicators (Informant 57).

The PMP and BMP process did not generate much controversy. For the PMP, “the most controversial piece of the plan was its focus on new infrastructure. When [SDOT] went out for public comment, we had to contend with a big push against SDOT not focusing more on maintenance” (Informant 53). No informants described a challenge to the indicators in plans, but one informant discussed how, within the City, the freight team had a “very long and established practice of using of using data and metrics, and they’re like, . . . we have this freight route and it’s got to be a million feet wide, because we bring . . . Boeing 737 wings through there at night” (Informant 55). The bicycle team
was “at a disadvantage because [they] didn’t have that data parity. And that’s a trend that still . . . happens” (Informant 55).

SDOT had sufficient financial and technical resources for plan development as well as for project development and implementation; Seattle has the highest city budget and transportation budget among case cities. In November 2015, a 9-year, $930 million transportation levy passed to help achieve the vision expressed in Move Seattle (Seattle, 2017, p. 17) and help sell the bond package by communicating how the City would spend the funds (Informant 53). This was the second levy voters had imposed upon themselves. In addition, the funding enabled the City to “leveraging outside grant opportunities” (Informant 56). As this levy sunsets in 2024, SDOT is preparing a new citywide transportation plan which will ideally launch a new funding strategy (Informant 52).

In general, the City and city transportation plans supported the people-centered transportation paradigm (see 4.5 for mission and goal statements). However, while many city staff were subscribed to the people-centered paradigm, conflicts between freight and active transportation projects were often elevated to the mayor’s office (Informant 55). Organizations involved in the people-centered advocacy coalition were the standing advisory boards associated with the PMP and BMP, the Cascade Bicycle Club, and Seattle Neighborhood Greenways (SNG), as well as local media such as The Urbanist and Seattle Bike Blog (Informant 52). The Cascade Bicycle Club and SNG pushed for a shift in transportation policy such that transportation infrastructure served people of all ages.
and abilities (Informants 51-52, 54). They also lobbied during the development of the Move Seattle Levy to ensure that bicycle metrics were included and that the bicycle program had dedicated funding (Informant 52). Some elected officials were champions for active transportation. One city council member in particular “pushed” on bicycle transportation (Informant 51) and a previous mayor identified as an active transportation supporter (Informant 54). However, these actors were engaged primarily at a project level and were only in office for limited amounts of time, so their support could not be relied upon for the long-term.

Seattle was the only case city to describe organized competing advocacy coalitions: the people-centered transportation coalition and the freight community. Freight perceived themselves as competitors, although it “doesn’t need to be” (Informant 56). “Seattle is and views itself as an industrial place” and active transportation projects, with the associated changes in land use, were perceived as a threat to the freight community’s “way of life” (Informant 56). Another informant described the conflict as “zero sum game of the different modalities [between] the freight board and the bike board and pedestrian advisory board, when in reality it should be more holistic” (Informant 51). However, this competition was most visible during implementation, such as the freight community blocking bicycle projects (Informant 56), and not during plan development.
6.3.5.2. **Argumentation and Health Framing**

Public health was not a leading message within the *PMP* or *BMP*, and where it was used, it was often associated with equity. In fact, those involved with the *BMP* were a “little fearful” about using public health as a leading message: “Is that the message people associate with biking? . . . We want it to be like, ‘Hey, anyone can ride a bike’” (Informant 57); that is, it might suggest that only bicycling is an activity limit to those who are already healthy. The *PMP* had an explicit goal for health and noted the multidimensionality of indicators; for example, the “number of pedestrian fatalities and serious injury collisions” addressed several themes: safety, equity, health, and vibrancy (see Table 15). Physical activity was a performance measure in the *BMP*, but it was classified under the theme of “livability” rather than health (see Table 16). In general, health “hasn’t been . . . the thing that people have used to justify” transportation policy or projects (Informant 56). One informant indicated that public health and transportation connections had a greater focus in the past, but the “area of emphasis has [been] shifting . . . to seeing better racial inequity outcomes” (Informant 53). In the *PMP* health indicators were connected to equity for the existing conditions analysis because “poor health indicators . . . highly correlate . . . with low-income and minority populations” (Informant 53). This was similar within the *BMP*, where “health outcomes . . . are used to evaluate equity” (Informant 52). However, members of the public don’t always see the connection between health and equity, so it hasn’t been something that SDOT centers in communication (Informant 52).
Generally, safety, equity, and connectivity are concepts that “make sense to people” (Informant 52). Increasingly SDOT’s approach is to undertake community engagement to understand community needs and frame projects in ways that speak to those needs, which might be about public health but could be about having transportation options (Informant 52). One challenge with framing projects with equity is that “everyone wants equity on their side” and “so people often use it as a justification for why something needs to be done” even though “you could use it either side of an issue” (Informant 56). This informant also emphasized that indicators are not value-neutral and support beliefs: “On the idea of ‘correct indicators:’ there’s no one answer to that question because it really depends on who and . . . how it serves the narrative that they would like to construct” (Informant 56).

