

# The State of Accessible Shared Mobility in Canada – Final Report –

**For Transport Canada**

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Prepared by  
The Canadian Centre on  
Disability Studies Incorporated,  
operating as



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## Executive summary

This project examines the accessibility of shared mobility in Canada and was conducted under contract with Transport Canada. Although “shared mobility” is a concept that covers several modes of transportation, this project focuses mainly on ride-sourcing, carsharing and microtransit as these are the services that have garnered the most attention in the literature.

Aims of the project were to: 1) provide a comprehensive understanding of accessible shared mobility services, related policies, and barriers for persons with disabilities in Canada; and 2) provide recommendations for policy makers and identify gaps to inform future research in this area.

Our methods included:

- A wide-ranging review of the literature including research reports, evaluations, policy briefs, news articles, websites, and blog posts; and
- Structured but open-ended and exploratory interviews (by phone and virtually) with 23 key informants, most of whom have disabilities and are involved as senior leaders with provincial or national disability organizations. Several of the interviewees also work for major transportation providers. All interviewees are knowledgeable about issues of access in transportation for people with disabilities.

Unfortunately, the literature on shared mobility in Canada does not include issues of accessibility for people with disabilities as a major focus of attention. Accordingly, we have also drawn widely from the literature on shared mobility from the US and Europe. In that literature, however, we still found infrequent and only very brief mentions of the accessibility issues that Canadians with disabilities face. As a result of the incomplete patchwork of scholarly material available, we also drew from other sources such as online news articles, industry websites, and blogs.

Based on the interviews and literature, the present project discusses accessible accommodations and services provided by shared mobility providers in Canada. We look at how shared mobility contributes to transportation options for persons with disabilities and seniors in Canada and the types of barriers they encounter when accessing shared mobility. We discuss how shared mobility is being integrated into existing services and infrastructure (e.g., public transit) in this country, actions taken by governments in Canada to enhance access to shared mobility, and international examples that showcase highly accessible shared mobility. From this material we have drawn to the foreground several best practices or lessons learned that could be, and indeed are being, applied in the Canadian context. We touch on the future of accessible shared mobility and pay particular attention to automated vehicle technologies. We also describe key challenges (and opportunities) unique to Canada in order to further accessible

shared mobility. We look at issues of service delivery in Canadian rural, remote, and urban regions while paying attention to distinct governmental roles, policies and regulations. We then provide recommendations for policy makers and suggest further research directions on accessible shared mobility in Canada.

## Key findings

Our interviews and review of the literature revealed the following key findings:

- Significant benefits of *ridesourcing* are that it provides greater flexibility, convenience, and predictability than paratransit, and is usually quicker than paratransit or regular transit. Ridesourcing usually costs less than taxis and has potential for greater personalization of service than regular transit, paratransit, or taxis.
- For brief personal use of a vehicle, people who do not require an accessible vehicle may find *carsharing* a more convenient option than regular car rental. Carsharing is economically efficient in that the consumer pays only for their actual use of a vehicle. People who opt entirely for carsharing vs personal vehicle ownership avoid the ongoing costs associated with owning a vehicle, which may be unused most of the time.
- Owing to the relative newness of *microtransit*, we were not able to find much literature on its benefits for people with disabilities. The people we interviewed also had limited experience with this form of shared mobility. However, microtransit holds promise of enabling people with and without disabilities to travel within and between communities that are unserved or underserved by public transit and inter-community buses. This is possible if microtransit is appropriately regulated for accessibility.
- Drawbacks of shared mobility have received attention in the literature and have also been experienced by people we interviewed for this project:
  - *Ridesourcing*. Ridesourcing is unavailable in many communities across Canada. Where available, ridesourcing frequently lacks the accessible vehicles that many people need. Where accessible vehicles are available, there may be a significant delay for the rider to be picked up. Drivers frequently seem to have little, if any, training on how to effectively serve people with various disabilities.

Moreover, the software for booking and paying for rides may not be accessible to people with visual impairments or manual dexterity difficulties. The software may not be useable by people who cannot afford cell phones or do not have credit cards. Riders with some disabilities (e.g., hearing, speech) may have difficulties communicating with their drivers, especially in times such as in the COVID-19 pandemic, when drivers and riders are obligated to wear face masks.

Our study also found that there are challenges with complaint mechanisms for ridesourcing. Riders who want to lodge a complaint about service from a ridesourcing company may experience difficulties locating and speaking directly with a company representative. If they manage to lodge a complaint, the company may not inform the consumer about the status of the complaint or how the company is handling it. Thus, there are challenges with accountability to riders with complaints.

- *Carsharing.* The lack of wheelchair accessible *carshare* vehicles is the key problem that simply deters people with mobility impairments from using this shared mobility option. Where available, accessible carshare vehicles may not be available on demand but instead may require a day or more advance notice. When vehicles are available, in some cases they may be littered, contaminated by allergens such as fragrances and tobacco smoke, or parked in locations that are inconvenient, inaccessible, seem unsafe, or which are not accurately indicated on the companies' digital platforms.
- *Microtransit.* Previous literature has little to say about the drawbacks of microtransit for people with disabilities. We conjecture that this is because accessible microtransit vehicles and well-trained drivers are few and far between, which discourages people with mobility impairments from using the service when it is available. People with less noticeable forms of disability such as in the areas of learning or mental health may be using microtransit, but do not show up as such in the literature. Interviewees had little to say about the drawbacks of this form of shared mobility, although several of the respondents have disabilities that are not in the area of mobility.

The regulatory system for furthering accessible shared mobility is complex. The system involves thirteen provincial/territorial governments and thousands of local governments. Canada's geographical expanses, widely varying types of communities, and population diversity within jurisdictions are considerable. Many people also live in rural communities, or even in small urban ones, where there is no public transit or inter-community bus service. Oftentimes, many communities are underserved by these services. Ridesourcing is only beginning to emerge in such communities while microtransit and carsharing are often fledgling enterprises, if they are present at all. Disability issues also often have limited priority in transportation planning and policy development. People with disabilities and older adults are therefore among the most transportation-disadvantaged in such communities.

## Key recommendations

In this context, the study details key recommendations for policy makers to:

- a) Develop a vision of a well-integrated and accessible transportation system that is equitably available to all;
- b) Ensure an adequate supply of wheelchair accessible vehicles is available for the people who need them; and
- c) Ensure ridesourced and microtransit drivers receive proper training on how to effectively serve people with disabilities.

Related considerations for policy makers are the need to:

- d) Engage in ongoing, substantive, and community-specific consultations with people with disabilities at all levels of planning, program development, and evaluation, especially concerning the services they need and the transportation difficulties that need to be addressed;
- e) Introduce measures to enable people with disabilities and older adults on low incomes to afford travel by shared mobility services;
- f) Ensure rider safety and good quality shared mobility services through various consumer protection measures; and
- g) Ensure basic standards are met.

In principle, a minimally invasive regulatory approach to ridesourcing would help consumers to reap the benefits of competition. However, we consider that a firm regulatory approach is needed for expanding the supply of accessible vehicles and for ensuring the proper training of drivers.

The study's recommendations for research are that the federal government should play a leading role, in collaboration with provincial/territorial and local governments, in order to:

- a) Collect disaggregated data with common units of analysis across geographic settings, and publish reports based on the data, about accessible and inaccessible transportation for people with disabilities and older adults;
- b) Support the production, gathering, organization, and distribution of research, policy, and information about effective practices on accessible shared mobility;
- c) Fund R & D pilot projects on accessible shared mobility and disseminate the evaluation findings with common units of analysis across the evaluations;

- d) Conduct research on personal vehicle use in Canada;
- e) Collect and report on broadly gathered information, from the perspectives of people with diverse disabilities, about the accessibility of local transportation; and
- f) Organize and present information about the regulation of taxis and ridesourcing in Canada.

The study ends on the positive note that shared mobility is offering people with disabilities and older adults a new range of transportation options that are affordable, convenient, and complementary to public transit. It cautions, however, that policy and action are required to further the National Transportation Policy's vision of a transportation system in Canada that is "without undue obstacle to the mobility of all persons" and is also "accessible without barriers to persons with disabilities." The recommended policies and actions would help to bring transportation arrangements in line with the principles that inform the *Accessible Canada Act*.

## I. Introduction

### A. Objectives:

This study examines the accessibility of shared mobility in Canada. It was performed by the Canadian Centre on Disability Studies, operating as Eviance, on contract with Transport Canada. The objectives of the research were to:

- 1) Provide a comprehensive understanding of accessible shared mobility services, related policies and existing – as well as future – barriers to transportation for persons with disabilities; and
- 2) Provide considerations for policy makers in Canada by way of recommendations and the identification of gaps to inform future research in this area.

### B. Scope of this paper and our approach

Specific aims of this project were to examine and discuss:

- Accessible accommodations and services provided by shared mobility providers in Canada (e.g., wheelchair accessible ride-sourcing, mobile applications for people who are blind or with low vision, etc.);
- Types of barriers persons with disabilities and older adults encounter when accessing shared mobility;
- How shared mobility contributes to an expanded array of transportation options for persons with disabilities and seniors in Canada;
- How shared mobility is being integrated into existing services and infrastructure (e.g., public transit) in Canada;
- Actions taken by governments in Canada (provincial, territorial and municipal) to enhance access to shared mobility, in the form of services, subsidies, policy, regulation, etc.;
- Distinct international examples that showcase highly accessible shared mobility, illustrating different business models and/or accessible services;
- Best practices or lessons learned that could be applied in the Canadian context;
- The future of accessible shared mobility in the context of advancing connected and automated vehicle technologies;
- Opportunities and challenges unique to Canada, including: service delivery in rural, remote, northern and urban regions; distinct federal, provincial, territorial and municipal roles; costs, existing policies and regulations, etc.;

- Recommendations for policy makers; and
- Recommendations for future research on accessible shared mobility in Canada.

Our approach involved a wide-ranging review of the scholarly, professional, and “grey” literature, and structured, open-ended interviews with 23 key informants. Our overall analytical approach reflects support for the principles which inform the *Accessible Canada Act*: the inherent dignity of all people with disabilities; their right to equal opportunity, barrier-free access and full and equal participation in society; their freedom to make choices; and the need for laws, policies, programs, services and structures that take into account and are responsive to the diverse needs and circumstances of people with disabilities (Canada, 2019).

For the review of the literature, we used a variety of search terms in Google Scholar to identify scholarly, professional, and other reports on shared mobility and accessible shared mobility in Canada. As shared mobility itself comprises or is associated with many discrete elements (as discussed below) which may or may not be well integrated in practice, we also used search terms that correspond with the elements of shared mobility, e.g., ridesourcing, ride sourcing, bikesharing, bike sharing, ridehailing, ride hailing, transportation hubs, Mobility-as-a-Service and numerous other terms. We also searched for permutations in Canada, which included the names of the provinces and territories and major communities such as Toronto, Vancouver, Calgary, Montreal, etc. We followed up by examining many of the documents cited in the materials we found.

Shared mobility is being implemented in smaller communities. It was not feasible to engage in an open-ended search for shared mobility by a myriad of small and mid-sized community names without prior knowledge about the likelihood of shared mobility being implemented there. However, we noted mention of smaller communities in the other documentation we obtained and followed up on source materials cited.

We observe that most of the scholarly materials on shared mobility pertain to continental Europe, the United States, the United Kingdom, and Australia. Canada, its larger provinces, and some of its cities, are occasionally mentioned in that literature, which we followed up upon. However, the material pertaining to Canada as a major unit of analysis is limited in that literature and, overall, impressionistic.

Certainly, rigorous studies have been completed about shared mobility in Canada, some of which have been conducted for provincial/territorial and municipal governments. In such cases, the reports mention how shared mobility is being operationalized. Usually, however, issues of accessibility for people with disabilities are not a major focus of attention in these documents or in the scholarly literature. In the face of such a patchwork of scholarly material with a focus on accessible shared mobility Canada, we have drawn from other sources such as online news articles, industry websites, and blogs.

The key informant interviews for this project were conducted by phone and virtually with 23 individuals: 9 individuals with disabilities (39%); 9 disability-related advocates or service providers (39%); and 5 providers of transportation services (22%). Informed by the literature, the interviews were exploratory, with the aim of capturing respondents' personal experiences, reflections, and recommendations, regardless of what the literature may say. The interviews were structured in that they took respondents through various topics. However, the questions which generated the most substantive feedback, and the bulk of the information we captured, were open-ended.

All the individuals with disabilities who took part in the interviews are involved with disability organizations, and several are presently focusing, or had recently focused, on issues of transportation for their organizations. These individuals generally hold, or recently held, senior leadership positions with national or provincial disability organizations. Almost all the disability-related advocates and disability-related service providers we interviewed have disabilities. Where this is not the case, they have many years of professional experience working with people with disabilities. All the advocates and disability-related service providers are also familiar with issues of transportation based on their own personal experiences, and the experiences of the people they work with. All the interviewees who work for transportation service providers are responsible for ensuring the accessibility of their organizations' services. Three of these individuals focus specifically on accessible transportation for people with disabilities. More information about the people we interviewed is provided in Section VII of this report, and in the Community Consultation Report, which was produced separately.

"Seniors" are mentioned in the literature on shared mobility. However, we have generally used the term "older adults", unless quoting directly from one of our source documents.

## II. Local transportation issues for people with disabilities

Data and analysis are fragmentary on the local transportation patterns and related difficulties for people with disabilities in Canada. It is known, however, that about a quarter of people with disabilities have difficulties using local public transportation in Canada. Half of those who report difficulties said they have “some” difficulty (13%), and the other half (13%) experience “a lot” of difficulty. The most common difficulties are getting on/off the vehicle (nearly half), overcrowding (nearly a third), and getting to or locating bus stops (nearly a third – Arim, 2015). That information was from the 2012 version of the Canadian Survey on Disability. Unlike the 2012 and earlier versions of this survey (e.g., Statistics Canada, 2012), which asked several questions about difficulties in using local transportation services, the 2017 version asked only a few questions that touch on local transportation. Those questions are asked of people with disabilities who consider themselves housebound. The lack of accessible transportation is one of the reasons respondents could give for being housebound. However, we were unable to find published information from Statistics Canada or other analysts based on responses to that question.

Drawing from the 2017 and 2001-2006 components of the National Household Travel Survey (NHTS) in the United States, Brumbaugh (2018) found that 8.5 percent of the US population age 5 and older have disabilities that make traveling outside the home difficult. More than half are adults age 18 to 64. The percentage of people reporting travel-limiting disabilities increases considerably with age. For example, 6.7% of people 50 years report travel-limiting disabilities, compared with 18.4% among people 70 years, 31.9% among those aged 80 years, and nearly 60% among people who reach 90 years of age. Among Americans with disabilities who have difficulties traveling outside home, seven in 10 (70.6%) have reduced their day-to-day travel and more than four in ten ask others for rides (44.6%). Over a third (34.1 percent) made no trips on the NHTS survey day versus 13.4 percent of people without disabilities. The percentages of people not travelling were higher: 37.3 percent among rural residents with disabilities, versus 16 percent for rural residents without disabilities.

In terms of disability supports associated with difficulties in travel, over half (57.8 percent) of all people with disabilities in the US use one or more medical devices, including canes and crutches. However, only 11.6 % use wheelchairs, 4.4% use motorized scooters and 3.9% use motorized wheelchairs. Another 22.9% use walkers. Only 1.1 % use seeing eye dogs (Brumbaugh, 2018). In Canada, based on 2012 data, Giesbrecht, Smith, Mortenson, & Miller (2017) found that 197,950 people with disabilities used a manual wheelchair, 108,550 used a mobility scooter, and 42,360 a power wheelchair. These researchers did not report on the prevalence of service dog usage or report the numbers they have highlighted as percentages of the population of people with disabilities in Canada.

### III. What is “shared mobility”?

According to the Shared-Use Mobility Centre (2020) in Chicago, Illinois, “shared mobility” is defined as:

“... transportation services and resources that are shared among users, either concurrently or one after another. This includes public transit; taxis and limos; bike sharing; car sharing (round-trip, one-way, and peer-to-peer); ride sharing (i.e., non-commercial services like carpooling and vanpooling); ride sourcing or ridesourcing; ride splitting; scooter sharing (now often grouped with bike sharing under the heading of “micromobility”); shuttle services and “microtransit”; jitneys and dollar vans; and more (Shared-Use Mobility Centre, 2020b).

In this rapidly developing field, definitions and terms continue to change, evolve and sometimes conflict in the literature.

#### A. Main elements

Component elements of the shared mobility ecosystem are described in SAE International’s<sup>1</sup> *Taxonomy and Definitions for Terms Related to Shared Mobility and Enabling Technologies* (SAE International, 2018), in the Toolkit produced by the Shared-Use Mobility Center (2016), and in Shared Mobility Definitions by the US Federal Transit Administration (2020).

##### 1. Modes of transportation

The modes of transportation most commonly found in the scholarly and grey literature, and as reflected in the present report, are ridesourcing, carsharing, microtransit, ridesharing, ride-splitting, bike sharing, and scooter sharing. Meanings attached to those terms vary somewhat by author.

- *Ridesourcing* is on-demand, prearranged transportation for compensation in which drivers and passengers connect via online digital applications for booking, payment and ratings. Drivers use personal, non-commercial vehicles for commercial purposes. Organizations that provide ridesourcing are often referred to as transportation network companies (TNCs) and include providers such as Uber and Lyft. The term “ridehailing” is sometimes used interchangeably with ridesourcing. However, unlike taxis which can be street hailed, TNC services typically cannot and require online booking. The term “ridesharing” is also sometimes used interchangeably with ridesourcing, but this usage

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<sup>1</sup> SAE International was previously known as the Society of Automotive Engineers. It is a U.S.-based but globally active professional association and standards developing organization for engineering professionals, with a principal focus on global transport industries.

is being discouraged by groups like SAE International because ridesharing is in many cases non-commercial, e.g., ride sharing among friends where monetary exchanges may be informal and aimed mainly at reimbursing the driver for the cost of fuel.

- Where the documentation we have drawn upon refers to “ridehailing” or “ridesharing” but clearly connotes ridesourcing, we have used the later term for the sake of clarity except in cases where we have quoted directly from a source.
- *Carsharing* is where members of an organization pay a fee each time that they use a vehicle provided by an organization that maintains a fleet. Use is usually short-term – typically hourly. The cars and/or light trucks within the fleet may be located at a variety of locations. The organization provides insurance, gasoline, parking, and maintenance. Typical or round-trip carsharing requires customers to borrow and return vehicles to the same location. One-way carsharing allows customers to pick up a vehicle at one location and drop it off at another. Peer-to-peer (P2P) carsharing allows car owners to enroll their vehicles in carsharing programs and monetize their vehicles’ excess capacity. The term carsharing is sometimes used interchangeably with ridehailing, but this equivalency of usage is confusing and falling into disfavour (SAE International, 2018).
- *Microtransit* includes privately or publicly operated transit services that are technology-enabled and which use shuttles, vans, or large SUVs. Services may be provided on-demand or on a fixed-schedule and the routes may be dynamic (changeable) or fixed. The United States Federal Transit Administration has defined ‘microtransit’ as “IT-enabled private multi-passenger transportation services... that serve passengers using dynamically generated routes, and may expect passengers to make their way to and from common pick-up or drop-off points. Vehicles can range from large SUVs to vans to shuttle buses” (U.S. Federal Transit Administration, 2020). A recent progressive (and as-yet unrealized) definition holds that “microtransit is on-demand transportation for everyone... microtransit systems are not restricted by an individual’s mobility needs or their ability to use fixed-route transportation (Spears, 2019).” Bridj and Chariot were examples of microtransit services that used dynamically generated routes. These companies have gone out of business. However, numerous municipalities continue to experiment with microtransit.
- *Personal vehicle sharing* is the sharing of privately owned vehicles between vehicle hosts and guests, for which companies broker transactions and provide the organizational resources needed to make exchanges possible (e.g., technology, customer support, driver and motor vehicle safety certification, auto insurance, etc.).

