The Pursuit of Cycling Equity: A Review of Canadian Transport Plans

Alexandra Doran
Steer, Vancouver Office
355 Burrard St #970,
Vancouver, BC V6C 2G8
Alex.Doran@steergroup.com

Ahmed El-Geneidy
School of Urban Planning

McGill University

Ahmed.elgeneidy@mcgill.ca

Kevin Manaugh*
Department of Geography and McGill School of Environment

McGill University, Montreal, Canada, H3A 0G4

kevin.manaugh@mcgill.ca

*Corresponding author

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ABSTRACT

Cycling is increasingly prioritized as a mode of transport with multiple socio-economic, environmental, and health benefits. However, the benefits associated with cycling are not always equitably distributed throughout society, meaning that some people (e.g. people with low incomes, immigrants and people of colour, women, and seniors) may not have access to safe and convenient spaces in which to cycle, with infrastructure inadequately accommodating the varying needs of all members of society. Based on a review of academic literature, as well as a critical review of city-level transport plans in Canada, we evaluate if and how transport plans in Canada are addressing equity, as well as the ways in which planning practice can more effectively provide for it. Findings from the review of Canadian transport plans revealed four key themes related to how plans can, and do currently address equity, including (1) socio-spatial network analysis (2) consideration of equity in projects and priorities, (3) equity-oriented funding mechanisms, (4) inclusive design and safety. While some plans were found to have addressed equity, many did not, or did so to a limited and ineffective way. As per the findings from the academic literature, many opportunities exist to advance the pursuit of cycling equity, including for example, the utilization of appropriate and effective methods of analysis, as well as locally tailored engagement and decision-making processes that effectively address the needs and concerns of local residents, particularly those who are most disadvantaged.

Key Words: Cycling, Equity, Canada, Transportation Plans, Disadvantaged Groups

1.0 INTRODUCTION

As a low cost and health-promoting mode of transport, cycling can play an important role in a city's overall transport system, helping to reduce greenhouse gas emissions, decrease vehicle congestion, and improve public health. As a result, many transport plans and policies have focused on promoting cycling (Boschmann and Kwan, 2008, Manaugh et al., 2015). However, the benefits associated with cycling are not always equitably distributed throughout society meaning that some people (e.g. groups such as people with low-incomes, immigrants and racialized minority populations, and women) do not have access to safe, secure, and convenient cycling conditions (Flanagan et al., 2016). This is particularly problematic as many people belonging to such disadvantaged groups are more reliant on alternative, cheaper forms of travel than the automobile (e.g. cycling, walking, and transit) (Allen and Farber, 2019).When planners and decision-makers fail to effectively incorporate equity into planning and policy-making, they risk disproportionately burdening, and inadequately accommodating the needs of those who stand to benefit most (Golub et al., 2016, Gössling, 2016, Zimmerman et al., 2015). Because of these inequities, disadvantaged groups become increasingly at risk of facing additional problems such as less healthy, inactive lifestyles, and socio-economic disadvantage (Lucas, 2012) – a concept known more generally as "transport poverty" (Allen and Farber, 2019). In response, researchers have pointed out the importance of incorporating equity into the core of planning and policymaking, as well as the processes by which plans and policies are generated (Martens, 2016). In doing so, planners and decision-makers are better equipped at putting forward plans and policies that support not only a healthier environment and economy, but a healthier society overall.

The 2016 Report prepared for the FHWA (U.S. Federal Highway Administration) *Pursuing Equity in Pedestrian and Bicycle Planning* states that a central goal of transport equity is "to facilitate social and economic opportunities through equitable levels of access to affordable and reliable transportation options based on the needs of the populations being served, particularly populations that are traditionally underserved" (Sandt et al., 2016 pp. 1).

This research seeks to understand if and how Canadian transport plans (insofar as they relate to cycling) are addressing equity by first reviewing academic literature to formulate a comprehensive definition of cycling equity, followed by a critical review of transport plans from across Canada. Lastly, this paper presents several conclusions and recommendations that highlight opportunities for both researchers and practitioners to advance the pursuit of cycling equity in planning practice and beyond.

2.0 LITERATURE REVIEW

A review of academic literature related to cycling equity revealed six key subject areas. Collectively these six subject areas have helped to formulate a comprehensive definition of cycling equity, including how it may be achieved. The six subject areas are: Disadvantaged Groups; Design, Safety, and Security; Political and Economic Forces; Racial Profiling and Harassment; (In)adequacies in Planning Tools; and The Planning Process and Procedural Equity.

2.1 Disadvantaged Groups

Any concept of equity depends on a clear understanding of what "good" is being distributed and to whom. Key groups acknowledged in the literature to have suffered disparities in terms of access to safe, convenient, and pleasant cycling facilities are people with low-incomes, immigrants and people of colour (i.e. racialized populations), women, and seniors and children (all of whom could be in multiple categories). Importantly, as we explore below, in addition to disparities in service, these groups have also been overlooked in terms of their inclusion in the planning and decision-making process.