Table 41  Seattle Social Learning Explanatory Factors

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Measurable indicators developed from plan goals within communicative processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributes of forums</td>
<td>Engagement processes open to the public, Standing advisory committee members with a strong role in plan development</td>
</tr>
<tr>
<td>Level of conflict</td>
<td>Low level of conflict during plan development</td>
</tr>
<tr>
<td>Attributes of actors</td>
<td>Shared beliefs among departmental mission, plan documents, City staff, and people-centered advocacy coalition, Two advocacy coalitions present</td>
</tr>
<tr>
<td>Argumentation</td>
<td>Indicator selection driven by beliefs and serve a narrative, Public health not a primary message; safety, equity, and connectivity leads</td>
</tr>
</tbody>
</table>

6.3.5.3. Policy Change

The 2017 PMP was an update of the 2009 plan, so the planning process did not involve a wholesale re-envisioning of the strategy but rather a document refresh that included an assessment of the previous plan’s accomplishments and updated data and
metrics (Informant 53; Seattle, 2017, p. 11). Equity was “definitely an influential factor in the development of this plan but . . . I don't know [the] delta between the old” plan and 2017 plan (Informant 53). The 2014 BMP did not completely restructure the previous BMP, but it did shift from the needs of vehicular cyclists to the idea of an all ages and abilities network (Informants 51, 57). This represented a major shift in policy and resulted in a new types of bicycle infrastructure, supported by the changing standards in bicycle infrastructure and facilities that was happening at a national level (Informant 55). Because Seattle had been using indicators in previous plans, there was no significant minor policy learning or change regarding data-driven planning, with the exception of new data sources becoming available (Informant 55).

The increased focus on safety and equity as part of transportation might be part of a change in cultural values among the public. In this context, the people-centered advocacy coalition succeeded in shifting transportation policy toward an all ages and abilities network. An external shock, or focusing event, occurred during Mayor Murray’s tenure, about the same time as the development of the BMP. A woman was killed cycling on Second Avenue downtown, which spurred the development of a protected bicycle lane on Second Avenue (Informant 51). Although this death clearly motivated project implementation, it is not clear how it affected the development of the transportation plan.
Table 42: Seattle Policy Change Explanatory Factors

<table>
<thead>
<tr>
<th>Policy learning</th>
<th>Indicators may have supported learning but did not drive learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in stable parameters</td>
<td>Change in public values about the role of transportation (e.g., safety, equity)</td>
</tr>
<tr>
<td>Change in dynamic parameters</td>
<td>External shock: death of a cyclist downtown</td>
</tr>
</tbody>
</table>

6.3.5.4. Seattle Conclusion

It appears that the major policy learning—delivering active transportation projects more equitably and creating an all ages and abilities bicycle network—occurred within the people-centered advocacy coalition and through their advocacy work. SDOT relied on standing advisory committees and discussions in these forums influenced the direction of the plans. Likely these conversations also occurred within the public engagement process, but informants did not describe these processes as a major forum for learning. Both the PMP and BMP were intended to be updates to existing plans, so perhaps SDOT may have considered an extensive engagement process to be unnecessary.

Indicators were measurable and were not weaponized in debate. The plan development processes were also not controversial, although there were two competing advocacy coalitions present in the policy subsystem. However, this controversy manifested during implementation processes, suggesting that the policy subsystem characteristics during implementation may be different from those of plan development.