This model also includes peer-to-peer (P2P) carsharing, P2P marketplace, hybrid business-to-consumer (B2C) and P2P models, and fractional ownership.

- *Ridesharing* (also carpooling and vanpooling) is the sharing of rides between drivers and passengers with similar origins and destinations. Passengers may share operating expenses and driving responsibilities. BlaBlaCar (Europe), Didi (China) and Ola (India) are examples of ridesharing services.
- *Ride-splitting* is a service provided in some cities which combines fares to reduce vehicle trips and generate savings for passengers. Uber Pool and Lyft Line allow drivers to add additional passengers to a trip, who split the cost among themselves.
- *Bike sharing* provides on-demand access to bicycles at a variety of pick up and drop-off locations for one-way or roundtrip travel. Services may be dock-based or dockless systems or peer-to-peer bikesharing and tech-light models that do not place technology in the bike or dock.
- *Scooter sharing* is similar to bike sharing but where users join an organization that maintains a fleet of motorized or non-motorized scooters, available at a variety of locations. The organization provides fuel, maintenance, and parking for a fee each time the scooter is used.
- *Shuttles* include corporate, regional, and local services that make limited stops and serve riders from specific employers, buildings, or residential developments.

Other modes of travel within the shared mobility ecosystem, but which garner comparatively little research and policy attention, include courier network services and pedicabs.

Ridesourcing services provided by transportation network companies (or TNCs, such as Uber and Lyft), carsharing, and microtransit services are important components of the emerging shared mobility system in Canada, and receive most of the attention in the published articles, reports, and other materials for this paper.

## 2. Mobility Hubs

Drawing from definitions used by the San Diego Association of Governments (SANDAG), the Los Angeles Urban Design Studio, Share North (Shared Mobility Solutions for a Liveable and Low-Carbon North Sea Region) and Metrolinx in Ontario, Aono (2019) has defined mobility hubs as

places “where different sustainable transportation modes are integrated seamlessly to help promote connectivity” (p. 3). Such modes include bikesharing, ridesourcing, carsharing, microtransit and regular community transit. They are often clustered around a major transit station to help cover first and last mile travel, i.e., travel from a point of origin (e.g., home) to a mode of connective travel (e.g., a train) and from that mode to the destination (e.g., office). Although usually in centralized, high density areas, hubs can also be in lower density areas that have potential for development.

Aono (2019) has provided several complementary typologies for classifying mobility hubs. *Gateway hubs* are in major transit stations in high population density areas, which link two or more current or planned rapid transit lines. *Anchor hubs* are in major destinations within a region that can accommodate population growth and transit areas that serve as international gateways, e.g., airports and railway stations (from Metrolinx 2008). The *urban context* typology includes hubs in city centres, urban transit nodes (major and local centers with moderate to high densities and mixed-use development), emerging urban growth areas, historic town centres, suburban transit nodes (like urban transit nodes but typically automobile-oriented), and unique destinations (like gateway and anchor hubs which generate significant activity and travel, such as universities and airports). The *transportation function* typology classifies hubs according to their envoy (for large-scale outbound trips), transfer (for trips within the regional rapid transit network), and destination (for large-scale inbound trips) functions. The LA Urban Design Studio (2016) classifies mobility hubs into three categories: *neighbourhood, central, and regional hubs*.

### 3. Online booking and integrated digital ecosystems

The market for personal mobility is changing rapidly due in part to smart phones, robust information processing, and widespread data connectivity. The integration and coordination of information is key to the seamless functioning of shared mobility across transportation modes, and is now available in consumer apps such as [Somo](#), [Moovit](#) and [Whim](#). SAE International (2018) describes commonly used categories of apps in its *Taxonomy and definitions for terms related to shared mobility and enabling technologies*.

Digital applications for individual consumers, and data platforms for connecting consumers to and across shared mobility modalities, are themselves components of broader digital ecosystems. These ecosystems are “interdependent groups of enterprises, people and/or things that share standardised digital platforms for mutually beneficial purposes” (Gartner Research in Bennett, 2017). Increasingly, digital ecosystems in the realm of shared mobility are focusing on integrating and managing disparate, time-sensitive information about individual consumers, pick up points and destinations, vehicles, drivers, public transit routes and schedules, vehicle maintenance, traffic congestion and flows, and other factors. Large volumes of data are

captured and analyzed by artificial intelligence (AI) to optimize mobility as a service or MaaS (discussed below). Data flows into the ecosystem from connected vehicles (CV), autonomous vehicles (AV) and the internet of things (IoT), through which vehicle-to-infrastructure technology analyzes the vehicle's surroundings and improves transit operations (Here Mobility, 2020). A transportation provider's intimate knowledge of its customers, and superior capacity to fulfill the customer's expectations, are key factors behind the ability of a shared mobility service to thrive in a world responsive to mobility on demand (MOD) and MOD's ecosystems (Jacobides, Sundararajan, & Van Alstyne, 2019; Pulkkinen, Jussila, Partanen, Trotskii, & Laiho, 2019).

#### 4. Integrated payment

With developments in online technology, significant attention is being dedicated to integrated systems of payment across modes of transportation (e.g., Guigui, Allen, Gores, & Kostecki, 2020). The integration of payments makes sense. According to the executive director, Randy Vanderhoof, of the Secure Technology Alliance, "With MaaS, [mobility as a service] users can navigate several modes of transportation from one gateway and plan, book and pay with a seamless experience. This opens up both opportunities and challenges as different transportation service providers work together to make it a reality." The Alliance has recently worked with U.S. transit agencies and fare payment providers to move to account-based, contactless, open payments which are "a cornerstone to align an array of disparate travel services and operators into a seamless end-to-end travel experience with MaaS" (Secure Technology Alliance, 2020; see also Secure Technology Alliance, 2017). Although progress is being made towards integrated payments for MaaS and models are discussed below, options remain limited and fragmented at the present time (movmi, 2020; Gooch, 2020).

#### 5. Mobility-as-a-Service (MaaS)

The integration of these elements – diverse transportation modalities, mobility or transportation hubs, online booking, integrated digital ecosystems and payments – can be understood within the umbrella concept of "Mobility as a Service," (MaaS), i.e. "the integration of various forms of transport services into a single mobility service accessible on demand" (MaaS Alliance, 2020). MaaS has been framed as is a service promise of the best possible point-to-point travel solution for the user, which will ensure their freedom while affording variety and flexibility, taking into account user preferences for speed of travel, cost efficiency, safety, health, environmental friendliness, accessibility, and work-while-commuting options (MaaS Alliance, 2019).

## B. What is *accessible* shared mobility?

“Accessible shared mobility” is here defined as shared mobility modalities that are barrier-free for people with mobility/agility impairments as well as those who are blind or have low vision, are Deaf or hard of hearing, have communication difficulties, psychosocial disabilities, learning disabilities or intellectual/developmental disabilities. As in disability-related literature, a connection is often made in the literature on accessible shared mobility to older adult (senior) populations, who often have disabilities and who stand to benefit from increased transportation accessibility.

A city or region with accessible shared mobility is one that reduces, to the greatest extent possible, the barriers faced by people with diverse disabilities. These barriers include informational, physical and attitudinal elements. In the current environment – where transportation options in general are proliferating in some regions and being eroded in others – regional governments and planners are increasingly partnering with private companies to meet the accessible transportation needs of their citizens, including citizens with disabilities.

## IV. How shared mobility contributes to an expanded array of transportation options

### A. For people in general

Shared mobility and MaaS are, in part, responses to concerns about climate change, increasing urban density and gridlock. They also have the potential to offer benefits to individuals, cities and transportation service providers, but not without some risks.

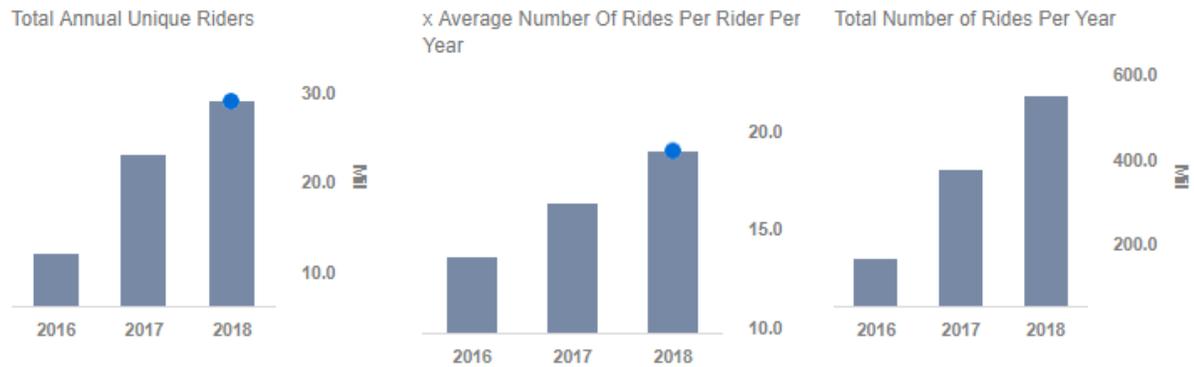
For individual consumers, MaaS provides transparency about routes, transport options, and pricing. It allows passengers to pay for transport via a plan customized to their needs, such as a monthly subscription for urban commuting, family, business, and casual use of transportation. Transport options may include buses, trains, cabs, rental cars, car sharing, etc. Consumers may instead opt to pay once on demand through an app for several services for a given trip such as by cab, train, ridesourcing or by scooter. MaaS enables users to change routines, discover and combine a variety of traditional and new mobility services, including regular transit and shared mobility. As well, in the largely unregulated shared mobility market economy, consumers who use MaaS have the benefit of comparatively low transportation costs as companies compete to provide the best services at the lowest possible prices. The absence of regulatory controls on the quantity (number of vehicles) and location (i.e., geographic boundaries) of areas served, and that TNC drivers do not work assigned shifts, also help ensure that the supply of mobility services will be available to meet consumer demand (National Academies of Sciences, Engineering, and Medicine [NASEM], 2016). Accordingly, shared mobility and MaaS can provide alternatives to consumers poorly served by dominant transportation approaches of the past such as fixed-route busses, trains, personal vehicle ownership, and taxi services. Shared mobility can also serve individuals who live in areas where public transport is not financially viable.

Further, shared mobility has the potential to alter how other forms of transportation service are delivered to individuals. For instance, competition from shared mobility providers has reportedly resulted in taxi drivers in some large cities being more courteous to passengers (Wallsten, 2015). Shared mobility is providing people access to jobs, customers, friends, services, and opportunities, and in the process is reducing the time, costs, risks and uncertainty of access in transportation (NASEM, 2016).

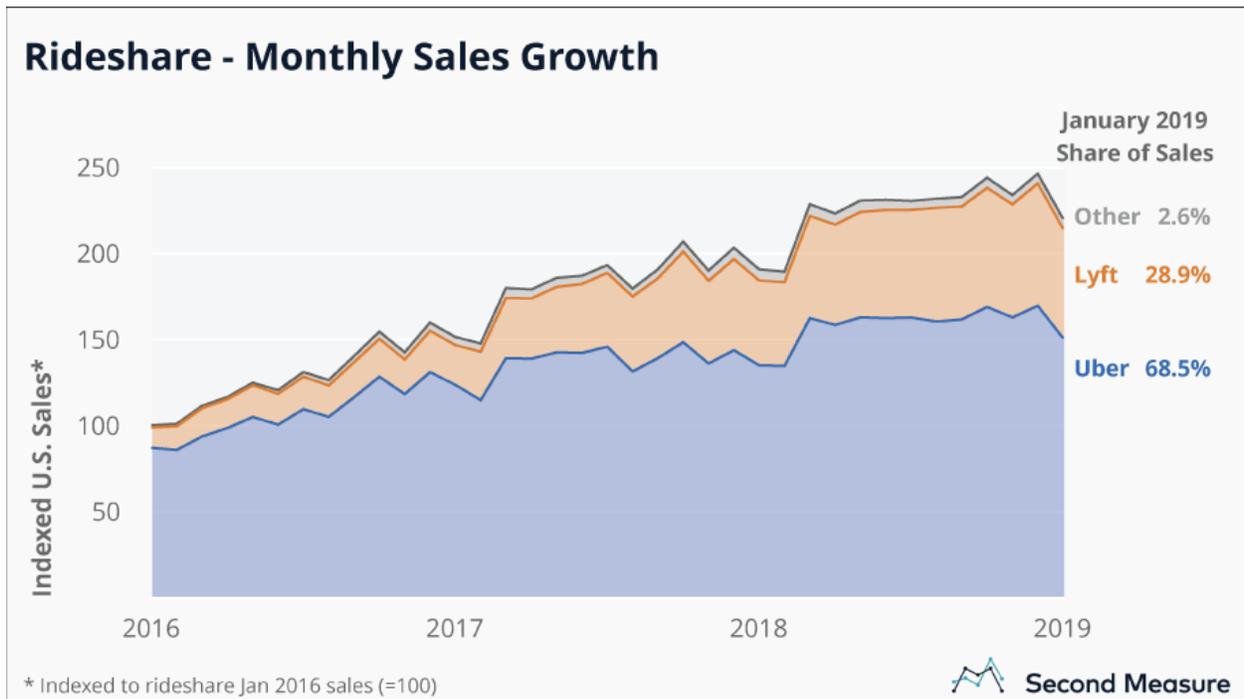
Indeed, if shared mobility and MaaS were not benefiting customers in these and other ways, this sector of the transportation economy would not have grown as quickly as it has in recent years (Cohen & Shaheen, 2018 – Appendix C; Crozet, Santos & Coldefy, 2019; Here Mobility,

2020). Comparable usage data were not available for Uber and Lyft. However, usage data for Lyft are instructive, as are data on Lyft’s and Uber’s increasing ridesharing sales (Figures 1 & 2, from Iqbal, 2020).

**Figure 1. Lyft users/rides per user/total rides** (Source: Iqbal, 2020)



**Figure 2. Lyft vs. Uber market share, January 2019** (Source: Iqbal, 2020)



If the growth in TNCs has been considerable, it has been estimated that half of all trips made with ride hailing services in North America could have been avoided or made by walking, biking, or public transit. Indeed, more than one in five of trips by TNCs are new. There have been corresponding reductions in the use of public transit in countries where ride hailing has

increased. As a result, stress on roads, congestion and delays for individual travellers have been increasing (Clewlow & Mishra, 2017; Schaller, 2018). In contexts where integrated services and MaaS are undeveloped, shared mobility also opens the prospect of consumers requiring several apps and having to figure out and coordinate an increased number of options and schedules.

For cities, shared mobility and MaaS have the potential to: reduce congestion by making it easier to use public transport while also providing easy access to alternatives such as carpooling, car sharing, bicycle or scooter rental; optimize the maintenance of transport systems by giving cities the power to prepare for unavoidable infrastructure changes; create data-driven services based on the information cities need for improving efficiency and for providing new mobility services; improve traffic management based on GPS data, customer feedback and service integration; and cater to diverse commuters through the customization of services, thereby improving customer's experiences, satisfaction and retention.

However, if shared mobility may complement public transport, the impacts on congestion, pollution and CO2 emissions are likely to be small or neutral unless ridesharing on a large scale replaces individual trips by car (Here Mobility, 2020; Crozet, Santos & Coldefy, 2019). As well, ridesourcing is disrupting traditional mobility services in cities, particularly taxis, which are an important source of income and wealth for many people and which in many cities have important social service responsibilities (e.g., Kwong, 2014). A measure of the impact on the traditional taxi industry has been the drop in prices for the taxi medallions required to operate a cab, which dropped in New York from \$1.05 million to \$805,000 from 2013 to 2015 (23%), from \$700,000 to \$500,000 in Boston (29%), and by 17% in Chicago (Transport Workers Union of America, 2017). Ridesourcing also increases the spectre of a precariat of contingent workers whose employment situations fall below the thresholds set for most other workers by employment standards and minimum wages (Ontario Ministry of Finance, 2018; Godavarthy, Hough, Libberton, & Koff, 2019), despite non-financial benefits that may accrue to drivers (Berger, Frey, Levin, & Danda, 2019).

For transport service providers, all-encompassing transport systems are reportedly easier to manage and operate than traditional, separately operated services, and are contributing to improvements in infrastructure, operations, and customer retention. Commuters have more freedom and control over their routes and can use multimodal transport apps to help manage all stages of their journey, which can include city transportation. As diverse transportation services become standardized as providers of transport, they will stream real-time data into MaaS apps and data systems and negotiate for pricing with MaaS operators (Here Mobility, 2020).

Researchers for the Centre on Regulation in Europe (CERE) argue, however, that mobility data should be gathered under the umbrella of Metropolitan Transport Authorities, who CERE argues are the only parties to be trusted with and capable of playing this role (Crozet, Santos & Coldefy, 2019). The CERE researchers also call for investment in public transit so shared mobility does not become the only or preferred option for travellers. Where it becomes the preferred option, this could result in increased congestion (American Public Transportation Association, 2018; Erhardt et al., 2019), more pollution and CO2 emissions, reduced public transport revenues (Santos, 2018; Finger et al., 2017), and reductions of public transit service quality. The latter would result in still further losses of patronage and revenues.

## B. For persons with disabilities and older adults

### *a) Increased flexibility*

For people with disabilities who can afford to use ridesourcing services such as Lyft and Uber on a regular basis, this transportation option can make getting around easier and more flexible than was previously possible, e.g. with paratransit (Conference Board of Canada, 2019). Because all payments are handled via a mobile app, blind customers do not need to worry that a driver might overcharge them; likewise, Deaf customers may find the communication of necessary information easier with a mobile app. Because these services have intentionally undercut taxi operators on price to gain market share, ridesourcing has become more affordable for people with disabilities, who are more likely than people without disabilities to live on low incomes, particularly people with more severe levels of impairment (e.g., Morris, Fawcett, Brisebois, & Hughes, 2018). For people with cognitive impairments (including older adults with dementia), caregivers can use the companies' apps to book a ride and verify that a person needing care has been transported successfully to their destination.

### *b) Potentially greater accessibility and freedom*

Shared mobility is a recent phenomenon and is in flux. However, the international literature suggests several features related to shared mobility that may facilitate greater accessibility and transportation freedom for people with disabilities and older adults:

- Web-based and mobile applications that offer, especially where mobility as a service (MaaS) is available, integrated, multi-modal trip planning and payment through barrier-free technology, which incorporates a range of available public transit and shared

mobility options (e.g., car sharing, bike sharing, including electric bikes and e-scooters, and ridesourcing services).