2.1.1 People with Low-Income

Many people with low incomes cannot afford a car, and are therefore dependent on active transport as a mode of travel (Houde et al., 2018). Unfortunately, in many urban contexts, transport plans and projects often exclude or negatively affect those living in low-income neighbourhoods (Grisé and El-Geneidy, 2018, Kent and Karner, 2018). As well, lower income areas are often exposed to negative transport-related externalities (Sider et al. 2015) such as noise and air pollution from nearby auto-dominated roadways and unsafe walking and cycling conditions (Houde et al., 2018). Furthermore, while increasing investment in low-income areas can help improve mobility and accessibility (i.e. the ease of reaching desired destinations such as grocery stores, banks, and greenspaces) (Hansen, 1959), a growing concern is fear of gentrification associated with cycling investments (Houde et al., 2018, Ibsen and Olesen, 2018). Recent evidence suggests that bicycle infrastructure is emerging "disproportionately in gentrified neighbourhoods or is itself a driver of gentrification" (Ibsen and Olesen, 2018). Relatedly, it is important for planners and decision-makers to be mindful of shifting demographic patterns resulting from forces such as gentrification, for instance whether disadvantaged groups living in particular neighbourhoods are likely to benefit from a given project by the time the project is complete. Understanding geospatial shifts caused by underlying political-economic forces is an important, albeit challenging consideration to bear in mind through the generation and implementation process of plans, projects, and policies.

2.1.2 Women

With the exception of countries with well-established cycling cultures such as The Netherlands, Germany, and Demark, the proportion of women cyclists is consistently lower than that of men (Aldred et al., 2016, Frater and Kingham, 2018, Goodman and Aldred, 2018, Xie and Spinney, 2018). For example, in the UK women are approximately half as likely as men to cycle (Goodman and Aldred, 2018). A number of studies reveal that concerns of safety and personal security are the primary reason for which women are less apt to engage in cycling, and that concerns of safety and personal security most often relate to quality of infrastructure or collisions with other road users, and concerns of crime and violence (Aldred et al., 2016, Frater and Kingham, 2018, Goodman and Aldred, 2018, Xie and Spinney, 2018, Abasahl et al., 2018, Aldred et al., 2017, Prati, 2018).

Additional factors can relate to cultural differences and assigned gender roles such as having to travel with children, fulfilling household responsibilities that require trip chaining (Prati, 2018) as well as harassment and abuse (Joshi and Joseph, 2015). For these reasons, women are sometimes considered "indicator species" of bicycle friendly environments (Abasahl et al., 2018).

2.1.3 Immigrants and Racialized Minority Populations

Immigrant and racialized minority populations, particularly those in the U.S., are often overlooked in planning and decision-making despite the fact that immigrant and racialized minority populations have been found to cycle more than their U.S.-born counterparts (Stehlin and Tarr, 2017, Barajas, 2018).This has arguably been worsened by a surge in cycling advocacy groups that are dominated by white, wealthier groups that tend to exclude and overlook the needs and concerns of those belonging to communities of colour more generally (Stehlin and Tarr, 2017). Accordingly, the history of advocacy for a more 'liveable city' by and for communities of colour becomes overshadowed by the contemporary practices and advocacy of predominantly, white, wealthier groups (Stehlin and Tarr, 2017).

2.1.4 Seniors and Children

Aldred, Woodcock and Goodman (2016) claim that promoting cycling should be a priority as the net health benefits of cycling tend to rise with age. However, the literature suggests that those at either end of the age spectrum tend to be more dependent on certain conditions for cycling to be considered both a feasible and desirable mode of travel (e.g. access to safe, high-quality infrastructure, short travel distances, and safety). Importantly, seniors and children may be less able (e.g.: physically, mentally, and legally restricted) to participate in the planning process and are therefore less able to effectively communicate their concerns and barriers.

2.2 Design, Safety, and Security

Cycling-related concerns pertaining to physical safety and personal security are felt universally, not just to those who are disadvantaged. However, in countries and cities with less-established cycling cultures (such as Canada and the U.S.), issues relating to physical safety and personal security often disproportionately affect disadvantaged groups compared to their more affluent counterparts (Golub et al., 2016, Barajas, 2018, Prati, 2018).

Physical safety primarily concerns the presence and quality of infrastructure that provides a safe, well-connected network that links travellers with desired destinations. The presence of a bike lane, for example, is not enough to ensure safe cycling if it is (a) not part of a well-connected system linking residents to desired destinations, (b) fails to be accompanied by adequate traffic calming measures, and (c) lacks community outreach initiatives to encourage cycling (Tucker and Manaugh, 2018). Different types of bicycle infrastructure tend to elicit greater or worse feelings of safety, with a painted bicycle lane on a busy road being the worst, and a fully separated bicycle path the greatest. Unfortunately, low-income, / immigrant and racialized minority neighbourhoods are often provided with the least safe forms of infrastructure (Golub et al., 2016, Grisé and El-Geneidy, 2018, Tucker and Manaugh, 2018, Barajas, 2018). A study from New York City found that census tracts with larger populations of immigrants experienced higher rates of both pedestrian and bicycle crashes after controlling for characteristics of the built environment (Barajas, 2018). This can in large part be attributed to having fewer investment in safe cycling (and walking) infrastructure throughout these areas (Rebentisch et al., 2019, Rothman et al., 2019).