There appeared a change in a stable parameter, changed cultural values about transportation, to facilitate this policy shift. The death of a cyclist downtown represents an external shock, although it may not have directly affected this policy shift.
6.4. Discussion

This research examined the conceptual use of health indicators in municipal transportation plans, defined as their influence on social learning and policy change. Drawing from diverse literatures, I developed three propositions for the influence of health indicators. The first proposition addressed policy learning:

1. Health indicators produce of policy learning during transportation plan development when:
   a. A policy actor frames problems using values (ACF, MSF);
   b. Within communicative processes and open forums (CPT, ACF); and
   c. Low to intermediate levels of conflict exist in the policy subsystem (ACF)

Informants described how the value of indicators was in “not just the numbers . . . but the point, the narrative” (Informant 35, original emphasis). Even before indicators are presented for public discussion, policy actors consider “how [an indicator] serves the narrative that they would like to construct” (Informant 56). Although staff planners were key actors who framed problems, the public also identified problems in Boston and Memphis, and nonprofit organizations led the conversation in Seattle. Public discussion in communicative processes—either through public engagement, within advisory committees, or during workshops—produced further learning, illustrating that “it was the dialogue, quite frankly” (Informant 31) that enabled indicators to produce social learning. Within all cases, the issue that garnered the most attention and generated
learning was social equity, particularly racial equity. Described by informants as a non-issue in previous years, transit emerged as another key concern. In all cases, the indicators that facilitated policy learning were not controversial, even if informants described them as eye-opening.

Plan development processes were low in conflict. One reason may be that the design of the engagement process; open and consensus-oriented forums are said to facilitate learning per the ACF and CPT. While all plans had relatively inclusive engagement processes, Seattle had the least extensive engagement process and also fewer instances of learning from indicators per se, according to informants. This supports the idea that more community dialogue promotes social learning.

Another possible reason for the low conflict could be that there was only one advocacy coalition present within the policy subsystems examined; only Seattle had a competing coalition, and it was not really active during plan development. Unitary policy subsystems (i.e., no competing coalitions) are said to support the status quo. Yet actors within the plan development processes, both internal and external to the cities, were actively seeking change. A third reason for the low conflict may be that implementation, with its attendant funding decisions, tends to be more controversial than plan-making. I discuss the nature of municipal transportation policy subsystems, particularly the relationship between plan-making and implementation in the conclusion.

The second proposition addressed minor policy change:
2. Policy learning will generate minor policy change when there are no shocks to the policy subsystem

The use of indicators within plans represented minor policy learning and policy change; that is, a change in policy instruments or instrument thresholds as defined by the ACF. Seattle had previously included indicators within plans, so this was not a new learning/change for them. In the case of Memphis, indicators were new in the context of comprehensive planning, but not for the City generally. The drive to include indicators came from mayors (Denver, Memphis) and departmental or plan leadership (Boston, Indianapolis). Accountability was also a key value among City staff and advocates external to the City in all cases. In many case cities, the motive for this policy shift was to address inequitable funding and implementation of projects. As discussed in Chapter 5, previous learning through other data-driven efforts, such as Vision Zero or Bloomberg Philanthropies What Works Cities program, helped to familiarize policy actors with indicators. Consistent with this proposition, no shock to the policy subsystem was necessary to produce this minor policy change.

The third proposition addressed major policy change:

3. Policy learning will generate major policy change when there are shocks to the policy subsystem

The major policy change that occurred within the transportation plans was about people-centered transportation, specifically with a stronger focus on access, safety, and equity and inclusion. It is not clear how much indicators per se promoted learning, given
that they were embedded within a larger process and closely connected to policy goals. Informants emphasized that the story about the data is what mattered more than the data itself. Policy change within some plans was not the result of learning provided by indicators. For example, Seattle's BMP shifted to deliver an all ages and abilities bicycle network absent a specific indicator within the plan development process (although previous research about the types of cyclists informed the change⁵).

Contrary to the proposition, there were no shocks to the policy subsystems. The major policy learning that occurred with engagement processes coincided with a broader shift in cultural values (a stable parameter), resulting in a shift in transportation policy. It is possible that this shift in cultural values was not needed to make policy change possible, but because a shift toward people-centered transportation occurred in every case city, there is no counterfactual to demonstrate that policy learning alone contributed to policy change. This change in attitude toward people-centered transportation could be a shift in public opinion, a dynamic parameter, rather than a change in cultural values, a stable parameter. The ACF does not define these two terms. However, the MSF emphasizes that a shift in public mood is less about objective measurement of the public mood but rather an elected official's interpretation of the mood. However, no informants described reactions by elected officials as the genesis of

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⁵ Roger Geller from the City of Portland proposed there were “four types of cyclists,” which was subsequently confirmed in research by Dill & McNeil (2016) (see references).
the people-centered policy shift. Alternatively, it is possible that the people-centered advocacy coalition became more sophisticated and better-resourced, which facilitated their dominance in this (aspect of the) policy subsystem; this would make it appear as though a cultural shift had occurred.