- Increased availability of shared transportation alternatives to fixed-route public transit, and a recognition that this could provide a more responsive, timely and less stigmatized alternative to regular and flexible route paratransit.
- A view of shared mobility as a potentially less costly alternative to high-cost fixed route public transit, particularly in lower-density areas. Increased use of ridesourcing (including ride splitting), and the growth of long-term contracts between transit agencies and private providers, may also increase the availability and reduce the cost of flexible transportation options for people with disabilities.
- A focus on “first and last mile” problems, i.e. linking travelers between fixed-route transit hubs and trip beginnings/destinations (e.g. home and office).

#### *c) Other advantages*

A recent U.S. study outlined four key promises of shared mobility for people with disabilities:

- A reduction in the need to rely on family, friends and service providers to perform everyday activities;
- A reduction in the need to book transportation far in advance;
- The cost of the new services may be lower than traditional options;
- Shared-use mobility can address gaps in fixed-route transit, including paratransit (Shared-Use Mobility Centre & National Center for Mobility Management [NCMM], 2020).

Shared mobility may well have the potential to meet the need for affordable transportation options in regions that are poorly served by traditional fixed-route transit (i.e. buses, subways and regional trains). However, while some jurisdictions have put disability near the forefront of transportation planning for MaaS, there is substantial evidence that people with mobility, perceptual and cognitive impairments continue to be an afterthought in many regions. Recent data from the United States indicate that transportation network companies [TNCs] dominate for-hire operations in large urban areas, and that residents of suburban and rural areas, people with disabilities and those without smartphones, continue to be reliant on traditional taxi

services (Schaller, 2018). We discuss some of the drawbacks of shared mobility in Section VII of this report, and in the Community Consultation Report, which was produced separately.

## V. How shared mobility is being integrated into existing services and infrastructure (4 c ii)

A poster session for the 2020 annual meeting of the Transportation Research Board in the US reported that shared mobility is widely available across the United States. Widely available modes included carshare, bikeshare, electric scooters, ridesourcing, ridepooling and microtransit. Of the most populated top 50 metropolitan areas, all have a form of ridesourcing, 47 have a form of carshare, 41 have a form of bikeshare, and 31 have electric scooters.

### A. Examples from the US and other jurisdictions

#### 1. Mobility-as-a-Service (MaaS)

The growth of private involvement in public transit has led to a proliferation of issues related to information and scheduling options. Several European jurisdictions have addressed these issues by creating one-stop cards that can be used to pay for multi-modal transportation (generally including public transit, regional trains, carsharing, bike sharing, and taxi services – but rarely ridesourcing). These card-based systems are in various states of advancement toward integration with mobile apps (e.g. Mobilitymixx in The Netherlands).

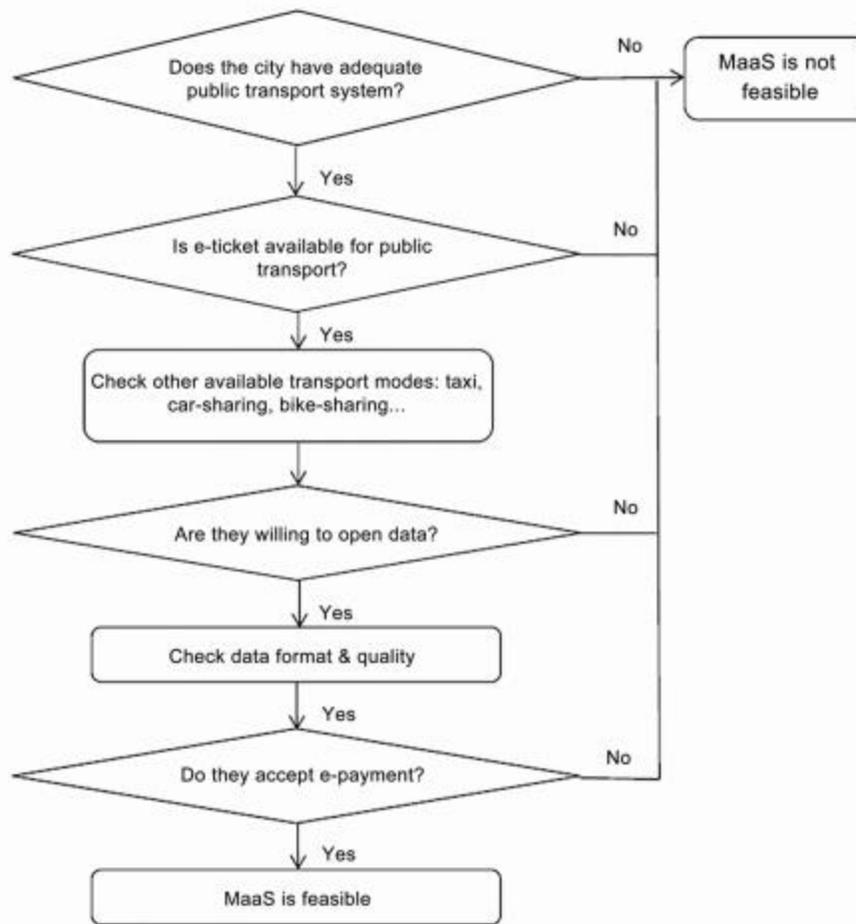
From a mobile trip planning and payment perspective, the leaders would appear to be Whim in Finland and Jelbi in Germany – both of which consolidate trip planning and payment for multiple transportation providers. Whim provides service packages for a range of fees. For instance, at the high end of Whim’s service offerings is Whim Unlimited, which costs 499 Euros per month (about \$760 CAD) and which provides up to eighty 5-km taxi rides per month or an economy rental car for a month, plus unlimited use of Helsinki public transport (buses, metro, tram, and local trains), access to book and pay e-scooters and unlimited 30-minute city bike rides. At the low end of Whim’s offerings is Whim to Go, which costs 24.90 Euros per month (about \$38 CAD) and which provides unlimited use of city bikes (which usually cost 30 Euros per month) plus standard pricing for public transit, taxis, car rentals and e-scooters but with the convenience of a single app for payment and ticketing. Whim has several other service packages between these two extremes (Whim, 2020). In contrast, Jelbi is less of a single coordinating service with discounted fees for affiliated transportation providers, and more of a coordinating information platform and app provided by Berlin's public transportation agency, which links travellers to mobility services available at selected transportation hubs (Jebli, 2020). Other jurisdictions have implemented inter-app integration whereby the mobile apps of different public and private service providers link seamlessly to each other (Hamilton, 2018a).

Table 1 below provides examples of MaaS pilots (adapted from Goodall, Dovey, Bornstein, & Bonthron, 2017). As MaaS is a quickly evolving space, services that seemed to be thriving a couple of years ago, such as Bridj, no longer operate in places where they were previously active or, as with the SMILE app, are no longer functioning as pilot projects. Meanwhile, other service models have expanded or reflect changed service offerings, such as Moovel.

<b>Table 1. Illustrative MaaS pilots around the world (adapted from Goodall, Dovey, Bornstein, &amp; Bonthron, 2017)</b>				
<b>Project</b>	<b>Services included</b>	<b>Run by</b>	<b>Scope</b>	<b>Links</b>
Whim app	Taxis, rental cars, public transport, bikeshare	MaaS Global	Helsinki	<a href="https://whimapp.com/">https://whimapp.com/</a>
UbiGo	Public transportation, carsharing, rental car service, taxi service, and bicycle system	Go-smart (by Lindholmen Science Park), and partners from industry, academia and government, co-funded by Vinnova	Gothenburg (80 households; approximately 200 users); launched in Stockholm in 2019	<a href="https://www.ubigo.me/en/about-ubigo">https://www.ubigo.me/en/about-ubigo</a>
Qixxit	Carsharing, ridesharing and bikesharing. Identifies ideal train connections and shows all travel possibilities	Deutsche Bahn	Germany	<a href="https://www.qixxit.com/en/">https://www.qixxit.com/en/</a>
Moovel (rebranding to Reach Now)	car2go, mytaxi, DriveNow, nextbike (and Deutsche Bahn in Germany)	Daimler AG and BMW Group	Germany (with testing in Boston, Portland and Helsinki)	<a href="https://www.moovel.com/en">https://www.moovel.com/en</a>
Beeline	Crowdsourced private bus services and routes-on-demand	Government agencies (Infocomm Development Authority and Land Transport Authority) in partnership with transport operators, academia and the private sector	Commuters in Singapore	<a href="https://www.beeline.sg/">https://www.beeline.sg/</a>

<b>Table 1. Illustrative MaaS pilots around the world (adapted from Goodall, Dovey, Bornstein, &amp; Bonthron, 2017)</b>				
<b>Project</b>	<b>Services included</b>	<b>Run by</b>	<b>Scope</b>	<b>Links</b>
SMILE app	A range of rail, carsharing, taxi and bikesharing options, with information, booking, payment, usage, billing and ticketing from a standardized interface	Wiener Stadtwerke, Wiener Linien, Austrian Federal Railways and private carsharing, taxi and bikesharing service providers	Vienna (1,000 pilot participants)	<a href="http://smile-einfachmobil.at/index_en.html">http://smile-einfachmobil.at/index_en.html</a>
Bridj	Commuter shuttle with a variety of vehicles, optimizing pick-ups, drop-offs and routing based on demand (Demand Responsive Transport)	Bridj Inc.	Sydney and Singapore (previously for commuters in Boston, Kansas City and Washington, DC)	<a href="https://bridj.com/">https://bridj.com/</a>

Li and Voegelé (2017) discuss challenges in terms of users’ perspectives, business models, operations and policy systems for the implementation of MaaS. Figure 3 lays out some of the operational difficulties that need to be overcome for MaaS to be widely adopted. Essentially, in order for MaaS to be feasible, a city or other jurisdiction would need to have an adequate public transportation system which uses e-ticketing, other available modes of transport that are willing to share data (e.g., providers of taxis, carsharing and bikesharing), and whose data are of useable quality, and whose data can be formatted for sharing, and who accept e-payment.



**Figure 3. Check list of operating MaaS in a city** (Source: Li & Voegelé, 2017)

In response to the need for integrated information systems across modes of transportation, the US Federal Transit Administration’s recent Mobility on Demand program (MOD) piloted a “multimodal, integrated, automated, accessible, and connected transportation system in which personalized mobility is a key feature. MOD allows for the use of on-demand information, real-time data, and predictive analysis to provide travelers with transportation choices that best serve their needs and circumstances... a traveler-centric approach” (U.S. Federal Transit Administration, 2020). Among the objectives of the program were to “Validate the technical and institutional feasibility of innovative MOD business models, and document MOD best practices that may emerge from the demonstrations”. The MOD demonstration programs involved a variety of transportation modalities and were implemented in eleven communities including San Francisco, Dallas, Chicago, Palo Alto-Prospect Silicon Valley Bay, Los Angeles and the greater Portland metropolitan area. Findings from evaluation reports are beginning to emerge. However, this type of consolidation continues to be rare in North America.

## 2. Transportation Network Companies (TNCs)

There has been a rapid proliferation of transport network company-based (TNC) ridesourcing. Uber stands as the giant among TNCs followed by Lyft and other players. Estimates of Uber's value as a publicly traded company was approximately \$49 billion at the beginning of October 2019. Lyft, which is also publicly traded, is about \$11.6 billion.

While Uber and Lyft are indeed huge companies, their financial viability is by no means assured. Lyft's second quarter forecast in 2019 was a loss ranging from \$850 million to \$875 million per year, which was higher than total losses in 2016 and 2017. Uber reported a \$5 billion quarterly loss instead of its projected \$4 billion loss for the entire year. While these two companies had been subsidizing rides up to 60% to lure customers, their drivers had been protesting their working conditions (Kindig, 2019). In addition to difficulties with drivers, which are the companies' main asset, Uber also laid off hundreds of engineering, product, and marketing employees (Hawkins, 2019). During the third quarter of 2019, Uber's net loss was \$1.2 billion.

At the beginning of October 2019, Uber's market capitalization had plunged to \$49 billion from the private valuation of \$76 billion ahead of its IPO in May. Lyft's market capitalization had fallen to \$11.6 billion from its previous private valuation of roughly \$15 billion (Palmer, 2019).

While Uber's third quarter position in 2019 may have been better than the company's previous quarter, several developments in late 2019 and early 2020 further stirred the already choppy waters for TNCs:

- London (England) declined to renew Uber's license late in 2019 (Griswold, 2019).
- New Jersey imposed \$640 million on Uber in taxes and penalties for misclassifying drivers as independent contractors (Catalini & Bussewitz, 2019).
- Seattle introduced new fees on rides and a minimum wage for drivers (Nickelsburg, 2019)
- Chicago passed a congestion tax on solo rides provided by companies like Uber and Lyft (Greenfield, 2019).
- Massachusetts Governor Charlie Baker introduced a budget plan that would increase the per-ride fee for Uber and Lyft customers from 20 cents to a dollar, 70 cents of which would go to the state and 30 cents to cities and towns to improve public transit (NBC Boston, 2020).
- California's new Assembly Bill 5 (AB5) law came into effect in January 2020, which made it harder for Uber and Lyft to classify drivers as independent contractors and which further complicated the companies' already uncertain futures (Bakiny, 2020). Uber's response for California was to allow select drivers to set their own fares up to five times higher than regular Uber fares in Santa Barbara, Sacramento, and Palm Springs (Gartenberg, 2020).

None of these developments were welcomed news for the TNCs. No doubt, the COVID 19 pandemic has worsened matters for both companies. In the third week of March 2020 a report in the Star in Toronto indicated that business for taxis and TNCs had “tanked” (McGran, 2020). A recent article in Investor’s Business Daily described Uber’s and Lyft’s troubled situations on the Nasdaq stock exchange, and cautioned investors not to buy (Lehtonen, 2020). Both companies lost considerable financial ground in 2020.

It is beyond the scope of the present paper to provide a detailed discussion of how the US and other jurisdictions are integrating TNCs into existing transportation services and infrastructure. Even a cursory discussion would be overwhelming and would fast become outdated. For instance, we conducted a search at the Shared-Use Mobility Center’s Learning Center for case studies, brief overviews and regional profiles of involving TNCs. As of the end of March 2020, we obtained 207 search results beginning in 2015. Some items were multi-example studies.

Indeed, some well-organized and well-resourced organizations in the United States regularly generate a substantial volume of high-quality information on TNCs and other modes of shared mobility in that country. The Recommendations section of the present report discusses selected examples. These provide useful descriptive reporting, with supporting statistical data and some reasonably detailed case studies, about how TNCs and other modes of shared mobility are being integrated into broader transportation infrastructures in the US. We discuss measures with a focus on people with disabilities in sections VII through X of this report.

### 3. Carsharing

Shaheen et al. (2019) have described several main forms of carsharing and business models. Main forms include *roundtrip* (vehicles are picked-up and returned to the same location), *one-way station-based* (where vehicles are dropped off at a different station from the pick-up point) and *one-way, free-floating* (where vehicles can be returned anywhere within a specified geographic zone).

Business models include: *business-to-consumer* (B2C – where consumers gain access to a business-owned fleet of vehicles through memberships, subscriptions, user fees, or various pricing models); *business-to-business* (B2B – where carsharing providers sell business transportation to business customers through a fee-for-service or usage fees); *business-to-government* (B2G – where carsharing providers offer transportation services to a public agency based on fee-for service contracts, per-transaction charges, or other pricing models); and *peer-to-peer* (P2P – where carsharing providers broker transactions among vehicle owners and guests by providing the organizational resources needed to make the exchange possible. This is sometimes called personal vehicle sharing). The following discussion focuses on business-to-consumer carsharing (B2C).

The earliest business-to-consumer carshare organizations in the United States were established in the early 1980s but Enterprise Carshare and Zipcar are presently the two largest providers in

that country. Flexcar and Zipcar, which had been the two largest for-profit carshare services, merged in 2007 under the Zipcar brand. Enterprise CarShare and Zipcar purchased what had been the large nonprofit carshare providers, I-GO in Chicago and Buffalo CarShare in Buffalo, New York (National Center for Mobility Management, 2017). As of 2019, carshare was available in 47 of the largest cities, population-wise, in the US (Shared-Use Mobility Center & National Center for Mobility Management, 2020).

Having experienced the lack of accessible vehicles in the European and North American carshare market, Charlotte de Vilmorin founded the company Wheeliz in France. De Vilmorin is a Parisian and life-long wheelchair user. Wheeliz connects people with accessible vehicles to people who need to use them for short durations. Vehicles include those with lifts and ramps, and adapted controls. This peer-to-peer model is based partly on the understanding that people who own such vehicles are not using them all the time. Wheeliz touts itself as offering the largest fleet of adapted vehicles anywhere in France. It charges considerably less than regular rental companies and will provide users up to a 50% reduction if they can find an equivalent vehicle cheaper elsewhere. French insurer MAIF covers the owner's vehicle and the renter for the entire duration of the rental period. In case of damage, the insurer will arrange for the owner's vehicle to be towed/transported and will provide a replacement vehicle to ensure the owner remains fully mobile. For the renter, the insurer provides 24-hour breakdown service and will ensure alternative arrangements are made for the driver and passengers (Keane, 2015; Wheeliz, 2020).

#### 4. Microtransit

Microtransit has been a key focus of municipalities attempting to bridge the gap between fixed-route transit and ridesourcing services. Aims have included serving less populated areas while containing costs and increasing and improving transportation options for people with disabilities. Thanks to the proliferation of both mobile solutions and vehicle providers, cities have a range of partners to choose from. Although there is always a risk that these providers will close up shop (e.g. Bridj, Chariot), two major providers offer this service: UberPOOL and Lyft Shuttle. Other examples include the following:

- Building on a smaller pilot project, the Los Angeles Metro recently awarded a \$29 million contract to RideCo to provide on-demand short trip rides to six service zones in Los Angeles County. RideCo will provide the vehicles and mobile/web platform, and LA Metro will hire new staff as drivers. The program “will allow riders to plan entire trips — both microtransit and their bus and train ride — using real-time booking through a single mobile app, internet browser or L.A. Metro’s call center. Riders will be able to pay for the service by using their TAP card and TAP account, or with a debit, credit or prepaid credit card.” Vehicles will accommodate up to 12 people at a time (Los Angeles County Metropolitan Transportation

Authority – Metro [LACMA], 2020). Los Angeles has a separate contract with Via to provide fully wheelchair-accessible first-and-last mile service to and from three high-use metro stations in the county (discussed below). The Los Angeles projects build on the county’s 2014 First Last Mile Strategic Plan & Planning Guidelines, which are a key element in the integration of fixed-route transit and shared mobility options (Los Angeles County Metropolitan Transportation Authority, 2014).

- Ongoing work to resolve the complex and costly Los Angeles region traffic problem also includes a project centred on the International Airport in San Bernardino County. The county’s transportation authority is subsidizing Lyft rides from four metro stations to the airport – rides up to \$35 are free with a code that is entered into the Lyft app. Riders with “special mobility needs” can book service by phone (Metrolink, 2019).