Concerns pertaining to personal security/social safety are different from physical safety as they primarily relate to acts of crime such as violent attacks and theft. As mentioned previously, concerns related to personal security/social safety are even more pronounced with women, children, and elderly, and are often considered to be their primary barrier to cycling (Prati, 2018, Xie and Spinney, 2018). A study conducted in Bogota, Columbia revealed that users of Bogota's cycling network (Cicloruta) had worse

crime-related safety perceptions than Bogota's inhabitants overall, resulting in the need for strategies to decrease threats to user's personal security and social safety (Torres et al., 2013). Strategies to decrease threats (real or perceived) to user's personal security and social safety include more lighting and an increase in police presence (Torres et al., 2013). It is important to note, however, that an increase in police presence may not elicit greater feelings of safety for everyone, but might instead elicit feelings such as insecurity and threat, for those belonging to racialized minority groups (e.g. Black) in the U.S. (discussed further in section 2.4 Racial Profiling and Harassment). The same study also acknowledged the need for more qualitative investigations to learn more about Cicloruta users' safety-related concerns (Torres et al., 2013). In addition to the strategies put forward by Torres et al. (2013), Barajas (2018) suggests planners be involved in helping to establish community-based solutions for improving safety as communities can often provide for more context-sensitive solutions to improving safety be it related to transport or otherwise.

Design and safety concerns have also been translated in recent years to approaches such as Planning for All Ages and Abilities (an approach that strives to provide safe, comfortable, and equitable conditions for all users). The Vision Zero movement, started in Sweden in 1997 and based on the ethical vision that traffic crashes are unacceptable and preventable, offers a system-focused look at road safety and moves beyond individual approaches to road safety. 'Complete Streets' policies and initiatives have also flourished in recent years, which attempt to bring in multi-modal approaches to street design and space allocation.

2.3 Political and Economic Forces

It is important to acknowledge the political and economic forces that shape plans, projects, and investment priorities in local contexts. When it comes to the framing of transport plans (e.g. transport goals, objectives, prioritization of investment), and ultimately, the distribution of transportation benefits, it is primarily planning professionals and elected officials that mediate such decisions (Linovski et al., 2018; Batistta & Manaugh, 2017). While at times the generation of plan and policy decisions can (and should) include a multitude of stakeholders such as local residents, community organizations, and bicycle advocacy organizations, Stehlin and Tarr (2017) note that plan implementation often "rests on the spatialization of these networked powers". For these reasons, planners must work to ensure all members of the community are able to effectively participate throughout the *entirety* of the planning process to ensure the wants, needs, and concerns of those we are planning for are adequately considered and addressed. Projects in particular should be assessed individually to identify the equity implications, and the assessment process should occur repeatedly throughout project planning as well as after implementation (Weinstein and Sciara, 2006). As noted by Weinstein and Sciara (2006), "equity concerns emerge at different times in different projects, from the very conceptual stages of project planning to well after implementation. Thus, one-time equity assessments are unlikely to be effective" (p. 181).

A recent study in Portland, Oregon argues that bicycle promotion is predominantly rooted in neoliberal urban development and economic growth paradigms, and that Portland is primarily concerned with promoting the image of bicycling as a symbol of city livability, progressivity and sustainability (Ibsen and Olesen, 2018). The authors conclude that while cycling certainly has the potential to serve as a less-costly, sustainable mode of travel, cycling seems to be fueling processes of gentrification and

displacement while depoliticizing policies of bicycle promotion under the banner of sustainability and equity (Ibsen and Olesen, 2018).

2.4 Racial Profiling and Harassment

Important cycling-related barriers and concerns pertaining to enforcement, profiling, policing and harassment felt by immigrant and racialized minority groups (particularly in the U.S) are another key theme in the literature. A phenomenon sometimes referred to as 'Biking While Black' demonstrates how people identified as Black are disproportionately subject to racism, profiling, and harassment from not only police, but other road users (Mitchell and Ridgeway, 2018, Goddard et al., 2015). Research on profiling and police bias in SQF (stop, question, frisk) encounters finds that almost uniformly Black and Latino/a populations are subject to higher rates of SQF than population benchmarks (Mitchell and Ridgeway, 2018). As an example, a well-publicized case found the Tampa Police Department issued 2,504 bicycle citations - a total greater than the cities of Jacksonville, Miami, St. Petersburg, and Orlando combined - and of those ticketed, 80% were Black yet only a quarter of Tampa's population is Black (Mitchell and Ridgeway, 2018).