6.4.1. Argumentation and Health Framing

The ACF suggests that a causal mechanism for policy change is an agenda change, which can be accomplished, for example, by “pursuing public narratives to attract attention to favored courses of action and by appealing to new actors” (Jenkins-Smith et al., 2018, p. 145). Dudley (2013) argues that policy actors construct a rhetorical frame using prevailing cultural values. Then the policy actor can tell a dynamic story using the facts particular to the current situation to couple the streams and create a policy window (Dudley, 2013).

Public health was sometimes a compelling message used to sell transportation solutions, but it never became the leading message in public communication. Most informants could articulate the link between health and the transportation plans, but the messaging to the community was focused on livability, quality of life, or economic vitality. However, some policy actors felt strongly that health was a concept capable of producing significant learning and insight because people could easily connect it to their own life. Partly for this reason, some informants suggested public health was an effective way to communicate equity impacts from transportation. Being able to use public health as yet another reason to promote healthy transportation was perceived as a benefit,
even if it was not the leading message. This is consistent with how the MSF conceptualizes problem framing: “When a preferred policy alternative can be coupled with several different problem definitions, a policy entrepreneur can choose which problem to use” (Knaggård, 2015, p. 451)

Where connecting to public health was helpful was in building a people-centered transportation coalition. The degree of coordination with public health actors varied across the case cities. In some cities, transportation actors had been successful in bringing health-oriented organizations to the transportation table and in other cities actors had recently started the conversation. In other cases, actors were determining how to build the relationship and the messaging. The most active connection to public health actors was within Denver and Indianapolis.

6.4.2. Other Observations

Many informants expressed admiration for Vision Zero’s clarity of messaging and action-orientation. Vision Zero programs had successfully used public health messaging, such as framing traffic deaths as an epidemic, to affect beliefs and change policy. Informants suggested that Vision Zero was easier to communicate than many other health indicators and the public readily accepted proposed solutions: “When you start looking at reduced crashes—I mean, everybody wants that” (Informant 41). Zero is also inherently data-driven (i.e., zero deaths and serious injuries), which informants credited for the softening up of the use of indicators within transportation planning.

Furthermore, some informants indicated that the action-orientation and accountability
that characterizes Vision Zero programs served as a model for other transportation plans: “[The Vision Zero program is] . . . very honest about it. . . . I actually wish more of our goals had specific actions that were time-bound, that we as a society can look at and say, are we doing the things we said, when we said we’d do them” (Informant 25)?

The MSF describes a policy community, actors that reside in policy stream, who debate policy but do not participate in political stream activities. This was not evident in my research where, to a large extent, the actors engaged in policy conversation were the same actors who engaged in political activity. This violates an MSF assumption, which asserts that the three streams (problem, policy, politics) are independent; this is necessary in order for stream convergence, a key moment in the political process, to occur. However, researchers have noted that smaller policy subsystems, such as local government, may differ from larger subsystems (Cairney, 2018). Streams may not be independent and policy actors may be able to manipulate the streams rather than waiting for the “big wave” (Cairney, 2018, p. 200). While Bandelow et al. (2019) found that policy learning in combination with a window of opportunity in the problem stream created policy change, this was not the order of events within this dissertation. That is, the policy window—the initiation of the transportation plan—created the opportunity for indicators to inform social learning and generate policy change. The MSF also suggests that different types of problem-solution coupling occur depending on how the policy window opens. For example, if the window opens from the political stream, policy actors search for a problem to match the proposed solution; if the window opens from
the problem stream, a solution is quickly coupled to the problem (Herweg et al., 2018).

In all cases, the planning processes proceeded in a more-or-less similar way; the primary differences were the specific methods of public engagement. It is not clear if the origins of transportation plans represent openings from different streams; it could be that they opened from the problem stream, where the transportation plan was the solution to the problem.