The United States Federation Transit Administration (FTA) has created the Mobility on Demand (MOD) Sandbox Program to support eleven of these types of programs, including funding of the LACMA/Via and Seattle/Via partnerships noted above (U.S. Federal Transit Administration, 2019).

## 5. Public-private partnerships and shared mobility

A recent report by the Shared-Use Mobility Center and the National Center for Mobility Management ([SUMC and NCMM], 2020) brings attention to the leading role that public transit agencies in the United States and elsewhere are taking to address the needs of people with disabilities by entering into public-private partnerships with shared mobility operators (Benedict, Shanley & Theunissen, 2020). Examples provided in the SUMC and NCMM report include the following:

- Chicago’s Vehicle Accessibility Fund (\$0.10 per non-accessible taxi or ridesourcing trip) has supported a program that offers: (i) \$15,000 to \$20,000 incentives to purchase a new wheelchair accessible vehicle (WAV) or convert a standard vehicle to a WAV taxicab; (ii) exemption from dispatch fees for WAV medallion holders; (iii) a \$10,000 incentive to medallion owners that purchased WAV taxis; and (iv) annual grants of up to \$5,000 for WAV taxi maintenance. The number of WAV taxis has grown from 91 to 436 since 2016.
- The City of Oakland, CA launched a partnership with Lime to provide 75 scooters that have been adapted for the needs of people with disabilities (with mobility impairments likely being the prime factor). Scooters are ordered and then delivered to a requested location. Additionally, Oakland has partnered with Ford GoBike to provide an adaptive bikeshare program that has expanded to four additional cities and offers access to more than 4,000

bikes that can accommodate users with a range of abilities and impairments. See also Adaptive Biketown in Portland and Adaptive MOGO in Detroit (Nonko, 2019).

- Santa Monica has replaced its dial-a-ride paratransit service with Mobility On Demand Every Day (MODE), in partnership with Lyft. The program provides same-day service, costs less than a dollar per trip, and includes customers who use wheelchairs and/or who need “door-through-door” assistance, i.e., assistance from the vehicle into their destination place.
- In 2019 the Evanston, Illinois district school board moved from using taxis to the shared mobility provider Zūm (which claims to have contracts with more than 4,000 schools and districts in the U.S.) to transport students enrolled in high school special education programs. Parents are able to use an app to track their child’s location in real time.

A recent publication by researchers for the National Academies of Sciences, Engineering, and Medicine in the US provides 20 case studies of communities that have implemented public-private partnerships with TNCs (Curtis, Merritt, Chen, Perlmutter, Berez & Ellis, 2019). The researchers found that the motivations for public transit agencies to enter into partnerships usually revolved around using TNCs to provide a specific type of service while meeting or responding to a specific policy goal or challenge, as well as demonstrating innovation and the flexibility to experiment. Target audiences commonly include people connecting to transit (i.e., for first mile/last mile travel), customers of paratransit or dial-a-ride services under the *Americans with Disabilities Act (ADA)*, people traveling in lower density environments, people with late night travel needs, and guaranteed-ride-home participants. The most common design of these partnerships involves transit agencies directly subsidizing TNC trips, and collaborative marketing of TNC discount codes by transit agencies and TNCs. For customers without smartphones, transit agencies generally facilitate travel arrangements through a dispatch service. For unbanked customers, transit agencies typically use a taxi company, dispatch service, or prepaid card.

Experience with these partnerships has shown public transport agencies that TNCs are often hesitant to share data due to concerns about privacy, public records requests (under “Sunshine Laws”) and competition. Earlier partnerships lacked data-sharing agreements. Even though the Regulations for the *Americans with Disabilities Act* apply to transit agency partnerships with TNCs, challenges continue to include TNCs failing to provide wheelchair accessible vehicles and to ensure equivalent response times for riders in these vehicles and in standard vehicles (Curtis et al., 2019).

While many people with disabilities can make do with curb-to-curb or door-to-door transportation services, some (particularly older adults and people with severe physical impairments) may require “door-through-door” transportation, including assistance leaving home or even getting out of bed in the case of acute health issues. The evidence suggests that TNCs that partner with public transit agencies are not usually adept at meeting such needs.

## B. Examples from Canada

### 1. Mobility as a service (MaaS)

We performed various searches for permutations of mobility as a service in Canada from 2017 to April 2020 and received few hits. Various other permutations and searches for references to mobility as a service in several provinces and major Canadian cities also led to few resources other than conversations on Twitter, advertisements, presentations (e.g., Bracewell, 2016) and information about conferences and symposia that have featured MaaS in this country (e.g., Simon Fraser University, 2019; Intelligent Transportation Systems [ITS] Canada, 2018). This is not to say that MaaS is of no interest to researchers in Canada: the Mowat Centre, the Conference Board of Canada, Arup-MaRS Solutions Lab, Deloitte, KPMG and others with operations in Canada have all weighed in on the subject. However, their publications have been general in geopolitical focus. Very little has been published by these organizations or by other researchers about the actual state of MaaS implementation and related issues in Canada.

That said, an Arup-MaRS study (Falconer, Zhou & Felder, 2018) has provided basic information about a small GO Connect pilot project run in Milton, Ontario from May 2015 to March 2016. The pilot involved a partnership between Metrolinx, the Town of Milton, a local taxi company and an app provider (RideCo). Metrolinx is the regional transportation agency responsible for improving the coordination and integration of all modes of transportation in the Greater Toronto and Hamilton Area. The Milton project served about 85 people per day, which was about a third of the intended ridership for the pilot. Although described as a “watershed for the GTHA [Greater Toronto Hamilton Area] in terms of mobility partnership”, and by Milton town staff as a “success”, the regional Halton Town Transit Coordinator said there were no immediate budgetary plans to reintroduce the dynamic transit service (Hennessey, 2016). The Arup-MaRS researchers concluded that the program was “weak regarding a proven value proposition” because of “low penetration and use, limited evaluative statistics and singular purpose of trips undertaken.” The authors concluded that “future pilots must be more comprehensive and cross-geographic” (Falconer et al., p. 29). A recent report by the Conference Board of Canada, however (Olateju, Markovich, & Francis, 2019), gave a more favourable reading of the project’s net increased ridership and financial benefits, indicating that such

partnerships “have an important role to play in ensuring the continued success and growth of public transit in the new mobility ecosystem” (p. 18).

The Arup-MaRS study (Falconer, Zhou & Felder, 2018) also described a local-area research project that involved 23 commuters (a mix of drivers, Toronto Transit Commission [TTC] riders and GO train riders). That research yielded insights into the commuters’ behaviours, their perceptions of different modes of commuting, common struggles during commutes, barriers to commuting, and ideas for addressing commuters’ transportation-related needs. GO Transit is the regional public transit service which links the Greater Toronto and Hamilton Area. In response to travellers’ difficulties, Arup-MaRS developed, tested and evaluated prototype solutions which included a trip-planning app, a dynamic carpooling service and a microshuttle service. The evaluation engaged 80 commuters from Vaughn, Ontario. The researchers concluded that suburban commuters drive to congested GO stations in high numbers, arrive early so they can obtain free parking, and undergo generally unpleasant experiences overall, in exchange for control and reliability, and because they do not perceive they have other options. The commuters struggle to see all their transportation options in one place and have difficulty managing the cost, time implications of different routes, and other difficulties associated with figuring out how to get to work on time. From their research the authors distilled principles to inform future development of mobility services. The principles centre on ensuring that travel-related information and services meet consumers’ needs, facilitate freedom and control, are convenient, trustworthy and cost-efficient, and present real time alternatives when travelling conditions on specific routes become problematic.

While not a single provider of integrated transportation service, Metrolinx’s Smart Commute has provided information about a variety of travel options (walking, cycling, transit and driving) and includes a ride-matching and carpooling option which matches people who want to travel within the region with participating drivers. A program of 19 municipalities in the Greater Toronto and Hamilton Area (GHTA) participate in the initiative. The Smart Commute website indicates that it has 13 offices, 345 staff, and engages over 712,000 employees and post-secondary students. However, that information about Smart Commute was current as of March 31, 2018 (Smart Commute, ND) – over two years before the present report was written – and the most recent Smart Commute Blog post was for January 20, 2018.

While research is limited about MaaS in Canada, some information has been reported about technological developments that could help move transportation systems and related information towards greater integration. Noteworthy developments on the technology front for shared mobility include the following:

### ***Canada-wide***

As of January 2020, Uber passengers in Canada (and the US) will be able to supply a PIN code to their driver to verify that they are in the right vehicle (e.g., every ride, for night trips). PIN codes

theoretically prevent tragedies similar to the murder of Samantha Josephson in March 2019, who entered the wrong car after hailing an Uber (Fingas, 2020).

### ***British Columbia***

In Vancouver, the Shared Mobility program, was launched on October 24, 2019 and was to run until May 2020. The project was pilot tested by 14 Vancouver-based employers for the work-related travel of about 200 employees. Employees used a Shared Mobility Compass Card to pay for and unlock travel on Evo Car Share, MODO Co-operative Car Share, and Mobi Bike Share. The employers were able to view employee travel expenses for each mode of travel at the end of the month through a streamlined expense report. The pilot tested the feasibility of Metro Vancouver residents' use of their Compass Card to travel on not only TransLink's public transit services, but also the car share and bike share services of select providers (Chan, 2019a). TransLink's website indicated that the pilot was still active late in August of 2020 (TransLink, 2020).

In November 2019, Vancouver hosted a Decode Congestion Hackathon for programmers to use data and new technologies to improve road safety, monitor traffic conditions and trends, ensure a smart and efficient transportation system, coordinate street use and prioritize people and good movement. Prize winners included a gamification tool for collecting bus data and encouraging transit use, a machine learning solution for detecting vehicles in static images, and a traffic camera that uses machine vision and computing technology to detect cyclists, pedestrians and buses (Crowe, 2019).

In August 2019, Vancouver's TransLink announced it will be expanding its artificial intelligence program to improve bus departure estimates. The initiative is based on a pilot project that improved the difference between predicted and actual bus departure times by 74% and reflects a collaboration between Microsoft and intelligent software and analytics company, T4G. The new AI program has been incorporated into TransLink's Next Bus [website](#) and SMS tool. The third-party Transit App and Google Maps will also use the new planning tool (Plana, 2019).

In May 2019, TransLink announced it would install over 50 state-of-the-art touch-screen kiosks on the SkyTrain stations on two of its major lines, as well as at West Coast Express stations, SeaBus terminals, Park and Ride locations and bus loops. The screens are like wayfinding screens at shopping centres and allow commuters to plan trips, view transit schedules, see upcoming departure times, be alerted to updates, and receive emergency messages (Chan, 2019b).

In May 2019, Vancouver-based Spare Labs received \$6 million seed funding from Mitsubishi Corp., which Spare will use to expand sales and support for its Spare Platform. The platform enables automakers, cities, and transit agencies, e.g., Dallas Area Rapid Transit (DART), to manage automated, on-demand transportation networks within multimodal transportation planning tools (T-Net, 2019).

## **Quebec**

Taxelco and Netlift announced in January 2020 that they will pool algorithms for routing, dispatching, matching and managing carpooling, parking and smart payments, and will make these available to all taxis throughout Quebec. Taxelco is the largest taxi company in Montreal and Quebec City. Netlift is a door-to-door carpool and parking platform (The Canadian Press Staff, 2020a).

## **Ontario**

Presented as a new initiative for its Smart City strategy, Ottawa announced in December 2019 that it would join Toronto, Montreal, New York and San Francisco in Google's Waze for Cities program. Crowd-sourced, Waze provides drivers with real-time information for avoiding construction, accidents, detours and other road delays. Waze will also share data to inform the city of any incidents on Ottawa roads (Techopia Staff, 2019).

In August 2019, Uber unveiled a kiosk at Toronto's Pearson International Airport that allows passengers to book rides without a smartphone. The company says it is designed to create greater access for travelers who might have difficulty using the Uber app because of language or tech issues. Uber says it is aiming to set up the kiosks to increase access at other high-volume venues (Rapier, 2019).

The St. Catharines Transit Commission in Ontario is the first transit agency supported by a partnership between Masabi and Transit to provide integrated mobile ticketing in Transit. Transit is North America's leading mobility app endorsed by dozens of agencies as their official app. Masabi's Justride is the leading Fare Payments platform for public transport. More than half of St. Catharines' riders already use Transit daily and can buy, store and use tickets inside this service instead of needing to download a new app. Such ticketing makes it easier for riders to use St. Catharines transit services. The agency can use the Justride Hub to access back office data including real-time sales, usage and validation information, and a customer service interface (Masabi US Ltd., 2019).

## 2. [Transportation Network Companies \(TNCs\)](#)

In March 2019, movmi published an online article which referred to another article written in 2016 which indicated that ridesourcing (called ride hailing in that article) was available in 14 regions in Canada. These communities comprised about half the population of the country and included parts of Alberta (Calgary, Edmonton), Ontario (Toronto/GTA, Hamilton, Ottawa, Kitchener, Guelph, Kitchener-Waterloo, Niagara, London, Windsor) and Quebec (Montreal, Quebec City) (movmi, 2019; Licorish, 2016). Major service providers were Uber and Lyft. Smaller organizations that the article mentioned were Facedrive (Toronto/GTA) and TappCar

(selected communities in Alberta and Manitoba). Movmi also mentioned that Saskatoon had recently joined those communities by permitting Uber to operate.

Since movmi's article in March 2019, ridesourcing became available in British Columbia and public officials were considering the possibility in the Halifax region in Nova Scotia. Unlike in the US, where various reports give details on where TNCs are operating, there is no single Canadian source of information. Uber's website says it operates in the following Canadian communities (Uber, 2020c):

- British Columbia (Vancouver)
- Alberta (Calgary, Edmonton, Lethbridge, Red Deer)
- Saskatchewan (Regina, Saskatoon)
- Manitoba (Winnipeg)
- Ontario (Ottawa, Kingston, Toronto, Hamilton, Kitchener-Waterloo, London, Niagara Region, Windsor)
- Quebec (Gatineau, Quebec City, Montreal)

Lyft's list of cities where it operates in Canada includes (Lyft, 2020a):

- British Columbia (Vancouver and nearby Richmond)
- Ontario (Ottawa, Hamilton, Toronto and surrounding communities such as Ajax, Brampton, Mississauga, Newmarket, Oshawa, Richmond Hill)

The following details were gleaned by searching the online Mobility Hub newsletter produced by the Shared-Use Mobility Center in the US and by following up on SUMC's links and other leads to recent articles and documents.

### ***British Columbia***

British Columbia's Passenger Transportation Board announced in January 2020 that it approved Uber and Lyft to operate their ridesourcing services in parts of British Columbia. Uber and Lyft had been prevented from doing so since November 2012, when the regulator informed Uber that it had to follow the same rules as limousine services and charge a minimum of \$75 per trip, which effectively shut Uber down in the province. Despite protests from Uber, Vancouver's City Council held fast. Over the intervening years, the percentage of Vancouverites who commuted to work by walking, cycling or transit increased significantly and short-term car rentals like Car2Go became highly popular. However, Car2Go announced it would cease operations in North America as of February 2020 (Griswold, 2020), and Vancouver residents and BC's tourism industry had been complaining about not having access to Uber and Lyft (Zipper, 2019). Uber and Lyft had been angling to operate in Vancouver and formally applied when licensing and insurance rules opened up in September 2019 (Bliss, 2019).

In the years when TNCs were not permitted to operate in BC, and despite the legal obstacles, Gokabu Group had been operating Kabu Ride with hundreds of drivers. The service earned

more than \$10 million a year, serving mainly Asian students while expanding its reach. As the new TNC rules were being developed, Kabu suspended operations to avoid legal troubles, encouraged its drivers to get their Class 4 drivers licences, and secured training to ensure the company would have enough drivers ready to work under new provincial rules (Shore, 2019). Kabu was approved to operate in February 2020 (The Canadian Press Staff, 2020b).

### ***Nova Scotia***

In January 2020, Halifax Regional Council signalled a green light to approve TNCs in the Halifax Regional Municipality but needed to request amendments to the *provincial Motor Vehicles Act* for the resolution to go forward (Quon, 2020). The Progressive Conservative party said it would introduce a bill that would amend licensing provisions to make driving for TNCs more rigorous than required for a standard Class 5 driving license but less rigorous than for the Class 4 license for taxis, which requires extra driving tests, an eye exam and a medical checkup (Davie, 2020).

The proposal was similar to the one the Select Standing Committee on Crown Corporations (2019) in BC had proposed. A bill was to be discussed in the Nova Scotia provincial legislature soon after reconvening in late February (Frisko, 2020). However, our search of Hansard for Nova Scotia found only two mentions of “transportation network company” “TNC”, “ride-hail” “Uber” or “Lyft” as of September 24, 2020. The discussion on March 6, 2020, included the messages from the Minister of Natural Resources that the regulation of TNCs is a municipal responsibility, but that the government was reviewing regulations for discussion in the fall of 2020. At issue in the legislative debates on March 10 was why the government’s announcement about TNCs, which was to have taken place on February 19, did not occur. The Minister of Natural Resources said that government officials had been meeting with Uber and Lyft, but that responsibilities fall mainly to the municipalities. In August, the Regional Council of Halifax announced its own intention to allow TNCs to operate in that region (Nichols, 2020). Halifax was not given the province’s permission to levy a per-trip charge on TNCs. Halifax has nonetheless required that drivers undergo checks for criminal background, child abuse and for serving vulnerable persons (Chisholm, 2020). Uber’s listing of cities for Canada did not include Halifax as of September 23, 2020 (Uber, 2020c).

Meanwhile, Nova Scotia’s Department of Energy and Mines had presided over a request for proposals it had put to tender late in 2019 for the provision of rural ridesharing in Nova Scotia “for the purposes of gathering information about the marketplace in order to assist in the determination of future purchasing options or requirements” (Nova Scotia Department of Energy and Mines, 2019; Mulligan, 2019).

### 3. Carsharing

The online shared mobility magazine, *movmi* (2019), recently reported that Canada had 20 carsharing services, more than 336,000 members and 5,200 vehicles in January 2018. Key players in the Canadian carsharing market are:

- Enterprise CarShare (available in Regina, Sackville, New Brunswick, Saskatoon and Toronto);
- Zipcar (available in available in Victoria, Vancouver, London, Kitchener / Waterloo, Toronto and Ottawa);
- Communauto (available in Montreal, Ottawa, Gatineau, Quebec City, Sherbrook, Halifax and recently, Toronto);
- Modo (North-America's first car sharing co-operative, available in the Vancouver Lower Mainland, Vancouver Island, Okanagan and Squamish);
- Evo (launched by the BC Automobile Association, available and with drop points only in the Vancouver Lower Mainland but useable anywhere in Canada).

Car2Go had been a major player but recently ceased operations in North America.