2.5 (In)adequacies in Planning Tools

To generate the conditions that provide for cycling equity, attention must be given to the types of methods and data being employed to assess it (Kent and Karner, 2018, Tucker and Manaugh, 2018). For example, relying on data from bicycle counters (depending on time and location of collection) and data collected from smartphones, could ignore many cyclists (Kent and Karner, 2018). Additionally, some Cycling Level of Service (CLoS) tools have been criticized for their inability to consider key criteria such as personal security that are critical barriers for some of the most vulnerable groups (e.g. women) (Xie and Spinney, 2018). Xie and Spinney (2018, pp. 201) note that the "absence of difference in Cycling Level of Service tools (CLoS) may be symptomatic of a professional ethnocentrism related to the overwhelming male domination of transport engineering, design and planning professions in the UK".

In recent years, however, several methods of analysis have been well regarded for their ability to assess equity, including accessibility and Level of Traffic Stress (LTS) analysis. Accessibility and LTS can be combined to provide a fairly robust equity analysis**.** Researchers are increasingly using LTS to quantify how comfortable a bicycle network is for cyclists, and accessibility to quantify how useful the network is for reaching destinations (Kent and Karner, 2018, Winters et al., 2018). For example, Kent and Karner (2018) employed an "equity of accessibility" assessment that prioritized projects in areas home to the most disadvantaged residents in Baltimore, Maryland. Similar methods have been used to study Brazilian and Canadian cities (Grisé and El-Geneidy, 2018, Tucker and Manaugh, 2018, Winters et al., 2018).

Methods and tools used to assess equity in other studies include Systems Dynamic Modelling (Macmillan et al., 2014), descriptive analyses of imagery found on cycling-related promotional materials and planning documents (Xie and Spinney, 2018, Osborne and Grant-Smith, 2017), qualitative environmental studies that examine the *quality* of infrastructure and surrounding environment, and local interviews / focus groups that investigate local barriers and concerns to cycling from a more in-depth perspective (Barajas, 2018).

2.6 The Planning Process and Procedural Equity

Transcending all of the above topics is the need for procedural equity. In brief, procedural equity refers to the need for inclusivity and participation of disadvantaged groups in the processes by which plans, projects, and policies are generated (Bullard, 2004). By failing to include members of these groups throughout the entirety of the planning and decision-making process, the ability to generate equitable outcomes becomes severely compromised, if not impossible (Bullard, 2004). This is of particular importance in Canada as Canada does not have any overarching legislation mandating the specific inclusion of *disadvantaged groups* in the planning process. As a result, the inclusion of disadvantaged groups in Canada remains wholly discretionary at every level of government, be it municipal, provincial, or federal. Fortunately, resources that provide fairly effective approaches for how planners and decision-makers can work towards procedural equity have started to emerge. Several scholars have argued for the importance of participatory planning to ensure more equitable transport outcomes with regards to active transport (for example, Elvy, 2014; Sagaris, Tiznado-Aitken, & Steiniger, 2017). Examples of such approaches include the formation of citizen action groups as well as Participatory Budgeting processes (Creger et al., 2018).

2.7 Comprehensive Definition of Cycling Equity

Given the research discussed above, cycling equity can be defined as a situation where cycling is a safe, secure mode of travel that improves mobility and accessibility fairly, enabling all people to participate in socio-economic life. To provide for cycling equity, planners and decision-makers recognize and address the needs and concerns of disadvantaged groups by including such groups throughout the entirety of the planning process, and by employing methods of analysis that assess a plan or project's potential to generate equitable outcomes. Plans and projects are prioritized in areas home to the most disadvantaged but are shaped under the consideration of key concerns and barriers such as physical safety, personal security, racism, policing and harassment, and fear of displacement from gentrification associated with cycling investments.

3.0 METHODS

With a definition of cycling equity, including how it may be achieved, transport plans (insofar as they relate to cycling) were evaluated to understand if, and how, they address equity, acknowledging that evaluating transport plans is just one way of understanding the extent to which equity is being addressed in planning practice.

To obtain a representative sample of cycling-related transport plans, the scope of this review focused on the municipal planning context and sought to investigate plan from at least two of the most populous cities within each of the Canadian provinces. Plans were selected using the following criteria:

- Presence of a city-level active transport and/or cycling plan no older than 2008 (approximately the last 10 years), and
- If no active transport or cycling plan, presence of a city-level transportation master plan that is no older than 2008.

This resulted in the identification of 25 plans from 17 cities, including a mixture of active transport, cycling, and transport master plans.

Plans selected were then subject to a screening process to establish whether equity was at all addressed. If the plan was deemed to have addressed equity in some capacity, it was subject to further review. If not, it was excluded from further study. Screening process criteria included the following:

1. "Keyword in Context": Do the words Equity, Justice, or Fairness appear, in context, anywhere throughout plan?