Finally, the transportation plan policy subsystems in my dissertation did not behave like a typical policy subsystem. In most cities, there was only one advocacy coalition within the plan development process, yet the plans and policy actors advocated for change, not the status quo. New information was not weaponized, and indicators did not need to be measurable to produce policy learning. The latter aspects regarding indicators could be explained by the low levels of conflict in the policy subsystem. As discussed above, one reason for the low level of conflict could be the design of the transportation planning processes, which involved high levels of interactive public engagement and co-development of transportation goals. However, the plan development process, crafted in a consensus-seeking process with no serious financial stakes, differs from the subsequent stage of funding and implementation in which informants described more controversy and opposition. This implementation
phase/component typically has a higher level of conflict, which has implications for how indicators are perceived (Ozawa, 1991; Weible, 2008).

6.5. Conclusion

Indicators are commonly regarded as instrumental tools to inform decision-making. This research highlights the value that indicators provide in facilitating social learning as well. My research demonstrates that social learning occurred during indicator development and community engagement processes in a low-conflict (aspect of the) local transportation policy subsystem. This communicative learning (Holden, 2008) is akin to policy-oriented learning in the ACF, which is more likely to occur in policy subsystems with low to intermediate levels of conflict. The ACF emphasizes that learning occurs within the context of beliefs and values, e.g. “the integration of this knowledge with the basic values and causal assumptions comprising the core beliefs of advocacy coalitions is the focus of policy learning” (Sabatier, 1988).

Many scholars, particularly from constructivist traditions, critique the instrumental rationality undergirding the development of indicators, whether it is informed by evidence-based policy (Smith, 2013) or performance management (Decoville, 2018; Dluhy & Swartz, 2006; Heinrich, 2007; Hezri & Dovers, 2006). This

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6 Policy process theories emerged in reaction to the prevailing “policy stages” approach to policy study. ACF theorists such P.A. Sabatier and C.M. Weible argue that implementation is not a distinct stage of the policy process. In fact, the ACF was first published as a description of the synthesis between top-down and bottom-up approaches to implementation (Jenkins-Smith et al., 2018).
perception of indicators as objective data makes them attractive to policymakers (Hezri & Dovers, 2006; Rydin et al., 2003), but indicators often hide an implicit worldview (Sébastien et al., 2014). In this research, informants engaged in indicator development and use did not perceive indicators as a value-free input into a technical process. Informants were aware that indicators could frame problems and solutions: “the data that you showed pushes your agenda . . . . the fact that we are calling out and even researching how expensive it is to travel in Indianapolis . . . I mean, that conveys a value” (Informant 31). In addition, indicators were envisioned as an accountability mechanism by policy actors, which was centered not on government efficiency so much as it was on equity and transparency. That is, indicators were not perceived only as an instrumental, technocratic tool; they were also considered a tool for facilitating learning (i.e., belief change), setting a policy agenda, and influencing policy change—including changes to advance access, safety, equity and inclusivity, and less explicitly, public health, in transportation policy.

6.5.1. Research Contributions and Limitations

This dissertation contributes to the literature in several ways. Transportation research tends to focus on the instrumental use of indicators; this dissertation examines not only the instrumental use (see Chapter 5) but also the conceptual use of indicators through social learning. I draw from diverse literatures to understand the role of indicators in transportation decision-making. In particular, I connect the “ideational” research in public policy with urban planning research (Béland, 2016). This dissertation
also focused on a municipal policy subsystem, to which the ACF is infrequently applied (Weible & Cairney, 2018).

My case study findings are limited in their applicability to cities with a population between 600,000 and 900,000. The findings do not apply to smaller cities. How indicators influence social learning and policy change in small cities is worth additional study because the belief systems regarding transportation may be different from those of larger cities and smaller cities often have fewer financial and technical resources. The beliefs held by the city and the public may be different in suburban cities in particular because many suburban cities are auto centric. In addition, suburban cities may define themselves in opposition to the principal city of the region, which policy actors and/or the public may be more likely to share a people-centered transportation paradigm.