Published materials leave patchy impressions of carsharing in various locations in Canada. We found that the Shared-Use Mobility Center's *Mobility Hub* newsletter is more useful than other sources for recent information about the situation in Canada. By following up on leads from this source we found the following:

### ***Vancouver and region***

Some 34 per cent of Vancouver adults are car sharing members, many of whom use car sharing to save money and to reduce greenhouse gas emissions. Since September 2019, users of Evo, a non-profit carshare organization which was established by the BC Automobile Association, have been able to park at Vancouver's city meters without charge. Vancouver's program added over 10,000 parking spots to the Evo network in addition to free car share parking in Resident Permit Parking and Resident Parking Only zones. Evo was the first carshare organization to participate in the initiative and operates 1,500 hybrid vehicles across the Lower Mainland. Users of Modo are allowed free parking for up to 2-hours at all metered stalls in the City of Vancouver. While the parking program does not include North Vancouver, Burnaby or New Westminster, Vancouver city staff are working with these municipalities to expand the program (Lloyd, 2019; Modo, 2019).

SUMO, a regional carshare company in BC, has announced plans to expand its fleet to put 2,000 electric vehicles on the road in Surrey by 2022 (Hincks, 2019). A recent review of SUMO's website (SUMO, 2020) indicates what appears to be the company's commitment to achieve that aim.

TransLink positions carsharing and other shared transportation modalities as ways of connecting customers with its services in the Metro Vancouver area. Translink's services include buses, SkyTrain rapid transit, SeaBus passenger ferries, West Coast Express commuter rail and HandyDART for passengers unable to use conventional transit. Translink enables free parking of car-share vehicles in reserved parking spots for carshare providers at several TransLink park-and-ride locations (Olateju et al., 2019).

Vancouver's supportive policies help to explain the popularity of carshare membership in that city. For instance, among other things, Vancouver Transportation Demand Management plan requires carshare in new multi-family residential and commercial developments (SUMC, 2019).

Carsharing has been of longstanding interest in Vancouver. The Carsharing Association (CSA) held its annual conference in that city in 2015 and was planning to convene another in Vancouver in 2020 but had to postpone the event until 2021 because of the COVID 19 pandemic. The Carsharing Association is a global, member-based organization that promotes the positive impacts of carsharing and supports the growth and advancement of industry globally. It reported that in 2015 it represented more than 4,000 shared vehicles and 125,000 drivers (Carsharing Association, 2015, 2020).

### ***Calgary***

In January 2020, Calgary began considering a three-tier pricing scheme for carsharing organizations so their members can park for free in the city. Communauto's vice-president Marco Viviani stated that this move was an "encouraging step" towards the return of carsharing to Calgary after the departure of Car2Go in October 2019. Communauto operates in Edmonton, Toronto, Kitchener/Waterloo, Hamilton, Guelph, London, Kingston, Ottawa, Gatineau, the regions of Montreal and Quebec, Sherbrooke, Halifax, and Paris, France (Chandler, 2020).

### ***Toronto***

Based on what they deemed a successful 18-month pilot program, Toronto's transportation services department and the Infrastructure and Environment Committee voted to allow carshare vehicles to be kept on city streets instead of in parking lots. The new rules will allow car-share users to pick up a car on a street near them and leave it on a street near their destination, instead of having to travel to a depot and leave the car there. As Car2Go had left Toronto because of what it called onerous rules and parking fees that were too high, Quebec City-based Communauto was the only company to participate in the Toronto pilot project. Although Communauto has only 200 cars and 6,500 customers in Toronto instead of the 80,000 city customers previously claimed by Car2Go, demand is high and the company's spokesperson said there is room for 2,000 car shares in the city (Kopun, 2020).

## 6. Public-private partnerships and shared mobility

Due to the visibility and controversy surrounding Uber and Lyft as poster children of the sharing economy, there has been widespread attention to developments in shared mobility in urban environments. This attention, and the potential/promise of shared mobility technology to improve transportation in general, has led municipal governments of all sizes around the world to take the plunge. For example, in Canada:

- An Arup-MaRS study (Falconer, Zhou & Felder, 2018) featured a project in which the Town of Innisfil, Ontario, entered into partnerships with Uber and Barrie Taxi, which was the first partnership between Uber and a municipality in Canada (Anne, 2017). This initiative, which began in May 2017, was also the first to provide a form of public transit service to the town, which had conventional bus service. In effect the town subsidized the travel provided by service vendors, thereby reducing the prices charged to customers. Fares under this arrangement were \$5 for selected destinations and a fare reduction of \$5 for other destinations within Innisfil boundaries. As such, the services were not constrained by public sector operating criteria, e.g., on geographic coverage, hours of operation or minimum service levels, and were more affordable to the town than conventional bus services would have been. While ridership for the project was considerable and the project seemed successful on that basis, accessible trips were not included in the metrics for evaluation. The Arup-MaRS authors point out that the price point was relatively high, especially for repeat or regular trips, and that there was “limited evidence” of evaluation benchmarks for performance or for the handover of data from the vendors for evaluation purposes (Falconer et al., 2018).

As of the writing of the present paper, the partnerships remain in place, with charges ranging from \$4 to \$6 per trip to selected destinations and a fare reduction of \$4 to other destinations within Innisfil boundaries.

- Okotoks, Alberta recently introduced an exclusively on-demand pooled ride transit model. It utilized a web-based and mobile booking service – utilizing adapted cargo vans, with fares at \$2.75 (Okotoks Transit, 2020). The city also provides subsidized taxi trips for older adults and people with disabilities and supports a volunteer driver program for people who require transportation to medical appointments outside the local area (City of Otokoks, 2020).
- In September 2019, Sault Ste. Marie, Ontario began a pilot of a mobile app and phone-based on-demand bus service on Sunday evenings. The service used existing city buses, routed in real time based on passenger demand. The New York City-based Via is the program’s key technology partner (Sault Ste. Marie, 2019). The service recently received a two-year extension (Della-Mattia, 2020).
- The Waterloo, Ontario-based RideCo has partnered with a number of municipalities to utilize its own mobile ride-scheduling technology solutions, including Cochrane, Alberta; Calgary, Alberta; and Guelph, Ontario (RideCo, 2020).

- The City of Belleville, Ontario has partnered with Pantonium (based in Toronto's MaRS Discovery District) to change its Route 11 night bus service from fixed-route to on-demand, which has led to a more than tripling of ridership (Meeks, 2019).

The Conference Board of Canada's, *My Ride, Your Ride, Our Ride: Public Transit and Shared Mobility* (Olateju et al., 2019) takes a wary view of the new shared mobility options in the country. Among its observations are that information from shared mobility providers is sparse and the futures of these services are uncertain. Accordingly, partnerships with shared mobility providers must be managed carefully, from a long-term perspective, and must prioritize, among other things, acquiring needed data from those providers.

## 7. Microtransit

Microtransit has been a key focus of Canadian municipalities attempting to bridge the gap between fixed-route transit and ridesourcing services. For example:

- *Longueuil, Quebec.* Longueuil partnered with New York's Via on a microtransit pilot project that was recently made a permanent feature of transit in the city. The service is sedan-based and thus not universally accessible, however it is accessible via phone as well as through a mobile app. The service is available only during morning and evening rush hours, for the same cost as a regular transit trip (Réseau de transport de Longueuil, 2019).
- *Bowen Island, BC.* Bowen Island recently piloted an on-demand microtransit service in partnership with Metro Vancouver's Translink network. The service complemented existing fixed-route transit, providing "one-to-many" service from a central location on weekdays, and "many-to-many" service (from and to any location in the service area) on weekends. On an island with a population of 3,680, 1,686 TapRide accounts were created to access the service. The project utilized existing TransLink shuttles, which were equipped with low floors and ramps for boarding (Bearisto, 2019). According to a respondent for the interviews we conducted for this project, the service was extremely popular. Transit authorities in BC are modelling such a service for the future.
- *Milton, Ontario.* Piloted between May 2015 and April 2016 in suburban Toronto, Milton's GO Connect demand-response pilot addressed passenger connectivity challenges between the regional commuter rail system (GO Trains) and a smaller suburban system through an application-based system. The service operated during the weekday morning and evening peak periods, connecting customers to and from their preferred GO Trains. Shuttles operate on optimized routes, based on reservation requests through the RideCo software platform,

which dynamically adjusts routes and pick-up/drop-off locations to maximize operational efficiency and minimize real-time travel delays (Town of Milton News, 2015, cited in NASEM, 2016).

- *Region of Waterloo, Ontario.* Grand River Transit (GRT) has recently run pilot projects for dynamic and flexible microtransit in the Kitchener-Waterloo area (Region of Waterloo, 2019a). Low ridership has been a problem for these services (Demarte, 2019). Pilots have included:
  - 901 Flex Trinity-Freeport, a fixed- and flexible-schedule community bus pilot that serves the Trinity Village and Freeport area of Kitchener, which are difficult to access by regular bus service;
  - 902 Flex Hespeler village, a subsidized taxi pilot operated in partnership with Golden Triangle Taxi that serves Hespeler Village in Kitchener; and
  - 903 Flex Northwest Waterloo, a ridesharing pilot that was operated in partnership with RideCo and which was ended in 2019.
  
- *The City of Toronto, Ontario.* Before COVID-19, the Toronto Transit Commission's (TTC) most recent five-year plan indicated the TTCs intention to integrate microtransit for first- and last-mile service to several of its major transportation terminals (Toronto Transit Commission, 2019). In view of drastically fallen ridership and fares for regular transit services due to COVID-19, the provincial government recently asked municipalities to consider using private service providers of microtransit for unserved and underserved parts of the province, including some routes in Toronto (Feinstein, 2020).

## VI. Barriers and accommodations for persons with disabilities and older adults in accessing shared mobility

### A. Lower use of shared mobility by people with disabilities than other people

*Ridesourcing.* Most ridesourcing (ride-hailing) services use applications on smartphones or tablets. Over four-fifths (86.5 percent) of working-age people (18 to 64 years) without disabilities in the United States use a smartphone daily compared with 66.5 percent of people with disabilities. Estimates vary on the extent of ridesourcing usage in North America. For instance, Marshall (2019) recently reported a recent Pew Research Center study, which found that 36 percent of American adults have used ridesourcing (ride-hailing) services. Other recent studies about Uber and Lyft ridership have found that between 24.4 and 43 percent of the US population have used apps to summon rides (Marshall, 2019). According to Statistics Canada (2017), from November 2015 to October 2017, 7.0% of persons aged 18 and older in Canada used peer-to-peer ride services such as those provided by Uber and Lyft. The people most likely to use the service were aged 25 to 34 (14.6% of all the service users) and 18 to 24 (13.5%). Only 2.1% of service users were people older than 55. The Statistics Canada report had no data on people with disabilities. However, Brumbaugh in the US reported that working-age people with disabilities were about a third as likely as people without disabilities to have used ridesourcing on the day the National Household Travel Survey was conducted in 2018 (4.6% vs 12.4 percent, respectively).

*Carsharing.* Concerning carsharing, we were unable to find many documents that placed significant emphasis on the scale of use by people with disabilities. The National Center for Mobility Management (2017) in the US recently stated bluntly, “Carsharing is ... unavailable to many people with disabilities, particularly to those who are unable to drive or to those who need vehicle adjustments in order to drive” (p. 16). People with disabilities receive only brief mention, without statistical backup, in a recent report on carsharing by Shaheen and Cohen and their colleagues, who are renowned experts on carsharing and other forms of shared mobility in the US (Shaheen, Cohen, et al., 2019). Based on empirical data from ten cities in the US, Tyndall (2017) recently reported that, despite carsharing firms receiving significant in-kind incentives from governments to operate, the benefits of free-floating carsharing falls mainly to advantaged populations, such as people who are educated, young, employed, and white. In a more recent report, Tyndall reported how carsharing played a major role in filling the transportation gap left by a major disruption of public transit in Vancouver. Replete with statistics, the report does not mention people with disabilities as carshare users (Tyndall, 2019).

*Microtransit.* Researchers and policy analysts have prioritized accessible microtransit service for people with disabilities and older adults in some communities (e.g., Hernandez, 2018; Walker, 2017). However, we were unable to find recent, broad-level statistical data on the extent of use of microtransit by people with disabilities. Paratransit has been repurposed in some

communities to provide non-emergency transportation to people with disabilities (Shared-Use Mobility Center and National Center on Mobility Management, 2020). However, statistical data are scarce on people with disabilities' use of microtransit services that are equally available and accessible to all members of the community.

*In general.* Lefler, Wilke & Leight (2020) have sent their observations to transportation leaders and members within the industry of transportation engineers, explaining that many dimensions of accessibility “have been limited, left behind, forgotten, or abandoned over the past 30 years” due to budget cuts, and shifts in priorities and economies. The authors call for transportation leaders to engage community health workers, social workers, case managers, community leaders, and individuals who face mobility challenges “in meaningful and deep discussions — not just once, but multiple times.” At risk of being overlooked in the excitement over mobility on demand and MaaS are individuals with disabilities, racial and ethnic minorities, individuals and families living below the poverty line, and older adults.

## B. Examples of barriers and accommodations from the US and other jurisdictions

Shared transportation providers in the US are implementing a range of measures for ensuring their services are accessible to people with disabilities and older adults. Below are a few examples of the difficulties people with disabilities have experienced and measures that have been adopted to address these issues. The Shared-Use Mobility Center provides numerous additional examples, as well as extensive data on a number of United States metropolitan areas (Shared-Use Mobility Center [SUMC], 2020b). Cohen and Shaheen (2018) also provide numerous examples, particularly in Appendix A, of *Planning for shared mobility*.

### 1. Service integration and mobility as a Service (MaaS)

Despite its emerging benefits, the integration of accessible transportation services continues to be rare in North America. A 2020 report of the Shared-Use Mobility Center (SUMC) and the National Center for Mobility Management (NCMM) provides a broad look at examples of policy and programs designed around the needs of people with disabilities. The organizations report that “With an increasing number of public & private providers entering this space, policies and programs are needed to ensure that people with disabilities also have access to equitable shared-use mobility service with a high standard of quality” (Theunissen, 2020). Given the substantial market potential in the US, the report highlights the US as a jurisdiction to watch closely as service providers will increasingly be obliged to offer equivalent services to people with disabilities. The Regulations for the *Americans with Disabilities Act* apply regardless of

federal funding, and apply to public and private transportation providers with respect to: response time, fares, geographic areas of service, hours and days of service, availability of information and reservations capacity, constraints on capacity or service availability, and restrictions on priorities based on trip purpose (SUMC & NCMM, 2020).

The same SUMC and NCMM report (2020) provides an overview of service coordination and trip planning initiatives. Examples include the following:

- California – Oakland Adaptive Scooter Pilot
- California – Mobility On-Demand Every Day, Big Blue Bus (BBB), Santa Monica
- California – Lyft partnership with First Transit for on-demand paratransit pilot in San Francisco & Los Angeles
- California – Ford GoBike Adaptive Bikeshare Pilot, Oakland
- Connecticut – Norwalk Wheels2U Microtransit
- Florida – Jacksonville Transportation Authority Pilot for Medical Appointments
- Illinois – Chicago suburb high school approval of ridesharing company to provide alternative transportation for special education students
- Kansas/Missouri – RideKC Freedom On-Demand Program
- Maryland – Washington Metro Area Transit Abilities-Ride paratransit program
- Michigan – Flint Mass Transit Authority’s on-demand NEMT [Non-Emergency Medical Transport] “Rides to Wellness” Program
- Michigan – Michigan Mobility Challenge for transit providers to improve customer service for the visually- and hearing-impaired
- Michigan – DOT Statewide NEMT Brokerage System
- Minnesota – GoDakota County Lyft Partnership
- Minnesota – Southwest Transit NEMT pilot program in Minneapolis
- Minnesota – Hitch Health and Lyft Pilot Program
- Missouri – St. Louis Gateway to Better Health Program with NEMT and Mobile Clinic
- Nevada – RTC Paratransit Partnership with Lyft
- Ohio – Smart Columbus NEMT Program for Prenatal Care
- Ohio – RTA & Ford partner for GoRide paratransit service, Dayton
- Pennsylvania – Rabbitransit Paratransit for Seniors and People with Disabilities
- Texas – Non-profit launches on-demand transportation pilot program for seniors and people with disabilities in rural counties
- Vermont – Go! Vermont Trip Planner
- Virginia – CARE On-Demand, Greater Richmond Transit Company (GRTC)
- Washington -Seattle Bikeshare Permit Program
- Wisconsin – Milwaukee Adaptive Bikeshare Program

## 2. Transportation network companies (TNCs)

There is substantial mention in the ridesourcing literature of people who utilize fixed-frame, non-collapsible wheelchairs, which present ongoing challenges for municipalities and ridesourcing companies. However, there is currently no publicly available data on the number of wheelchair-accessible vehicles from Uber, Lyft, etc., nor on the number of drivers signed on to the Uber Assist program, for example.

Despite positive elements with services such as Uber and Lyft, there is a substantial history of ridesourcing operators discriminating against people with disabilities, including those who use wheelchairs and/or who employ service animals. For example, in 2015, the United States National Federation of the Blind and several blind individuals who use guide dogs sued Uber after being refused service because of the presence of service animals. This resulted in a nationwide class-action settlement that forced the company to create policies for ensuring equal treatment of customers with service animals (Disability Rights Advocates, 2020).

In 2019, the law firm Disability Rights Advocates filed a lawsuit against Lyft on behalf of several San Francisco Bay area residents who use wheelchairs, arguing that the company has failed to provide wheelchair-accessible vehicles in the Bay Area, in violation of the *Americans with Disabilities Act*. The suit positions Lyft (and Uber) as “a critical transportation option,” given that these innovations have “driven traditional taxi models, which used to make accessible vehicles available, out of the market, leaving people who use wheelchairs without any accessible on-demand transit options in the Bay Area” (Disability Rights Advocates, 2019a).

Disability Rights Advocates and Carlson Lynch LLP filed a class action suit in 2019 against Uber in a similar case. The suit argues that the company has failed to provide wheelchair-accessible service in and around the city of Pittsburgh, again in violation of the *Americans with Disabilities Act* (Disability Rights Advocates, 2019b).

Indeed, despite comprising a multi-billion-dollar industry, TNCs have an ongoing track record of poorly serving and even excluding travelers with disabilities. For instance, a 2018 report by New York Lawyers for the Public Interest (NYLPI, 2018) found that Uber and Lyft had no wheelchair-accessible service available 70% of the time, that Lyft infrequently responded to demands for wheelchair accessible rides (i.e., in only 4.6% of cases), and that Uber’s response rate was marginally above 50 per cent. The NYLPI’s follow up report for 2019 found that wait times for wheelchair accessible vehicles for Lyft and Uber are on average at least double, and sometimes up to five times longer, than for inaccessible vehicles. A recent report written for the City of Toronto also found that it takes Uber twice as long to provide accessible vs non-accessible service (Big Data Innovation Team, 2019). The NYLPI found that Juno (owned by Gett) does not

offer any WAV service at all in New York, and that Lyft fails to provide or arrange for such service in 38% of cases where people request it. Lyft has a legal obligation to provide an alternative where it does not directly provide the service (NYLPI, 2019. See also Disability Justice, 2019).

When reviewing the history of legal action against Uber and Lyft, and the companies' responses, the human element is often central. Thus, the role of the driver must be considered as a factor in the accessibility of – and, perhaps as importantly, in creating barriers to – ridesourcing.