In keeping with the definition of cycling equity formulated from the literature review:

2. Is equity (as a concept) addressed in the plans overarching (i.e.: not pertaining to any particular mode of travel) principles, goals or objectives?
3. Is equity (as a concept) addressed more specifically in cycling-related material (e.g.: cycling-related principles, goals or objectives)?

In order to tangibly address some of the areas of concern identified above, we identify the following four strategies to achieve cycling equity, as informed by our review of literature and other work on equity in planning for active transport (e.g. Batistta & Manaugh 2019); these are concrete approaches that planners can adopt to move towards cycling equity:

(1) Robust socio-spatial network analysis.
(2) Consideration of equity in projects and priorities,
(3) Incorporation of equity-oriented funding mechanisms,
(4) Incorporating accessibility, design and safety measures which includes
  a. Accessibility,
  b. Universal Design for All-Ages and Abilities (AAA)/Complete Streets, and
  c. Personal Security

Importantly, this list does not make recommendations for how to achieve procedural equity as methods to do so are highly contextual and must be established at the local level. That said, methods discussed above (e.g. participatory budgeting processes) are still recommended for consideration. Similarly, equity and justice-related concerns pertaining to gentrification, as well as policing and harassment must also be tackled at the local level, and therefore a discussion of approaches goes beyond the scope of this paper.

Of the 25 plans preliminarily selected for review, 8 were excluded from further evaluation, leaving 17 plans from 16 Canadian cities. All provinces except for Prince Edward Island are included in this study. When only one city was selected from a province, such as in the case of Newfoundland, Nova Scotia, New Brunswick and Manitoba, it was because only one city was deemed eligible for review given the criteria. Alternatively, in the case of Ontario, more than two cities are selected as Ontario has the largest population in Canada warranting the inclusion of a larger sample size. Plans written in English and French were analyzed and included in this study. The 17 plans were then subject to a more in-depth evaluation to understand how equity was being addressed. Table 1 includes the list of cities whose plans were preliminarily selected for review, including the city's population and area (km^2) and whether it was selected for further review. To give a sense of the geographic scope of analysis, Figure 1 depicts the cities where plans were obtained. As illustrated in Figure 1, plans were obtained from every province except Prince Edward Island (no documents were found to have met the criteria), highlighting plans from cities across the country, not just those that tend to dominate Canadian [transport] planning research (i.e. Toronto, Montreal, Vancouver). Note that other terms other than Equity, Justice, or Fairness these might have revealed other issues related to equity such as 'abilities' and 'seniors',

however, we do not believe this would have greatly impacted the sample or analysis. The following section describes how the four components are incorporated in the selected plans.

Insert Table 1 Canadian Cities Preliminarily Selected for Review

Location	Population (2016)	Area (km²)	Plan	Included
Saint John's, Newfoundland	108,860	446	Cycling Master Plan, 2009	Yes
Halifax, Nova Scotia	403,000	5,490	Integrated Mobility Plan, 2018	Yes
			Centre Plan, 2017	Yes
			Halifax 2014-19 Active Transportation Priorities Plan	No
Fredericton, New Brunswick	58,220	132.6	Active Transportation Connections Plan, 2017 (update)	No
Quebec City, Quebec	531,900	484.1	Plan de Mobilité Durable, 2011	Yes
			Vision des Déplacement a Vélo, 2016	No
Montreal, Quebec			Cycling Master Plan, 2016	No
			Transportation Plan, 2008	Yes
Ottawa, Ontario	934,240	2,778	Ottawa Transportation Plan, 2013	Yes
			Ottawa Cycling Plan 2013	No
Hamilton, Ontario	536,915	1,138	Transportation Master Plan, 2018	Yes
London, Ontario	383,825	420.6	Cycling Master Plan, 2016	Yes
			Transportation Master Plan, 2013	No
Kingston, Ontario	123,795	450.4	Active Transportation Master Plan, 2018	Yes
Toronto, Ontario	2,732,000	630.2	Cycling Network 10 Year Plan, 2016	Yes
Winnipeg, Manitoba	705,245	464.1	Pedestrian and Cycling Strategies, 2014	Yes
Regina, Saskatchewan	215,105	180	Transportation Master Plan, 2017	Yes
Saskatoon, Saskatchewan	246,375	228.1	Active Transportation Plan, 2016	Yes
Calgary, Alberta	1,239,000	825.3	Transportation Master Plan, 2009	Yes
			City of Calgary Cycling Strategy, 2011	No
Edmonton, Alberta	932,550	684	Transportation Master Plan, 2009	Yes
Vancouver, British Columbia	631,490	115	Vancouver Transportation Master Plan, 2012	Yes
			Active Transportation Promotion and Enabling Plan, 2016	No

Kelowna, British Columbia	127,380	211.8	Pedestrian and Bicycle Master Plan, 2016	Yes

Figure 1: Location of Canadian Cities Preliminarily Selected for Review

4.0 ANALYSIS

A description of each of the four strategies identified in Section 3.0 are described below, as well as the plans that were most effective in incorporating any or all of the four strategies. When plans provided tangible practices for addressing these ideas, they were deemed to have "operationalized" the concept. Plans deemed to have "operationalized" a given subject are, for example, those then went beyond simply stating it as a goal or objective. While some past research has more narrowly focused on indicators and metrics, we use the broader concept of operationalization to better capture the variety of ways in which plans addressed these issues. A summary of findings for all plans, not just those deemed most effective at addressing and/or operationalizing strategies are presented in Table 2: Summary of Key Findings.