The role of philanthropy within local transportation policy subsystems was an underexplored component of this research. Foundations played a key role in funding transportation plans or participating in policy conservation. Unlike other policy actors, they were more likely to refrain from political activity, suggesting that they are part of the policy community described in the MSF that is active only in the policy stream. Other policy actors that were not interviewed include those from transportation and/or land use media, such as The Urbanist in Seattle. Additional research using either an MSF or ACF approach should identify the role of these actors in the policy stream or advocacy coalition. The funding associated with foundations might provide one kind of influence in policy change; media would potentially create a different kind of influence.
It is difficult to confirm that social or policy learning occurs in a plan-making process, how indicators contribute to that learning, and how strongly that learning relates to policy change. My research design did not support the ideal operationalization of social learning, which requires measuring the beliefs and cognitive processes of informants. Instead, I relied on informant descriptions of individual and collective learning and informant perceptions of policy change. The extent of this learning is not known—did it occur only in the mind of that informant, among members of the advisory committee, and within a group in a public engagement process? I did not identify the total membership of the advocacy coalition or trace learning between members. Because the indicators developed in these case cities were embedded in policy goals, it was also difficult to ascertain whether the indicator or policy discussion specifically informed the learning. The degree to which indicators led to policy learning is also not known, relative to other factors, because this dissertation only examined how indicators were used in municipal transportation plans.

6.5.2. Further Research

Additional research on how indicators, or other technical information, influences social learning should include research designs that directly measure learning. For example, Deyle and Schively Slotterback (2009) recommend before and after planning process treatments to determine if learning has occurred. Before-and-after surveys about the indicators could be sent to advisory committee members and those who participated in public engagement processes (although on which topic individuals will
learn is difficult to anticipate). Furthermore, if the research objective is to determine whether participatory processes are essential to social learning, then criteria are needed that defines whether the process is sufficiently participatory (Deyle & Schively Slotterback, 2009; Innes & Booher, 1999).

This research relied primarily on the ACF to operationalize outcomes and explanatory factors, although it noted correspondence to MSF concepts. Additional research on indicators within planning processes could apply the MSF more thoroughly, such as using the MSF to understand whether and how a transportation plan opens a policy window. Policy window dynamics include a coupling logic, which are the arguments used to couple streams, and decision style, which involves the amount of information needed to make a decision (Jones et al., 2016). Dudley (2013) argued that a policy window can be opened and closed through a compelling narrative using a rhetorical frame reflective of cultural values. Based on these descriptions, indicators can play a role in both crafting an argument and in providing information to decision-makers. Indicators and policy windows are the among the most popularly studied components of the MSF (Jones et al., 2016).

Further research on the role of indicators in a plan-making process using an ACF approach could address some limitations in the ACF literature. Just as research on communicative learning needs to better understand how learning occurs within group contexts (Deyle & Schively Slotterback, 2009), the ACF also needs to describe the leap from individual learning to collective learning (Weible et al., 2010). The type of policy
actors under examination in the ACF differs from those typically studied with CPT approaches. A planning advisory committee, often the subject of CPT study, represents some of the key policy actors, but an ACF approach requires identifying the extent of the advocacy coalition. Some researchers have employed social network analysis to delimit advocacy coalitions (Henry, 2011; Jenkins-Smith et al., 2018; Weible et al., 2019). Beliefs are the most reliable way to identify coalition members and are a key driver of coordination (Weible et al., 2019). Further research on what constitutes the deep core beliefs, policy core beliefs, and secondary policy beliefs of transportation advocacy coalitions is needed, particularly in the context of attracting coalition members from outside typical transportation policy circles such as public health professionals.

One key omission from the ACF, perhaps because local policy subsystems are not typically studied, is the role of the general public in engagement processes. The ACF and many policy studies theories focus on the activities of elite policy actors. Is the role of neighborhood residents only to provide public opinion, to which elite policy actors respond (cf. Innes & Booher, 2004)? How does the goal-setting that emerges in the public engagement process relate to ACF assumptions and hypotheses on coalition formation, policy learning, and policy change?

Collaborative policymaking is one area of policy studies that examines the role of public engagement. Collaborative policymaking challenges classical implementation theory, which isolates the political policymaking process from the administration implementation process (Ansell et al., 2017). One of the claims of collaborative
policymaking is that the buy-in generated from collaborative policy design lends itself to smoother implementation (Ansell et al., 2017). Similarly, plan-making processes are credited for building a constituency for plan implementation (Deyle & Schively Slotterback, 2009; Innes & Booher, 1999; Kinzer, 2016; Talen, 1996).