Examples provided in a recent document by the Shared-Use Mobility Center (SUMC) and National Center for Mobility Management (NCMM) (SUMC and NCMM, 2020) feature the following programs involving TNCs that have a focus on people with disabilities:

- Arizona – Expansion of TNCs as Non-Emergency Transportation (NEMT) Option for Medicaid Recipients;
- California – *TNC Access for All Act*;
- Illinois – Chicago WAV Requirement and Accessibility Fund;
- Washington – King County Wheelchair Accessible Services Fund; and
- Massachusetts – MBTA The RIDE and MassDOT Pilot Program to Increase WAVs MBTA.

### 3. TNCs' policies, guidelines and vehicles

Uber and Lyft are major service providers that tend to monopolize the shared mobility conversation. As venture-financed and publicly-traded companies, the profit motive is always primary for these organizations, and evidence suggests that accessibility for people with disabilities has only come into play (i) as a side effect, (ii) in response to public approbation and lawsuits, or (iii) as a result of government regulation, oversight and monitoring. Partly in response to difficulties companies like Uber and Lyft have experienced with passengers with disabilities, the policies of these companies have clear and specific guidelines about wheelchair access, service animals, and discrimination more generally. For example, Uber's non-discrimination policy for "users" (including drivers and passengers) reads as follows:

"Uber and its affiliates... prohibit discrimination against users based on race, religion, national origin, disability, sexual orientation, sex, marital status, gender identity, age or any other characteristic protected under applicable law. Such discrimination includes, but is not limited to, any user refusing to provide or accept services based on any of these characteristics. Any user found to have violated this prohibition will lose access to the Uber platform" (Uber, 2020b).

These and other similar policies have been required for ridesourcing services to operate under the human rights policies of various jurisdictions. Much of the related literature focuses on people who use wheelchairs or employ service animals. Ridesourcing companies have evolved their approaches and practices for (i) people with mobility impairments who can self-transfer from a wheelchair into a vehicle, and (ii) people with disabilities (with and without service animals) who likewise need little or no assistance to order, enter, and exit a vehicle.

Both Uber and Lyft have taken steps to increase the availability of fixed frame, non-collapsible wheelchair-accessible vehicles through the WAV option in the Uber app in some jurisdictions, and with Access Mode in the Lyft app (currently said to be available in Boston, Toronto, Los Angeles and San Francisco [Lyft, 2019]). Both companies appear to be experimenting with different WAV delivery options, with Lyft partnering with paratransit provider First Transit, and Uber engaging with various delivery partners (Lekach, 2019).

#### 4. Driver training and service packages

Both Uber and Lyft have implemented policies and operational initiatives to address issues of access and discrimination against people with disabilities. For example, Uber has committed to informing drivers about their obligations to transport people with mobility and other disabilities, as well as people who employ service animals. The company will require existing and new drivers to expressly confirm that they understand their legal obligations to transport riders with guide dogs and other service animals. Uber has committed to banning drivers following a single complaint if it is found that the driver knowingly denied a person with a disability a ride because the person was traveling with a service animal (National Federation of the Blind, 2016).

Lyft takes a somewhat lighter approach to access for people who use wheelchairs:

“Lyft’s policy is that passengers who use wheelchairs that can safely and securely fit in the car’s trunk or backseat without obstructing the driver’s view should be reasonably accommodated by drivers on the Lyft platform. Drivers should make every reasonable effort to transport the passenger and their wheelchair.

“If you refuse to provide a ride to a passenger whose wheelchair could be reasonably accommodated, we’ll follow up with you to find out why. Drivers who are found to have unreasonably refused to transport passengers with lightweight wheelchairs that can

be dismantled or folded are liable to be removed as drivers on the Lyft platform” (Lyft, 2020b).

Uber has implemented Uber Assist, which is said to equip drivers to provide additional assistance for older adults and people with disabilities. According to the company, “Driver-partners are specifically trained by a third party to assist riders into vehicles and can accommodate folding wheelchairs, walkers, and scooters” (Uber, 2015). Additionally, unlike regular trips – which are “curb-to-curb” – Uber Assist provides “door-to-door” service.

In terms of the transportation services provided, with support from Minnesota Health and Human Services, Dakota County has partnered with Lyft to provide on-demand rides to eligible people with disabilities (in a region evenly split between urban, suburban and rural areas). All rides are covered by Medicaid, with funds uploaded directly to users’ Lyft accounts.

Both Lyft and Uber have promoted their health care-related transportation services as programs that will increase health care appointment keeping among people who are at risk of missing scheduled visits. In Minneapolis, Hitch Health has partnered with Lyft in such a program. Participants were able to request rides via call or text, with Hitch Health managing logistics with Lyft. When appointments ended, participants merely need to text “ready” through the designated platform to arrange a ride home.

## 5. Carsharing

While some business-to-consumer providers of carsharing offer accessible vehicles, their offerings are not entirely consistent with one another and are not available on demand. For example, Enterprise CarShare and Zipcar both offer carshare vehicles which are operated by hand controls. Typically, however, the companies require several business days’ notice for such vehicles. The availability of these vehicles from Enterprise can vary depending on the availability of mechanics qualified to install the devices. Zipcar does not mention wheelchair accessible vehicles at its website and Enterprise directs people who require a van with a lift to Wheelchair Getaways “as a courtesy to customers”, stating that, “Wheelchair Getaways is not affiliated with Enterprise or any of its subsidiaries” (Enterprise CarShare, 2020a). A Google Map search of Wheelchair Getaways found only 14 operating locations in the US, two of which were “temporarily closed” but which upon further scrutiny were found no longer operating. However, we also found that Wheelchair Getaways was itself absorbed by Accessible Vans of America (AVA) in January 2019, a van rental organization with many locations across the US (Accessible Vans of America, 2020). AVA has indicated that it receives calls from Enterprise, and from Hertz, Avis, Alamo and Dollar car rental companies. In this connection, accessible vehicles booked through initial contact with Enterprise are more like brokered access to conventional

rentals for accessible vehicles than carsharing. Zipcar advertises that it serves people who use service animals, require assistance booking their vehicle, or who need a personal assistant while travelling (Zipcar, 2020). It also offers a service to clean the hair left in vehicles by service animals after use. Enterprise CarShare does not mention providing such services. It does, however, charge, \$50 and any further cleaning costs if the next user of the car reports pet hair or mess, and \$50 plus further cleaning costs if the next user reports the strong smell of tobacco smoke or finds ashes.

What had been one of the largest US carsharing organizations, City Carshare, introduced a few wheelchair accessible vehicles to its Berkeley and San Francisco fleets in 2008 (Business Wire, 2013). In 2014, City CarShare received a nearly \$1 million grant from the state-funded Metropolitan Transportation Commission to expand its fleet, including AccessMobile, to underserved East Bay communities. However, Getaround absorbed City CarShare in 2016 and ceased making wheelchair accessible vehicles available after the state grant ran its course (Rodriguez, 2017).

Reflecting on the carsharing situation for people with disabilities in the US, a report by the National Center on Mobility Management (2017) said, “Carsharing is ... unavailable to many people with disabilities, particularly to those who are unable to drive or to those who need vehicle adjustments in order to drive” (p. 16).

More recently, Shaheen et al. (2019) suggested that cities might consider requiring that carsharing operators adopt accessibility measures, such as adaptive technology in vehicles or wheelchair accessible vehicles. To ensure rates are equitable for people with disabilities, the authors have recommended that cities subsidize fares where providers of carsharing provide disability-related services.

## 6. Microtransit

Several communities in the US have implemented measures to increase the accessibility of microtransit. For instance:

- King County and the City of Seattle, Washington, have partnered with Via, a New York-based global transportation service provider that operates in more than 20 countries (Via, 2020), to offer on-demand pooled van rides to and from five light rail stations. Ride fares are paid by transit pass and at the same price as a regular Metro fare. Project documentation includes the 101-page legal partnership contract (King County, 2018) as well as a substantial independent evaluation (Hamilton, 2018b).
- The City of Las Vegas has partnered with Lyft on a pilot that provides on-demand paratransit service to “a select group of Specialized Services customers.” Customers who do

not need a wheelchair-accessible vehicle can book through the Lyft app. Those who do require an accessible vehicle can call the public transit agency's customer service line (Regional Transportation Commission of Southern Nevada, 2020).

- Grand Rapids, Michigan has partnered with New York-based Via to create Rapid on Demand, a microtransit service specifically for older adults and people with disabilities. As part of the Michigan Mobility Challenge (Michigan Department of Transportation, 2020) to increase transportation options for older adults, people with disabilities and veterans, the service links the city's existing paratransit fleet with Via's mobile solution expertise. Fares can be paid through the app, by cash, or in the form of a transit ticket (The Rapid, 2019).
- Norwalk, Connecticut has launched Wheels2U, a pooled free shuttle service that uses off-duty paratransit vehicles to offer ridesourcing for anyone with access to the app in the city. Currently offered in the evenings from Thursdays to Sundays, the pilot has been running since 2018 (Kultys, 2019).
- Los Angeles has a separate contract with Via to provide fully wheelchair accessible first and last mile service to and from three high-use metro stations in the county. Rides can be booked through an app or by phone, and riders are provided with a limited number of pickup spots to which they must travel to meet their ride. Thanks to subsidization, these rides are substantially less expensive than, for example, Uber Pool: "Riders who are registered with Metro's low-income fare program, LIFE, can ride for free. Riders who input TAP cards during account creation will ride for \$1.75 and riders without TAP cards can ride for \$3.75" (Wanek-Libman, 2019).
- Flint, Michigan's "Rides to Wellness" program offers an example of microtransit in a more isolated and less-populated region. The initiative involves on-demand van transportation to medical appointments, in partnership with regional health and social service providers that include Veterans Services and the American Cancer Society. Rides are free for clients of participating organizations, with fees paid by Health and Human Services, supported by a federal grant of \$300,000. (Uber is also heavily invested in the sector through Uber Health). The model is currently being expanded into other areas of the state.

## C. Examples of barriers and accommodations from Canada

### 1. Service integration and mobility as a service (MaaS)

Perhaps because the integration of services through digital technology and MaaS are fairly new developments in the world of shared mobility, we were unable to locate recent published material on these subjects as they pertain to people with disabilities and issues of accessible shared mobility in Canada.

### 2. Transportation network companies (TNCs)

There is information about the uneasy relationship between ridesourcing companies, the people who drive for them, and customers who use mobility devices and service animals. The general picture that emerges is one of uneven accessibility in TNC services in Canada, with accessibility addressed as an add-on, and which may be resulting in lower availability of accessible transportation from other providers such as taxis. For example, in the Vancouver Lower Mainland, a consortium of taxi operators sued to overturn Uber and Lyft's license to operate in the province. The Vancouver Taxi Association recently announced that it will end the practice of subsidizing drivers of wheelchair accessible taxis because of declining revenues (Little, 2020; CBC News, 2020). Given TNCs' impacts on traditional taxi services, it is conceivable that the availability of wheelchair-accessible transportation is being eroded as taxi companies struggle to compete. Yet, aside from requiring that basic safety standards be met, BC's application for a Transportation Network Service (TNS) requires little from TNC operators other than payment of a 30 cent per trip surcharge for all non-wheelchair accessible vehicles. The funding contributes to an accessibility fund to support "accessibility programs" (British Columbia Ministry of Transportation and Infrastructure, 2020).

Concerning Alberta, we could find no mention of transportation network companies being required to provide accessible services to people disabilities in the province's *Traffic Safety Act*, in any of that province's informational materials for newly approved transportation network companies, or about various classifications of drivers' licenses (e.g., Government of Alberta, 2020a, 2020b).

For its part, Uber advertises a variety of accessibility supports and services for people with disabilities in Canada (Uber, 2020a). Among these, UberWAV uses technology to broker connections between people who need accessible vehicles for non-collapsible wheelchairs and the drivers of such vehicles. However, Uber does not own its own fleet of vehicles and insufficient numbers of Uber drivers own such wheelchair accessible vehicles to meet consumer demand. Accordingly, Uber's CEO has explained its partnership arrangements with MV

Transportation and other third-party organizations to address this shortage (Khosrowshahi, 2018). UberASSIST provides trained drivers who can provide basic assistance for consumers with disabilities and older adults to get into and out of vehicles. Drivers will stow collapsible and other smaller mobility devices in vehicles large enough for that purpose but not large enough to accommodate fixed frame wheelchairs (e.g., Uber, 2016). However, UberAssist is a limited option across the country (Olateju, 2019), which presents a significant barrier for people with disabilities who do not require a wheelchair accessible vehicle but who do require personalized assistance or enough space to stow a walker, collapsible walker or other mobility aid. And while Uber does provide wheelchair-accessible vehicles and accommodates service animals by means of UberWAV in Toronto, Uber does not provide WAVs in Ottawa but instead makes a seven cent per ride contribution to an accessibility fund (Osman, 2018).

Lyft also contributes to the City of Ottawa's fund instead of providing accessible services. In 2019, Ottawa's Community and Protective Services Committee approved \$1.2 million expenditure from the accessibility fund to help community agencies expand accessible transportation in rural communities, while reducing the cost of taxi coupons by 25 per cent, doubling the number of allowable of taxi-coupon books per customer per month, and developing an app for riders to track their trips with Para Transpo, which is the city's specialized transport service (Ottawa, 2019). City Councilors approved the first three measures, leaving Para Transpo to cover the costs of app development (Oattes, 2019). City Council did not require Uber or Lyft to provide accessible services. Meanwhile, Para Transpo was dealing with its own problems with consumers over cancelled trips and other issues (Molina, 2019) and had been facing such difficulties for years (e.g., Mullen, 2005; Westerlund, Isabelle, & Ebonka, 2019; Fawcett, 2000; Ontario Human Rights Commission, 2002).

With respect to accessibility, Quebec's Sustainable Mobility Policy to 2030 states that:

“Vulnerable, low-income persons with reduced mobility and disabilities must have access to the different transportation modes to benefit from mobility comparable to the rest of the population. They must have completely equal access to the different sites of activities and the various points of service in an inclusive approach.”

The policy acknowledges that “much still remains to be done so that vehicles, infrastructure and complementary services are universally accessible...” and that paratransit funding and service is currently inadequate to need. There are, however, few details on how these issues will be addressed (National Assembly of Quebec, 2018). In fact, Quebec's policy plan seems to have been designed in a world in which Uber does not exist. Although the document refers to “new mobility,” the focus is on “new technologies, autonomous vehicles and intelligent

transportation systems” rather than single-user shared mobility. Further, “support will be provided, in particular, to new forms of mobility that use electricity as an energy source and clean technologies, as well as projects for use of autonomous vehicles in a shared mobility perspective.” While support is promised to the taxi industry, none seems to be forthcoming for ridesourcing companies.

In October 2019, the Quebec National Assembly adopted Bill 17, *An Act respecting remunerated passenger transportation by automobile*, effectively placing regulation of the ridesourcing industry at the provincial level. This act is quite new and still being interpreted. Relevant passages are provided below:

- “Only a taxi may provide a trip when the driver is hailed, when the trip is otherwise requested person to person, or when it is requested by means of a telephone call”. This measure disallows ridesourcing services from implementing call-based accessibility for people who do not have or are unable to use mobile phones.
- The Act “promotes the rollout and availability of automobiles adapted for persons with disabilities,” with the relatively soft language that “A transportation system operator must take reasonable measures to make an adapted automobile available as soon as possible to respond to a trip request requiring the use of an adapted automobile.”
- The Act requires that drivers of vehicles-for-hire complete training on the safely and transportation of people with disabilities, and that only drivers who have completed advanced (i.e. additional) training can operate a vehicle adapted for people with disabilities.

The Quebec example is not alone in its apparent hesitance to engage with some of the newer modes of shared mobility. For example, the 204-page Metrolinx *2041 Regional Transportation Plan* for the Greater Toronto and Hamilton Area (Metrolinx, 2018) does not mention ridesourcing services. Even with respect to first and last mile issues, the plan is limited to traditional publicly owned or contracted transit services (e.g. buses, micro-transit), carpooling, walking, and cycling. Although these measures seem to be a response to the need to reduce single vehicle occupancy, pooled ridesourcing providers are not being considered as adjuncts of the region’s fixed-route transit systems. That said, the Quebec government recently moved to deregulate the taxi industry and permit the use of ride hailing apps for taxis, against stiff opposition from the industry (CBC News, 2019). However, the city of Montreal had argued that it was better suited than the provincial government to regulating taxis (Riga, 2019).

The Conference Board of Canada's *My Ride, Your Ride, Our Ride* (Olateju et al., 2019) refers to "a changing Canadian demography with disparate mobility needs and preferences" and, concerning the accessibility of ridesourcing services, the regulatory chaos that currently exists across the country.

"This non-uniformity of regulatory policies skews the quality of service provided to individuals with mobility-related disabilities. This impacts a considerable number of customers who potentially require mobility services. In a 2012 Canadian survey, 7.2 per cent of Canadians had a mobility-related disability. That equates to 2.6 million Canadians. In addition, Canada's senior citizen (65+) population has experienced the largest growth of any age group, with a growth rate of 20% from 2011 to 2016. Combined, either through disability or age limitations, this means the importance of enhancing the quality of service to these demographics cannot be overstated."

The Conference Board argues that public transportation authorities need to exercise leadership in this context.

### 3. Partnerships with TNCs

Concerning the Innisfil pilot partnership project with Uber and a local taxi service reviewed by the Arup-MaRS group (Falconer et al., 2018), our further enquiry into the program found that riders who require more than 30 trips per month must apply to have their trip limit extended to a maximum of 50 per month. Innisfil Transit "will give special consideration" to older adults, students, people who rely on the services for work and people who face "challenging circumstances", which would include many people with disabilities who are not yet older adults. People who do not use smart phones and who want to book a ride with Uber can do so using regular telephone with a 24-hour dispatch service operated by Innisfill. This measure was designed into the project from the outset to address system features which would otherwise have excluded lower-income people without cell phones from using the partnership transit service (Gladstone, Flatt, Fader, & Hellstern, 2018), which would have excluded an outsized number of people with disabilities who typically have comparatively low incomes. That said, unlike Uber in Innisfil, only the taxi service is accessible, and people who require an accessible taxi are required to "provide a few days notice" (Innisfil, 2020). Despite such limited responsiveness to people with disabilities, the Conference Board of Canada (Olateju et al., 2019) considers the Innisfil pilot an example of how shared mobility may be able to play a complementary role in providing services in sparsely populated communities.

Some communities are experimenting with models that are like public-private partnerships with TNCs in terms of demand responsiveness, but do not actually draw upon TNC services. For instance, a 2019 Master's thesis out of the University of Waterloo (Mozayani, S. (2019) addresses first and last mile issues in low-density areas that are poorly served by fixed-route public transit. While the document does not engage directly with disability, its key focus is people who do not have access to private vehicles, who are likely to be socially and geographically isolated, and who are most in need of affordable public transportation.

“Low-density areas on the fringe of the built urban environment often have scattered and low demand for public transit, and consequently, receive low-frequency service with very long cycles which discourage ridership. This negative loop leads to the higher cost of public transit service and lower service span in low-density areas.”