4.1 Socio-Spatial Network Analysis

This concept deals with how plans identify spatial gaps in the existing cycle network while simultaneously identifying socio-demographic groups that *currently* benefit from the network, and those

who *could* experience improvements. By performing a socio-spatial network analysis, cities are more adept at knowing what currently exists, for whom, and therefore what could exist, and for whom. This theme compliments the strategy 4.2 by helping to prioritize projects that are deemed most likely to contribute to equitable outcomes.

From the 17 plans, Winnipeg and Saskatoon were deemed to have most effectively addressed and operationalized this.

By analyzing a combination of spatial and Census data using spatial software (e.g. GIS), Winnipeg performed an equity analysis that identified disadvantaged groups/communities that can benefit from having access to more transport options including low-income, indigenous and immigrant groups, and identified areas that are spatially deprived of infrastructure. Like Winnipeg, Saskatoon operationalized this approach by employing an equity analysis using spatial and census data. This analysis evaluated the current distribution of facilities and identified areas where limited access is present for disadvantaged groups. In other words, Saskatoon identified traditionally underserved and disadvantaged groups/communities that would benefit from having access to more transport options.

4.2 Consideration of Equity in Projects and Priorities

This refers to the extent to which individual projects can provide for equitable outcomes, and by prioritizing those projects which have been assessed to provide for equitable outcomes. Only two city's plans (Winnipeg and Saskatoon) provided solid evidence of addressing and operationalizing this.

Winnipeg operationalized the inclusion of equity by prioritizing network improvements using a Multiple Account Evaluation (MAE). The MAE assessed each pedestrian and bicycle facility based on the following criteria: 1. Network Connectivity 2. Generators 3. Access to Transit 4. Level of Protection 5. Walking & Cycling Potential 6. Equity 7. Safety and 8. Network Spine (City of Winnipeg, 2014). Priority was given to projects that had the potential to contribute to the creation of equitable outcomes by applying a heavier weight to the equity criteria compared to all others.

Similar to Winnipeg, Saskatoon operationalized the inclusion of equity through a process of "Cumulative Factor Scoring" which identifies priority improvement locations based on a list of variables, including Network Connectivity, Trip Generators, Access to Transit, Level of Protection, Equity, Safety, Network Spokes and Potential. Each variable was scored on a five-point scale. After scoring each variable on a five-point scale, results were aggregated to generate an overall score for each new facility. The city then developed a transparent project-ranking list. Areas with the greatest equity potential were given the highest score (City of Saskatoon, 2016).

4.3 Equity-Oriented Funding Mechanisms

This refers to evaluating funding mechanisms for their potential to minimize the financial burden of transport costs on those who are least able to pay. Only two plans incorporated this, one of which (Quebec's Plan de Mobilité Durable 2011) did so minimally. The other, Kelowna's Pedestrian and Bicycle Master Plan 2016, was comparatively much more effective. This approach is an important consideration in the pursuit of equity, as it speaks to the importance of the role funding plays in generating equitable outcomes. While this focuses on ways to fund projects in a more equitable fashion, its scope can be

expanded to include an analysis of budgetary decisions, such as how much money is being allocated to what, and where.

Kelowna operationalized this approach by establishing criteria to assess the extent to which potential funding sources are equitable. More specifically, Kelowna asked, "is this revenue source equitable in terms of income, by avoiding drawing overly upon those that can least afford to pay?" (City of Kelowna, 2016) Kelowna identified two types of funding that reflect at least some degree of equity, including General Funds/Taxation and Local Area Service Taxes. The former tends to be equitable as lower valued properties pay less tax, and the latter the potential to promote spatial equity. Importantly, however, Kelowna notes that the latter mechanism risks imposing income inequity if those who vote "no" to project due to financial constraints are forced to contribute to the wishes of the majority (City of Kelowna, 2016).

4.4 Accessibility, Design and Safety

This approach encompasses three sub-themes, including accessibility (e.g. the ease of reaching desired destinations), Universal Design/Complete Streets, and Personal Security. Collectively, this strategy focuses on the overall functionality of the cycling network by evaluating convenience, connectivity to destinations, as well as physical and social safety. Importantly, the inclusion of this strategy is largely responsible for why so many plans were chosen for a more in-depth review. Much of this is related to the universal access/complete streets sub-theme as most, if not all plans, state a goal of creating universal access and complete streets policies.