However, the literature on how participation is linked to implementation is faced with several challenges, such relying on assertions rather than empirical data (Deyle & Schively Slotterback, 2009), poor operationalization of constructs, and a general paucity of research (Kinzer, 2016). Furthermore, the findings that exist do not demonstrate that public participation always improves planning policy (Kinzer, 2016). Further research would improve understanding on whether plans are implemented, what kinds of outcomes they produce, and whether participatory processes improve implementation. In addition, the connection between plan-making and implementation could help confirm whether the shift toward people-centered transportation truly represents a shift in cultural values or if it represents only the values of the winning advocacy coalition.
7. Overall Conclusion

This research sought to understand how health indicators are used in transportation plans as well as how these indicators influence decision-making. Regarding use, indicators were used as directed by transportation plans for the most part. In post plan-adopt use cases, certain indicator characteristics enabled the indicators to be incorporated into existing routines (i.e., single-loop learning) or modified routines (i.e., double-loop learning). Organizational factors were more important than indicator factors for influencing administrative decision-making, including the institutionalization of indicators over time. Key factors that were responsible for indicators’ influence on administrative decision-making and institutionalization were departmental or elected official leadership, financial and technical capacity, and administrative routines with a clear link to a decision. Prior experience with data-driven planning helped with adoption of indicators and their institutionalization. In many cases, elected leadership who embraced a data-driven management paradigm was responsible for driving the use of indicators, but informants also described how programs like Vision Zero familiarized policy actors with the use of indicators. Accountability mechanisms, particularly in the form of public reporting or reporting to elected leadership, were also important for influencing administrative decision-making.

In addition to administrative decision-making, I defined indicator influence as social learning and policy change. Social learning appears to have occurred through participatory processes where policy actors—city staff or members of the public—
framed problems to be addressed in the transportation plan. Policy actors first framed issues as problems through the selection of indicators within existing conditions analyses. The results of these analyses were also used to frame problems in public discussion and informed policy goals and strategies.

Social learning can be an outcome of a policy process but also an input to policy change (Dunlop & Radaelli, 2020). Changes in policy goals represents a major policy change (Bennett & Howlett, 1992; Hall, 1993) or double-loop learning (Innes & Booher, 1999). Based on informant descriptions, many transportation plans under examination shifted policy toward a people-centered transportation paradigm. For some, this was a radical change, such as the policy change within *Memphis 3.0*, while in others the change in goals was more subtle, such as the shift toward promoting an all ages and abilities network in the Seattle *BMP*. Improved safety, equity, and access to destinations were important aspects of the people-centered transportation paradigm. It is difficult to discern if indicators per se influenced policy change because indicators were embedded in goals. Social learning resulting from discussion of indicators may have been one factor in changing the policy goals within transportation plans.

A key factor enabling major policy change was a change in a stable policy subsystem parameter: the changing cultural values about transportation. Informants described this shift in values based on public preferences as well within the planning profession itself. This is contrary to the ACF hypothesis that social learning produces
major policy change only when there is a concurrent shock to the policy subsystem (a
dynamic parameter).

The inclusion and use of indicators with transportation plans represents minor
policy change; that is, a change in policy instruments (Bennett & Howlett, 1992; Hall,
1993), single-loop learning (Innes & Booher, 1999), or “know-how” (Fischer et al, 2009).
As discussed above, previous experience with data-driven planning and management
helped institutionalize indicators into administrative routines. The link between major
policy learning (i.e., transportation policy goals) and institutionalization was not
confirmed.

Policy actors were able to use public health-related indicators to help craft
narratives to attract attention to an issue and broaden coalition membership (Dudley,
2013; Jenkins-Smith et al., 2018). Informants found that public health was sometimes a
useful way to describe the benefits of transportation plans, but it was never the primary
message in general public communication. The most common way to describe the
benefits of transportation plans involved more traditional planning concepts, such as
livability. In many cases, equity was the focus of the problems defined by indicators, such
as transit access to employment, health equity, or the equitable distribution of
transportation investments. Public health was used as a way to communicate the equity
impacts of transportation projects in Boston, Denver, and Seattle. Within Boston, Denver,
and Indianapolis, public health was used to broaden coalition membership and within
Memphis, policy actors felt that public health had the potential to bring new members into the advocacy coalition.