The document takes a deep look at York Region Transit's approach to first and last mile issues. The public transit agency offers several on-demand options, including the Mobility Plus traditional paratransit service and a widely-available dial-a-ride program (DAR), i.e. a demand-responsive service that connects travelers to their requested stops and operates on a first-come, first-serve basis. Utilizing a range of York Region Transit (YRT) vehicles, including sedans, small vans and full-sized passenger vans, the service is available to anyone by reservation (see Persico, 2019), and:

- Is offered in low-density residential areas as a feeder service to main bus routes and as a substitute for evening and weekend bus service.
- In low-demand urban areas, DAR allows direct travel between YRT stops within a predetermined geographic area.
- In rural areas, DAR works as a first/last mile transit service and picks up people from any address in that area and takes them to a requested transit stop and vice versa (Curb-to-Stop).

York Region Transit has created an extensive plan for dial-a-ride services in the region, and in 2017 moved all DAR trips to a contract with the existing Mobility Plus provider – effectively integrating the two services. This service integration reduced fuel consumption and improved vehicle productivity. The model allowed for multiple trips to be booked at once by Mobility Plus staff using new scheduling software to optimize trip requests for both DAR and Mobility Plus customers (York Region Transit 2017).

These innovations in the region build on a fixed-route system that is highly accessible: all vehicles are low-floor or equipped with ramps for people with mobility impairments, and 80% of transit stops are accessible in terms of mobility/agility (York Region Transit, 2020).

#### 4. Carsharing

The picture of accessible carsharing for people with disabilities in Canada is spotty, with isolated local examples flushed out as a result of time-consuming Google searches. For instance, in British Columbia, Modo carshare made a Saanich-based accessible van available to its members in the Victoria area on Vancouver Island, in February 2020 (Saanich News, 2020). The van is the second in Modo's province-wide fleet, the first of which debuted in Vancouver in 2013. The vans can fit four passengers and a wheelchair user, and feature a folding ramp, rear entrance and tie-down straps (Modo, 2020). Kootenay Carshare, a cooperative in southeastern British Columbia, introduced a wheelchair accessible van to its fleet in 2017 (Johnson, 2017). A search of the organization's website was not able to confirm whether the vehicle is still available, however.

In Ontario, the city of Peterborough considered giving the green light to Community Car Share to operate in that city. However, city councilors nixed the plan when they discovered that the city would need to invest \$60,000 for the organization's initial operating cost and another \$27,000 to retrofit a vehicle with wheelchair accessibility (Kovach, 2017). A search to determine whether Community CarShare had in fact been established in Peterborough found that the organization does indeed have a website, but its content is supplied by Vrtucar, whose link directed us to the website for Communauto. Communauto's Toronto fleet consists of Hyundai Accent 5-door vehicles (Communauto, 2020a), which are too small for fixed frame and motorized wheelchairs and scooters. In other communities, such as the Ottawa-Kingston region, Communauto offers a wider suite of choices which include a Nissan mini cargo van and Toyota SUV (Communauto, 2020b). However, no mention of wheelchair accessible vehicles or vehicles with other accessibility features could be found at Communauto's website. While Communauto advertises that it is "pet friendly", it places full responsibility on users to clean hairs and other traces of service and other animals from its vehicles after use.

In Atlantic Canada, CarShare Atlantic, added an accessible van and three accessible cars to its fleet in Halifax in February 2019. This Canadian company claims to be the only Canadian carsharing operation with accessible vehicles. The founder of CarShare, Pam Cooley, said the vehicles are, "Not only for people with physical disabilities who can drive but also people who care for people who are physically limited and can't drive themselves" (Hartai, 2019). Government played a role in supporting the development of this accessible service. CarShare Atlantic received more than \$42,000 from Nova Scotia's Business Access-Ability Program through the Department of Communities, Culture and Heritage, and a community investment

grant of \$15,000 (Auto Rental News [ARN] staff, 2019). Communauto recently acquired Atlantic CarShare (movmi, 2019).

The general features of carshare services provided by large organizations, like Enterprise, Zipcar and Communauto, suggest that the provision of accessible vehicles has not been a major priority. Interest by carshare providers in providing accessible vehicles in Canada tends to devolve to smaller local and regional providers like Modo in the west, CarShare Atlantic in the east and other local and regional providers in between. A community-by-community search and analysis of information pertaining to carsharing was beyond the scope of the present research. However, Namazu (2017) found that research on carsharing in Canada is itself biased in favour of early adopters of this mode of shared mobility, because such service users are simply more likely to be represented in whatever studies have been conducted. As people with disabilities who require accessible vehicles are less likely than others to be careshare users, if indeed they are users of careshare at all, their experiences and views are under-represented in the research. A take-away message of Namazu's research is that accessible carsharing has not been widespread in Canada. Irrespective of accessibility, carsharing has not been widely adopted in rural communities (Godavarthy, Hough, Libberton, & Koff, 2019).

## VII. The experiences of people with disabilities: Background and key findings of our community consultations

We invited 60 knowledgeable people with disabilities and other stakeholders to be interviewed for the community consultations for this project. We explained that our aims for the consultations were to further understand “accessible shared mobility” from their location (i.e. persons with lived experiences, providers of disability-related services and people working in the transportation sector). We interviewed the 23 individuals who accepted our invitation. Here we provide selected characteristics of the interview process, the people we interviewed, and the key messages they told us about shared mobility. We have integrated within the Recommendations section of the present report the interviewees’ recommendations for what government policy makers can do to further high quality accessible shared mobility for people with disabilities. The Community Consultation Report was produced separately as a stand-alone document.

### A. The interview process and people we interviewed

We designed our interview guides for individuals with disabilities, providers of disability-related services and disability-related advocacy, and providers of shared mobility and other transportation services. Although the literature informed the development of these guides, their most substantive questions were open-ended and we invited respondents to talk about their experiences, perceptions, and recommendations. We obtained ethics approval for the guides and used them flexibly in interviews that lasted from about 60 to 90 minutes. We explored:

- Whether the individual respondent used or tried to use shared mobility in the past year (or, in the case of disability-related service providers, whether their organizations had supported individuals who used or tried to use shared mobility);
- The difficulties people experienced with shared mobility and how those issues were addressed;
- The potential benefits and shortcomings of shared mobility for people with disabilities; and,
- The respondent’s recommendations for shared mobility providers, disability-related service providers, individuals with disabilities and various levels of government to ensure people with disabilities have equal access to good quality shared mobility services.

We interviewed 9 individuals with disabilities (39%), 9 disability-related advocates or service providers (39%) and 5 providers of transportation services (22%).

- All the individuals with disabilities that we interviewed were involved in disability organizations and several of these individuals were presently focusing or had focused on issues of transportation for their organizations. These individuals generally hold, or recently held, senior leadership positions with national and provincial disability organizations.
- Almost all the disability-related advocates or service providers (7 out of 9) had disabilities. All were familiar with issues of transportation based on their own personal experiences and the experiences of the people they work with. Two of the 9 did not report having a disability personally but had worked for many years serving people with intellectual disabilities and people who are Deaf-blind. These individuals provided proxy interviews for the people they serve.
- None of the 5 individuals we interviewed who work for transportation service providers identified as having a disability. However, all are responsible for ensuring the accessibility of their organizations' services. Three of these individuals focus specifically on accessible transportation for people with disabilities.

In terms of their social activism, most of the people we interviewed are currently or were recently involved with disability organizations (74%). Nearly half serve or recently served on the boards of directors of national, provincial or local disability organizations (43%). About a quarter (26%) are, or were recently members, of such organizations' committees including committees that focus on transportation issues. Nearly four in ten (39%) work as senior staff of disability-related organizations. More than four in ten respondents (43%) do other volunteer work related to accessibility, including about half of the people who work as staff.

The organizations' activities and the respondents' expertise span a variety of policy and program areas including: (i) transportation as a major focus of attention for people with and without disabilities; (ii) transportation for people with disabilities as a particular focus; and, (iii) transportation for people with disabilities as it relates to education, employment, human rights, the law, and independent living (including implications of transportation for the use of attendant services, assistive devices and service animals).

Slightly more than half of the people we interviewed are women (52%). None of our respondents self-identified as LGBTQ2S+, although we reached out to organizations that represent people with diverse gender identities. The average age of respondents is 50 years; about a quarter (26%) are older adults 65 years or older, nearly one in five (17%) are younger than 40 years, and about half (52%) are 40 to 64 years of age. Most respondents live in Ontario (61%), followed next by British Columbia (17%), Manitoba (9%) and Saskatchewan, Quebec, and Nova Scotia (all at 4% each). Nearly 4 in 10 presently live in, or are otherwise familiar with, rural

or smaller communities and transportation issues in those communities for people with disabilities. One interviewee reported membership in the Métis nation.

Three-quarters of the people we interviewed have some form of disability (74%). Nearly half of the respondents reported disability in the areas of mobility, dexterity, or flexibility (48%), most of whom had difficulties with mobility and several of whom (26% of all respondents) use wheelchairs. Nearly a third of respondents (30%) reported disabilities that affect sensorial functioning. These include people who are blind (9%), have low vision (9%), are Deaf (4%), hard of hearing (9%) or who are Deaf-blind (4%). About 1 in 8 (13%) have psychosocial (mental health) disabilities, including anxiety and depression. Nearly one in ten (9%) have intellectual disabilities. About one in six (17%) reported various "other" disabilities including Attention Deficit Disorder and conditions that affect the heart, circulatory and respiratory systems. It was fairly common for interviewees to report that their disabilities fall across more than one of these broad categories. Nearly one in five respondents (17%) use service or guide dogs.

## B. Key findings

We here provide highlights of the community consultations. The full report is provided in the Appendix.

As a backdrop for the findings, many respondents spoke about the difficulties they, colleagues, friends, and the people they serve, have experienced due to the lack of good quality, safe, affordable, reliable and accessible transportation consistent with their needs. A couple of respondents reported how the disability-related service organizations they work for have been forced by circumstances to raise funds to provide accessible van services to the people they serve because no one else is providing relevant, timely, affordable and safe service – neither ridesourcing companies, public transit agencies nor cab companies. The COVID 19 pandemic has aggravated the situations of people who were already feeling isolated because of difficulties moving about in their communities.

Respondents reported that, based on their experiences, the process for booking rides with ridesourcing companies was generally convenient and problem-free. Respondents appreciated knowing in advance, and being able to let others know, about the vehicle they will be in, its driver, the route, the estimated time of arrival and the cost of the trip before they get in the vehicle. Most respondents who have used ridesourcing said that the vehicles were comfortable and seemed well-maintained and safe. Several respondents also said they found the drivers courteous, pleasant, and willing to be helpful. Several appreciated the convenience of being able to maintain an ongoing rider-driver relationship, the assistance the drivers have provided, and the courtesies drivers have shown them and their service dogs. Riders appreciated that ridesourced service is flexible, available on demand, and reliable. Drivers usually pick the riders up and drop them off when expected and the same driver will sometimes be available to provide return transportation. Ridesourced trips are usually quicker than public transit and less

expensive than what a taxi would cost. Only a few mentioned difficulties in paying their fares through the ridesource providers' digital platforms. There also seems to be some flexibility for the rider and driver to negotiate a fare when the trip extends beyond the driver's usual service area.

While there have been some media reports of unacceptable treatment and even victimization of riders by ridesourced drivers, this was not an experience widely reported by our interview respondents. That said, several did mention being refused rides because of their service dogs, and a couple of respondents wondered whether their disability might have been a reason why they and others they know have been refused rides. A couple of respondents said they felt ridesourced drivers were not always safe drivers. Several respondents also said they were occasionally unhappy with how they had been left to fend for themselves at their drop-off points, sometimes in very bad weather.

Some respondents relayed their experiences with "glitchy" and sometimes inaccessible software that made booking and paying for rides more difficult than it should have been. Several also voiced concerns about what they experienced as limited payment options which can be a particularly difficult problem for people living on low incomes. Several respondents also spoke about ridesourcing companies' reliance on digital technology, and the absence of phone-based booking, information-providing, complaint-response, and other services as problems for people who lack smart phones and other digital technologies.

An issue many respondents flagged was their inability to obtain an accessible ridesourced vehicle when needed, and the complete non-availability of such vehicles in some communities. Several argued that a regulated approach is required, much like the requirement that taxi companies must ensure a percentage of their fleets are wheelchair accessible vehicles. A related concern several respondents reported is that an unsuitable ridesourced vehicle will sometimes arrive to pick them up despite the company being given clear information about the vehicle features the rider will need.

Another concern that respondents frequently reported was that ridesourced drivers often seem inexperienced with the how to's of effectively interacting with and serving riders with disabilities. Many respondents attributed this problem to the lack of training as a regulated requirement for ridesourced drivers.

Concerning carsharing, accessible vehicles seem to be few and far between. Bikesharing may be an attractive option for some people, but also brings the potential for pedestrian injury where issues of sidewalk clutter and safe passage from vehicles to sidewalks have not been properly addressed.

Respondents who spoke with knowledge about transportation in rural communities indicated that the lack of accessible shared-use mobility vehicles, and the low number of disability-competent ridesourced drivers, aggravates many other difficulties people experience. In such communities where conventional transportation services are lacking, inaccessible, or hard to

obtain, people may find themselves prisoners within their communities, highly reliant on the vagaries of volunteer transportation, and unable to travel from one community to the next. Some leave their communities altogether and, in exchange for greater mobility, leave behind the relationships, services and informal supports presently available to them.

## VIII. Actions taken by governments to enhance access to shared mobility (4 c iii)

### A. Examples from the US and other jurisdictions

#### 1. Required capacity and duty to serve

A large number of cities have policies requiring a minimum level of accessibility among taxi fleets. For example, in Washington, D.C., any taxi or black car company with more than 20 vehicles must ensure that 20% of their fleet is wheelchair accessible.

The City of Portland, Oregon requires that ridesourcing companies operating within its bounds must accept any “requests made by persons with disabilities and requests for wheelchair-accessible service.” As of the time of writing, both Uber WAV and Uber Assist, for example, are available for the same price as UberX with similar drop-off times. Companies must show zero tolerance for discrimination with a policy that has been approved by the city. Portland’s bylaw has an extensive section on accessible service requirements including those related to service animals, individuals who are Deaf and hard of hearing, people with visual impairments (e.g. apps and customer service support must conform to W3C guidelines), and people with mobility devices, with a requirement that any company must provide related data on request, e.g. wheelchair-accessible trip wait times (City of Portland, 2020).

The State of California, through the 2018 *TNC Access for All Act* (California State Legislature, 2018), requires that ridesourcing companies provide access for people with disabilities, including people who require wheelchair-accessible vehicles (California Public Utilities Commission, 2018).

#### 2. Accessibility charge on TNCs

One of the most common policies implemented to address service for people with disabilities is the accessibility charge. For example:

- Seattle, Washington collects \$0.10 on every taxi and ridesourcing ride toward a fund used to offset owner and operator costs for wheelchair-accessible taxis (Sam Schwartz Engineering, 2019).
- The State of California (through the *TNC Access for All Act*) has implemented a \$0.10 per trip fee for all ridesourcing companies in the state, with proceeds either spent by those

companies to improve accessibility options, or by the state transportation commission for on-demand WAV service (California Public Utilities Commission, 2019).

- Chicago's Vehicle Accessibility Fund collects \$0.10 for each non-accessible ridesourcing vehicle or taxi trip (Chicago.gov, 2017).

### 3. Subsidies

- Separate and distinct from ridesourcing services acting independently in a pure market situation, the City of Chicago has implemented the Taxi Access Program (TAP), which offers \$3 taxi rides for TAP card holders. Each \$3 charge can purchase rides worth up to \$30, and the cards can be used for up to eight rides per day. All Chicago taxi providers are required to accept TAP cards. Anyone considered permanently eligible for the city's paratransit service can access the program (PACE, 2019).
- Boston has a similar On-Demand Paratransit Pilot Program in partnership with ridesourcing companies Uber, Lyft and Curb. Eligible users (i.e. those who qualify for the city's traditional paratransit service) pay \$2 per ride for rides up to \$40, at which point the rider pays the rest. The pilot began in 2016 and was scheduled to run until the end of March 2020 but has been extended to the end of September 2020 (Massachusetts Bay Transportation Authority [MBTA], 2020c). While the per-ride cost for the program is lower than that for traditional paratransit, the popularity of the program has led to greater use and higher overall costs. In the first two years of the pilot, participants took 43% more trips overall, but 27% fewer by traditional paratransit. One limitation of the program is a shortage of wheelchair-accessible vehicles, suggesting inequality of access to the program for people with mobility impairments (Metzger, 2018).
- Los Angeles has the Cityride program for older adults and people with disabilities which offers a card containing \$84 in fare value that can be purchased for \$21 (\$9 for people living on low incomes). The card can be used with differing rate structures in taxis, paratransit and fixed-route transit, the latter of which is free for older adults and people with disabilities (Los Angeles Department of Transit [LADOT], 2019).

### 4. Multiple actions

In a recent report (2019b), the San Francisco Municipal Transportation Agency (SFMTA) addresses a range of issues related to accessible shared mobility and offers a framework that

can assist municipalities in balancing the growth of ridesourcing services with the transportation needs of people with disabilities. While the report is designed with California in mind, the framework has wide applicability. It outlines the responsibilities of the various sectors involved, including the following:

- For the public sector:
  - *Strengthen regulatory oversight* of transportation network companies by:
    - i. Extending protections to people with disabilities equally in all areas of the state;
    - ii. Require TNCs to share relevant data on efforts toward accessibility;
    - iii. Ensure all drivers receive training about serving people with disabilities;
    - iv. Provide users with a mechanism to provide input on the performance of TNCs; and,
    - v. Commit public staff time to programs and enforcement of standards for people with disabilities.
  - *Leverage local agencies and consumers* to develop and enforce relevant regulations, with a particular focus on agencies with expertise in accessible transportation services.
- For the private sector:
  - *Improve the user experience* of all people “who have traditionally not been served or underserved, particularly wheelchair users who require accessible vehicles.” Steps can include an increase in accessible vehicles, enhancement of apps and interfaces, and increased representation of people with disabilities and other underserved groups in decision-making processes (San Francisco Municipal Transportation Agency [SFMTA], 2019b).

The SFMTA report provides in-depth case studies of three municipal-TNC partnerships that address access for people with disabilities, the key points of which are summarized in the screened box, below.

- New York City – Increasing accessibility of TNCs

In New York City’s five boroughs, all licensed for-hire vehicle (FHV) businesses must provide equivalent service to wheelchair-using riders. To meet accessibility requirements, FHVs can choose one of three approaches:

- Dispatch a minimum of 5% of all trips to wheelchair-accessible vehicles (WAVs) as of June 2019, growing to a minimum of 25% of trips by 2023. Companies that do not meet the percentage will be fined \$50 for each 100 trips short of the requirement.
- Establish an agreement with an Approved Accessible Vehicle Dispatcher. All trips booked with the dispatcher are required to meet response time benchmarks set by the city agency (the NYC Taxi and Limousine Commission). The dispatchers must meet the wait time benchmarks established by the TLC and demonstrate that response times are improving each quarter.
- Become an Approved Accessible Vehicle Dispatcher (i.e. the option chosen by Lyft, Uber and Via), under the same rules outlined above.
- Regardless of which option is chosen, TNCs must submit monthly trip data to the regulating authority in order to show they are meeting requirements.