4.4.1 Accessibility

While some plans demonstrated the beginnings of what could be an accessibility analysis (e.g. socio-spatial gap analysis), none operationalized it (i.e. no plan conducted a formal accessibility analysis). However, plans that are most readily prepared to conduct an accessibility analysis include Winnipeg and Saskatoon as a socio-spatial gap analysis provides an effective foundation for doing so.

4.4.2 Universal Design / Complete Streets

All plans addressed the idea of Universal Design and Complete Streets, with Regina's plan being most effective at operationalizing it. However, other notable plans include those Vancouver, London, and Toronto.

In every plan, cities operationalized this approach by adopting, or recommending the adoption of a Complete Streets policy and/or accessibility design standards. As stated in their 2009 Transport Master Plan, Regina intended on adopting two policies, including a universal accessibility policy and a Complete Streets policy that is tailored to fit the context of the City of Regina (City of Regina, 2009). The city further intended on establishing evaluation criteria that helps monitor the progress of achieving objectives of the Complete Streets policy. Once developed, the city intends on reviewing the policy as part of any updates to the city's Transportation Master Plan to ensure any changes in user needs are accounted for.

As of their 2012 plan, Vancouver intended on adopting and implementing plan and design guidelines that support a bicycle network that is comfortable for people of all-ages and abilities, as well as developing a cycling comfort index to help identify bicycle routes that currently do not meet proposed

guidelines. Through this index the city can be informed of where new routes need to be added, and which existing routes are in need of upgrade (City of Vancouver, 2012).

London and Toronto have existing guidelines and standards pertaining to universal accessibility and complete streets. The City of Toronto is currently working on developing on-street bikeway design guidelines to be released in 2019 (City of Toronto, 2016).

4.4.3 Personal Security

Plans that both addressed and operationalized the idea of personal security are Saint John's Cycling Master Plan 2009, Winnipeg's Pedestrian and Cycling Strategies 2014, Regina's Transportation Master Plan 2009, Saskatoon's Active Transportation Plan 2016, Edmonton's Transportation Master Plan 2009 and Calgary's Transportation Plan 2009.

In each plan, cities most effectively operationalized this idea by recommending, or continuing to ensure Crime Prevention through Environmental Design (CPTED) principles are implemented into pedestrian and bicycle facility design. Key principles of CPTED include improving visibility of underpasses with lighting and/or open design concepts and illuminating sidewalks, crosswalks, pedestrian corridors and pathways (City of Winnipeg, 2014). As acknowledged in Saint John's Cycling Master Plan, CPTED is an important consideration as "the fear produced by the possibility of crime can be at times as much of a barrier to cycling and AT activities as any physical barriers and depending on the situation, can be more difficult to address. This psychological barrier becomes even more pronounced within certain groups such as women, children, the physically challenged and senior citizens" (City of Saint John's, 2009).

Table 2: Summary of Key Findings from Plan Review

				Inclusive Design and Safety		
	Socio-Spatial Network Analysis	**Consideration of Equity in Projects and Priorities**	**Equity-Oriented Funding Mechanisms**	Accessibility	Universal Design (AAA)/Complete Streets	Personal Security
Saint John's, NL 1. Cycling Master Plan, 2009					Addressed	Addressed & Operationalized
Halifax (Halifax Regional Municipality), NS 2. Integrated Mobility Plan, 2018				Addressed	Addressed	
3. Centre Plan, 2017		Addressed			Addressed	
Ville de Québec, QC 4. Plan de Mobilité Durable, 2011			Addressed		Addressed	
City of Montréal, QC 5. Transportation Plan, 2008		Addressed			Addressed	
City of Ottawa, ON 6. Ottawa Transportation Plan, 2011					Addressed	
City of Hamilton, ON 7. Transportation Master Plan, 2018		Addressed			Addressed	
City of London, ON 8. Cycling Master Plan, 2016					Addressed and Operationalized	
City of Kingston, ON 9. Active Transportation Master Plan, 2018		Addressed			Addressed	

City of Toronto, ON 10. Cycling Network 10 Year Plan, 2016				Addressed and Operationalized	
City of Winnipeg, MB 11. Pedestrian and Cycling Strategies, 2014	Addressed & Operationalized	Addressed & Operationalized	Addressed	Addressed	Addressed & Operationalized
City of Regina, SK 12. Transportation Master Plan, 2017		Addressed		Addressed & Operationalized	Addressed & Operationalized
City of Saskatoon, SK 13. Active Transportation Plan, 2016	Addressed & Operationalized	Addressed & Operationalized	Addressed·	Addressed	Addressed & Operationalized
City of Edmonton, AB 14. Transportation Master Plan, 2009				Addressed	Addressed
City of Calgary, AB 15. Transportation Master Plan, 2009				Addressed	Addressed
City of Vancouver, BC 16.Transportation Plan, 2012				Addressed & Operationalized	
City of Kelowna, BC 17. Pedestrian and Bicycle Master Plan, 2012	Addressed	Addressed & Operationalized		Addressed	