7.1. Research Contributions

My dissertation contributes to the literature in several ways. I have responded to calls to better understand where health-related indicators are used in transportation decision-making. Furthermore, I examined these indicators at a local level, which are understudied compared to metropolitan and state levels. Rather than examine the data characteristics of indicators as explanatory factors, I used indicator usability and organizational factors to explain why indicators were useful or influential. I examined not only the instrumental use of indicators, which is typical of much indicator research, but also the conceptual use of indicators in a plan-making process. To address the long-standing challenge of operationalizing terms such as “use,” “influence” and “conceptual,” I clearly defined these terms where use was treated as the handling of indicators and influence as administrative decision-making and social learning. The latter was specifically how I defined the conceptual use of indicators. By bridging several literatures that are often isolated from each other, such as knowledge utilization, society and technology studies, urban planning and policy process theories, I was better able to operationalize these terms as well as provide a more robust analytical framework. My dissertation addresses additional understudied areas of policy process research, such as a low-conflict policy subsystem (Jenkins-Smith et al., 2018) and a local policy subsystem using the ACF (Jenkins-Smith et al., 2018; Weible & Cairney, 2018). Finally, I raised some
questions about the nature of local, collaborative plan-making processes, further discussed below.

7.2. Further Research

There are several aspects of the plan-making process described in my dissertation that differ from descriptions of ACF policy subsystems. Plan-making processes were low in conflict and indicators were not weaponized, although higher levels of conflict were reported during implementation. City staff and members of the public and non-profit organizations were part of the same coalition and were advocating for change in the status quo, which is atypical for a unitary policy subsystem. Many of the policy actors in the policy and political streams were the same, contradicting an MSF assumption, although new oppositional actors emerged during implementation. This raises several questions about local transportation policy subsystems: Do collaborative, plan-making processes represent exceptional policy subsystems? Are implementation activities a different phase or different policy subsystem? Do policy process frameworks apply to local policy subsystems?

Public engagement events and advisory committees are relatively inclusive forums intended to produce recommendations to city council, which is another policy forum. Engagement processes may be only one venue within the policy subsystem, much like the observation that ACF research on watershed partnerships “do not encapsulate the entire policy subsystem but rather involve a single venue within the subsystem” (Jenkins et al., 2018, p. 155). Further research should clarify the extent of
the local transportation policy subsystem, including the range of venues/forums available for participation, and how activities from one part of the subsystem, such as plan-making, affect other aspects, such as implementation.

Typically, developing a transportation plan involves high levels of engagement and collaborative processes. Collaborative processes are said to produce additional outcomes beyond social learning, such as higher participation rates (Pineo et al., 2019), community empowerment (Coburn & Cohen, 2012; Innes & Booher, 2004; Pineo et al., 2019), enhanced institutional capacity (Innes & Booher, 2004), and new governance structures (Coburn & Cohen, 2012; Innes & Booher, 1999; Innes & Booher, 2004). These are some of the first, second, and third order effects of consensus building articulated by Innes and Booher (1999). Further research could explore whether the first, second, and third order effects of collaborative policy processes occur and whether they influence other venues and aspects of the policy process. This is consistent with calls to study whether the political capital built in collaborative processes supports implementation activities (Ansell et al., 2017; Innes & Booher, 1999; Kinzer, 2016).

Within this research, I defined a change in plan policy goals as policy change. However, the plan-making process could be considered an agenda-setting exercise, which is part of the pre-decision process (Kingdon, 1995; Liu et al., 2010). Agenda setting is defined as a process when problems are identified and defined and solutions are “generated, considered, and attached to these problems” (Liu et al., 2010). This is an apt description of a transportation plan. Further research should clarify whether the
adoption of plan documents in a policy process best represents agenda-setting, policy change, or implementation.

Finally, it is likely that the characteristics of local governance differ from higher levels of governance, which has not yet been adequately studied using the ACF. The ACF is typically applied to national or international policy subsystems (Weible & Cairney, 2018). Local policy processes may be different. This has been suggested by MSF researchers who have theorized that the three streams in smaller policy subsystems can be manipulated by policy actors, unlike the streams at higher levels of governance. Using the MSF, Liu et al. (2010) found that the most important characteristics in local policy subsystems differed from those in national subsystems. Despite these differences, the MSF is frequently applied to the study of local government activities (Jones et al., 2016), suggesting the framework is compatible with local governance. Additional research using the ACF could enhance understanding about whether and how local government policy subsystems are unique.
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