4.5 Key Takeaways

Based on the analysis presented in the previous section, four plans emerged as current "best" examples in terms of addressing equity in cycling planning: Winnipeg's Pedestrian and Cycling Strategies, 2014; Saskatoon's Active Transportation Plan, 2016; Regina's Transportation Master Plan, 2017; and Kelowna's Pedestrian and Bicycle Master Plan, 2016. However, this is not to argue that that these plans and the approaches described within them could not be improved to better address equity (e.g. disparities in access to safe, comfortable, and convenient cycling infrastructure across socio-economic factors). For example, while the approaches described above in Winnipeg and Saskatoon's plans that attempt to transparently score projects (one of such scoring criteria being equity) they lack many specifics. For example, Furthermore, specific metrics and indicators are lacking in terms of how the equity of plans and outcomes can be measured. As noted by Weinstein and Sciara (2006), equity and distributional concerns are ongoing and cannot be completely measured at the time of plan approval.

5.0 CONCLUSION AND RECOMMENDATIONS

As municipalities increasingly focus on promoting cycling, it is critical that planners and decision-makers ensure the needs and concerns of the most disadvantaged residents - those who are, or who could be, most reliant on cycling as a less-costly mode of travel - are effectively recognized and addressed. At present, several Canadian transport plans have made efforts to bring equity into the planning process including plans from Winnipeg, Saskatoon, Regina and Kelowna. However, there is much room for improvement as most plans make limited or no efforts to address and operationalize equity. For these reasons, it is critical that researchers and practitioners, including planners and decision-makers at all levels of government, continue to learn from one another and work collectively to advance the pursuit of cycling equity. As revealed from these findings from both the literature and plan review, many opportunities exist for both researchers and practitioners to do so. This section presents considerations and practical recommendations for practitioners to advance the pursuit of equity throughout the planning process as well as future research needs.

To ensure meaningful participation from stakeholders, practitioners must work to ensure disadvantaged groups are being included throughout the entirety of the planning process, and seek to create context-specific ways to engage with local groups to involve them in decision-making processes. Examples include the formation of Citizen Action Groups and participatory budgeting processes. In addition, recognizing not only who is "invited to the table", but who is "setting the table" is vital.

To achieve equity, it must be pursued not only externally, but internally (e.g. through the structural and systematic organization of institutions). The findings contained within this paper highlight the value in researcher – practitioner collaboration, which can help to advance and accelerate the pursuit of cycling equity, and equity more generally. Uncovering what the underlying intention behind the promotion and enabling of cycling or a particular intervention is also key to mitigating potential adverse or unintended impacts. For example, whether cycling interventions are motivated by socio-environmental sustainability or to the marketing and development of a city is an important element in understanding the potential risk of interventions to fuel or contribute to processes of gentrification and displacement. And finally, planners should question what methods and data sources are currently being used, if any, to assess equity. Increasingly known and accepted tools and metrics such as accessibility, level of traffic stress, and qualitative environmental studies are available to aid decision-making.

For researchers, there is much work to be done on understanding the political-economic forces impacting decision-making. Select examples include an investigation into how much and where city budgets are being allocated, and to whom the benefits are going. In other words, how much money is being spent, where, and for whom? It would also be a worthwhile endeavor to better understand and uncover the local thoughts and perceptions of equity to understand whether plans, projects, or policies deemed to improve equity, actually do so in the eyes of those impacted by them. Comparing such findings to the thoughts and perceptions of the planners and decision-makers crafting and implementing plans, projects, and policies would aid in understanding these impacts.

As equity becomes an increasingly important subject area overall, it is expected that it will begin to have a much stronger presence not only in planning documents (e.g. transportation plans), but in how organizations and institutions structure and operate themselves both internally and externally. This trend has and will continue to be supported by an increasing demand for equity and justice by the people – not just by those belonging to research and practitioner groups. To help support and continue the growth of this subject area, a number of additional studies are recommended. Such studies include a comparative analysis between current and future plans to assess the extent to which equity is being addressed over time. What plans (and therefore what cities, towns, districts etc.) are regarded as having improved, stayed the same, or worsened in how equity is addressed in plans? And, finally, it would be valuable to conduct an investigation into the extent to which plans are actually achieving what it is they set out to do, evaluating whether a plan has contributed to increasing equitable conditions from not just a spatial perspective, but from the socio-economic perspective (e.g. the perspective of the local community). Studies such as this can also be tailored to highlight the challenges and opportunities planners and decision-makers have faced when attempting to implement their stated goals and objectives. Qualitative research such as interviews with planners, decision-makers, and community members in local contexts will be key to establishing a better understanding of all of the above, particularly the local needs and concerns of disadvantaged members of society. In doing so, researchers will undoubtedly provide for a more robust understanding of whether equity was improved not just spatially, but socially and procedurally. As a result of this research, practitioners can be better informed of how to begin, or continue to effectively make progress in this area.

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