- Boston – Improving paratransit services

- In October 2016, the Massachusetts Bay Transportation Authority (MBTA) began a pilot with Uber and Lyft to offer on-demand service to customers of RIDE, the agency’s paratransit service. Customers who qualify for paratransit can participate. Each month, subsidy funds (which provide a maximum of \$40 per ride) are loaded into a customer’s account with the company of their choosing. Wheelchair users can use any/all of the participating companies (Massachusetts Bay Transit Authority, 2020c).
- In July 2018, the pilot was expanded to include the Curb Mobility taxi app to increase access to wheelchair accessible vehicles, and to make cash payment an option (since neither Uber nor Lyft accept cash payment).

- As of April 2019, the program was cost-neutral, with 0-1% total savings. While the average TNC trip costs around \$17 (compared with a traditional RIDE trip average cost of \$41), riders have used the TNC services 46% more than they did the traditional paratransit program.
- Participation by wheelchair users was low as of April 2019, likely because of the lack of available WAVs in the Uber and Lyft fleets. Thus, a WAV subsidy pilot has been initiated by the Massachusetts Department of Transportation (MassDOT) and the MBTA to provide a fixed per-hour subsidy for each hour that an Uber or Lyft WAV is available on TNC platforms.

As in New York, participating agencies must submit data to regulating agencies to ensure they are meeting program requirements.

- Chicago – Accessibility charge

Chicago's accessibility charge (\$0.10 for each non-accessible trip, plus \$100 per vehicle per year, reaching \$6.5 million per year) has funded the addition of accessible taxis as well as incentives for wheelchair-accessible ridesourcing vehicles. In terms of regulation, ridesourcing partners must:

- Ensure that digital platforms connecting drivers and passengers be accessible to riders who are blind, visually impaired, Deaf or hard of hearing.
- Implement plans to enhance service to customers with disabilities.
- Prohibit drivers from providing ratings to customers based on disability.
- Ensure that drivers undertake training relevant to serving people with disabilities.
- Submit data to regulating agencies to ensure they are meeting program requirements.

The SFMTA report concludes that:

- Wheelchair-accessible services will always be more expensive to operate because of up-front costs, higher operating and maintenance costs, longer deadheading, and more time needed on average for riders to load and unload.
- Riders of all abilities want to be able to choose between fixed-route public transit, taxis, and ridesourcing.
- Training drivers of wheelchair accessible vehicles is an absolute necessity. “Drivers need to be comfortable with the securement systems and tie-downs, as well as different types of mobility devices. Drivers should also be well versed on the common needs of persons with different types of disabilities. Finally, drivers must know that riders with disabilities are the experts on their needs.”
- Data sharing is required for monitoring and to ensure compliance.

## B. Examples from Canada

As in the US, Canadian cities have undertaken a range of actions to move shared mobility services towards accessibility for people with disabilities and older adults. The following are some examples.

### 1. Required capacity and duty to serve

The City of Toronto took relatively early action on the accessibility of ridesourcing services (what the municipality calls Private Transportation Companies, or PTCs), i.e. “any person who offers, operates, or facilitates transportation services for compensation using software, an application, or a telecommunications platform to communicate with passengers and PTC Drivers.” Its 2016 bylaw held that any ridesourcing platform with more than 500 vehicles must offer wheelchair-accessible service to the public, available within wait times that are comparable to non-accessible vehicles, for fares that are equivalent to non-accessible vehicles (City of Toronto, 2016). This regulation is also part of the 2020 bylaw. It is likely no coincidence that an Uber WAV and Uber Assist are both available at the same price as UberX, with only slightly later drop-off times in mid-town Toronto. The majority of wheelchair-accessible trips in Toronto are fulfilled by brokerage companies that use only wheelchair taxis (Toronto Accessibility Advisory Committee, 2019).

In contrast, the City of Calgary Livery Transport Bylaw employs the word “disability” only four times; “wheelchair” once, and “impairment” not at all. The bylaw gives little direction on the accessibility of taxis or ridesourcing services and makes few or no demands regarding the availability of accessible service. Returning to the benchmark used above with Toronto and Portland, neither Uber WAV nor Uber Assist are currently available in Calgary (City of Calgary, 2019).

These city-to-city differences are well understood by some disability advocates and by ridesourcing companies themselves. In a recent news article discussing ridesourcing in Vancouver an advocate noted that, without regulations and conditions on licensing, there is no obligation for ridesourcing companies to implement accessible transport. Saltman (2020) urged, “If Uber is not yet licensed, and [the government has] been successful in keeping Uber out of the province, and Uber wants to get in to the province, now is the time to negotiate, and the negotiation should be to get equivalent service.” In the same article, an Uber representative is quoted as saying that “when Uber first hits the road in Metro Vancouver, he does not anticipate wheelchair-accessible vehicles being available on the app ‘because drivers will be using their own vehicles, and most vehicles are not wheelchair accessible.’” Clearly, however, this issue involves more than the types of vehicles owned by the company’s drivers.

## 2. Driver training

The City of Toronto’s 2020 vehicle-for-hire bylaw holds that all licensed drivers must take an accessible vehicle training course, the content of which is still to be determined, with the city currently accepting applications for driver training programs as of early March 2020 (City of Toronto, 2020). Likewise, the City of Montreal requires that all ridesourcing drivers complete training on the safety and transportation of people with disabilities (National Assembly of Quebec, 2019).

The City of Calgary recently contracted a review of “effective practices” in fifteen municipal ridesourcing regulatory frameworks (CPCS Transcom Limited, 2019). With respect to disability, the review found that “Overall, the research and several discussions mentioned the importance of ensuring that all drivers are trained with interacting with people with disabilities. Considering that many disabilities are not necessarily obvious, some jurisdictions are planning to introduce training requirements for all drivers.” Examples of this include the following:

- The State of California requires “training on the *Americans with Disabilities Act* and state disability rights laws, including making it clear that it is illegal to decline to serve a person with a disability or who has a service animal.”

- In Chicago, drivers must complete an online or in-person driver training program that must include information on providing service to people with disabilities.
- In Alberta, all licensed Class 4 professional drivers must complete a test that includes information about the transportation of people with disabilities.
- The province of Quebec requires that drivers complete “training on safety, transportation of persons with disabilities, and the other subjects prescribed by regulation of the Minister.” Further, “adapted” (i.e. wheelchair-accessible) vehicles can only legally be used in a for-hire capacity by individuals who have completed “advanced training on the transportation of persons with disabilities and passed an examination on that training” (National Assembly of Quebec, 2019).

In general, the Calgary study positioned “importance of access for people with disabilities” as one of the eight top issues put forward by study participants. A recent study performed for the City of Los Angeles put forward the idea that, with respect to driver training:

“While the general trend is toward less training, there is one trend in the opposite direction: many jurisdictions have either created or expanded education programs to teach drivers how to meet the needs of persons with disabilities” (Sam Schwartz Engineering, 2019).

While the big ridesourcing companies have put policies in place that enforce non-discrimination, the industry is not fully inclusive. In larger cities, the companies can partner with providers of accessible transportation. However, there is no guarantee that the model in its current form will be able to address accessible transportation in regions where public providers do not exist. More work needs to be done to identify and assess the incentives that would motivate drivers to operate in a way that removes barriers to people with various types and levels of impairment.

### 3. Accessibility charge on TNCs

As in several US cities, Canadian cities have been levying accessibility charges on TNCs. For example:

- In British Columbia, provincial regulations require a \$0.30 per-trip fee for non-accessible vehicles, the proceeds of which will feed an as-yet-undefined accessibility program (Saltman, 2020).
- In Toronto, each ridesourcing trip includes a \$0.10 regulatory charge that is put toward the city's Accessibility Fund Program, "to support the availability of accessible service and to offset the higher cost of providing wheelchair accessible service" (City of Toronto, 2020). For example, the city waives licence application and renewal fees for wheelchair accessible taxis.
- In Ottawa, the Vehicle-for-Hire Accessibility Fund collects \$.07 for each Uber or Lyft ride, a program that raised \$1.2 million between 2017 and early 2019 (Pritchard, 2019).
- The City of Calgary collects \$0.10 for every taxi and ridesourcing trip taken within the municipality. The charge feeds into the Accessible Taxi Incentive Program, which offers up to \$1,500 per year to holders of Accessible Taxi Plate Licences and accessible taxi drivers. The funds can be used to improve service, reduce costs related to accessible taxis, and improve 24/7 taxi service for people with disabilities (City of Calgary, 2020).

## IX. International examples showcasing highly accessible mobility

A 2018 study by the United States Department of Transportation came to the conclusion that “Europe today continues to lead the United States with innovations in areas such as fare payment integration, electric vehicle carsharing, and MaaS [mobility as a service].” The study’s authors chalk this up to a range of factors, including the reality of intensive public sector involvement, anchored by extensive public transit networks, including in suburban areas and smaller towns, and a socio-political environment that is supportive of sustained shared mobility (U.S. Department of Transportation, 2018). Overall, the Department of Transportation report puts forward four key factors to explain the successful growth of shared mobility in the European context:

- Boundary-defying public-private partnerships and contracting methods.
- Proactive planning and design for shared infrastructure and electrification.
- Forward thinking transit agency leadership with a vision for shared mobility connectivity.
- Development of “whole community” approaches to reduce personal vehicle travel and to create and support shared mobility.

The report points to the difficulties and advantages inherent in a context of municipal, regional, country-specific and European Commission oversight. In Europe, intense regulation has supported collaborative and effective “public-private partnerships with clear public benefit objectives and performance rules that meet long-range planning goals and other social objectives” (U.S. Department of Transportation, 2018, p. 10), including the integration of traditional public transit and emerging shared mobility modalities.

The report also notes that, whereas the U.S. approach is notable for its municipal and regional focus, European MaaS advances have come with a high level of national (and international, e.g. the POLIS group) involvement. Probably no single city to date has effectively implemented all the features that would ideally be in place for fully accessible shared mobility linked with other modes of accessible transportation. However, the examples we provide in this section illuminate features of accessible shared mobility in cities that have been making significant progress towards fully accessible systems.

As context for the American examples, the *Americans with Disabilities Act* (ADA) and its Regulations require that public transportation providers and private sector transportation providers under contract with public agencies meet several key accessibility obligations. The Northwest ADA Center and National Aging and Disability Transportation Center (2019) provide

a helpful summary of those requirements. Transportation organizations are required to provide:

- Rider information about services in accessible formats for persons with different types of disabilities (e.g. information in large print, braille or alternative and electronic format).
- Assistance equipment and accessible features such as lifts, ramps, securement devices (such as straps for securing wheelchairs on board), signage, and communication devices. All such supports must be in good operating condition and, if out of order, must be repaired promptly. In the interim, an alternative accessible vehicle or option must be available.
- Adequate time for people with disabilities to board and exit from vehicles.
- Accommodation of service animals that accompany people with disabilities in vehicles and facilities.
- Priority seating and signs for fixed-route transportation services that designate seating for passengers with disabilities. At least one set of forward-facing seats must be marked as priority seating for people with disabilities.
- Operator training on vehicle operation and equipment safely on properly assisting individuals with disabilities in a respectful and courteous way and on the different abilities and needs that require different types of assistance.

Concerning paratransit, the ADA requires that service must be available where fixed-route service exists and must have a pickup and delivery area of within three quarters of a mile from a fixed route station. The service can be curb-to-curb or door-to-door. Additionally, services must operate on the same hours and days as fixed route service; fares may not exceed twice the fare that would be charged to an individual paying full fare for a fixed-route trip of similar length at a similar time of day; a personal care attendant cannot be charged; paratransit service must be provided at any requested time on a particular day in response to a request for service made the previous day; and real time scheduling is allowed but not mandated, e.g., where a call to the transit provider would result in a pickup on the same day.

The following are not allowed: restrictions or priorities based on trip purpose; restrictions on the number of trips per eligible individual; waiting lists for access to the service; substantial numbers of significantly untimely pickups for initial or return trips; substantial numbers of trip denials or missed trips; substantial numbers of trips with excessive trip lengths.

Private companies that provide transportation services to the public are legally required to be accessible to individuals with disabilities. Companies that use non-accessible vehicles must provide equivalent service. That is, they must provide a different accessible vehicle to provide service to the same traveling points for the same cost within the same time frame as for a regularly scheduled trip. The service is to be provided “in the most integrated setting appropriate to the needs of the individual” (Northwest ADA Center and National Aging and Disability Transportation Center, 2019).

## A. Boston

### **Transportation accessibility for people with disabilities in Boston**

Transit access in Boston builds on the *Americans with Disabilities Act* (ADA), which applies to both public and private ground transportation in the United States. As with many large cities around the world, Boston is in the process of upgrading its transit fleet and facilities to be accessible for people with mobility and other impairments. In 2002, the Boston Center for Independent Living sued the MBTA for failure to comply with the *Americans with Disabilities Act*, and the MBTA/BCIL Settlement Agreement was reached in 2006. This agreement continues to guide and inform transit accessibility improvements in the city, led by the System-Wide Accessibility (SWA) department of the MBTA (Massachusetts Bay Transportation Authority, 2020a).

The accessibility of Boston's public transit system is a work in progress. While the MBTA says that it is "striving to become the global model of accessible public transportation" (Massachusetts Bay Transportation Authority, 2020a) and has noted that "the majority of the system is accessible," the term appears to be defined around the needs of people who use wheelchairs and employ service animals. As of 2018, 60 elevators were still in the design phase, wayfinding technologies for people with sensory impairments were still being studied, and many buses continued to require the use of steps (Massachusetts Bay Transportation Authority, 2018).

### **Mobility as a Service for people with disabilities in Boston**

As is the case in a large number of U.S. cities, the MBTA has engaged with various partners to improve transportation options for people with disabilities and to reduce high paratransit costs. Uber and Lyft have worked with the MBTA to provide trip request, service, and payment options that are ADA-compliant for people eligible to access the city's paratransit service. Trips are largely subsidized by the MBTA, with funds coming in part from accessibility fees that are charged for non-accessible TNC trips. As noted in a previous section of this document:

- In October 2016, the MBTA began a pilot with Uber and Lyft to offer on-demand service to customers of RIDE, the agency's paratransit service. Customers who qualify for paratransit can participate. Each month, subsidy funds (which provide a maximum of \$40 per ride) are loaded into a customer's account with the company of their choosing. Wheelchair users can use any/all of the participating companies.

- In July 2018, the pilot was expanded to include the Curb Mobility taxi app to increase access to wheelchair accessible vehicles and to make cash payment an option (since neither Uber nor Lyft accept cash payment).
- A WAV subsidy pilot has been initiated by the Massachusetts Department of Transportation (MassDOT) and the MBTA to provide a fixed per-hour subsidy for each hour that an Uber or Lyft WAV is available on TNC platforms (San Francisco Municipal Transportation Agency, 2019b).
- The pilot was extended to March 31, 2020.

More generally, TNCs in Massachusetts are regulated by state, rather than municipal, legislation, i.e. the 2016 *Act Regulating Transportation Network Companies*. The legislation mandates that TNCs have, among other things:

“... an oversight process in place to ensure that [companies] and drivers... accommodate riders with special needs, including riders requiring wheelchair accessible vehicles, in all areas served by transportation network companies, [and that the companies and drivers] comply with all applicable laws regarding non-discrimination against riders or potential riders and ensure the accommodation of riders with special needs.”

“... procedures governing the safe pickup, transfer, and delivery of individuals with visual impairments and individuals who use mobility devices, including but not limited to wheelchairs, crutches, canes, walkers, and scooters.”

The legislation also provides for surcharges to feed into an Accessible Transportation Fund that would be used to increase the availability of on-demand wheelchair-accessible vehicles. The fund is fed by a \$0.20 fee charged to all non-accessible trips, and currently provides TNCs a subsidy of \$24 for every hour that a wheelchair accessible vehicle is available for use (Fenoglio, 2019). It is notable that neither Uber WAV nor Uber Assist currently appear to be an option in the city, though these services have been available in the past.

## B. San Francisco

### **Transportation accessibility for people with disabilities in San Francisco**

As in Boston, transit access in San Francisco builds on the *Americans with Disabilities Act (ADA)*, which applies to both public and private ground transportation in the United States. (See the summary of the ADA's requirements in the section on Boston, above.) The city has a range of transit services and accommodations for people with disabilities, including the following:

- Eligible people with disabilities living on low and moderate incomes can access the city's Muni public transportation system (including buses, light rail, streetcars and cable cars) for free. For a single person household, the income cut-off is the city's median income at this household size, i.e. \$86,200 (San Francisco Municipal Transportation Agency, 2020a).
- SF Access (operated and managed by the Transdev corporation) is a traditional pooled paratransit service, utilizing converted vans for people unable to access the city's buses, light rail and streetcars some or all of the time. Trips are scheduled seven days in advance (SF Paratransit, 2020a).
- The SF Paratransit Taxi program revolves around the SF Paratransit debit card/photo ID, which can be used to pay for any San Francisco taxi. These cards must be pre-loaded. For every \$6 loaded by a patron, SF Paratransit adds \$30 in value, up to a maximum monthly purchase allotment. People needing mobility assistance (including those using wheelchairs) can access one of the city's more than 100 taxis equipped with wheelchair ramps. Taxis can be hailed in person, by phone, or via the Flywheel app (SF Paratransit, 2020b).
- The SF Paratransit Group Van service provides pooled transportation for groups of eligible people attending adult day programs for people with disabilities, senior centres, and work sites. Scheduling is managed by agency staff of the program in question (San Francisco Municipal Transportation Agency, 2020b).

The city also offers other related services, including Shop-a-Round (group shuttle to grocery stores, with assistance loading and unloading groceries) and group or individualized travel training. These services are managed by the Mobility Management Centre within SF Paratransit (San Francisco Municipal Transportation Agency, 2020c).

More generally, substantial work has been accomplished in making San Francisco's transit system (including historic streetcars) accessible for people with mobility and sensory impairments. The system revolves around accommodations (e.g. ramps, collapsible stairs,

designated accessible boarding areas) rather than universal design principles (San Francisco Municipal Transportation Agency, 2019a).

The city's transit agency identified a gap related to older adults and people with disabilities who have difficulty utilizing fixed route transit, but who do not have a disability that makes them eligible for ADA protections and services (San Francisco Municipal Transportation Agency, 2016). To address this gap, the city is looking beyond issues of transit access toward factors such as income, location of key services (e.g. grocery stores), and other characteristics of "communities of concern," i.e. those with populations facing significant barriers to health and well-being (San Francisco County Transportation Authority, 2017).

### **Mobility as a Service for people with disabilities in San Francisco**

San Francisco has long been a leader in the shared mobility universe. The SF Paratransit taxi service was available as early as 2015 and anticipated more recent moves on the part of municipalities to partner with TNCs and taxi operators to offer subsidized rides to people with disabilities. A 2019 research report by the SFMTA on TNCs and access for people with disabilities is clear-eyed about the current reality:

"... many of the benefits that have attracted users to TNCs, such as quick response time, cheaper fares, and ease of payment, have not been afforded equally to all riders with disabilities. Pilots to introduce wheelchair accessible TNC service are sparse, and information on their progress is limited or unavailable; TNCs provide limited training and guidance to provide assistance to persons with a variety of disabilities; and healthcare transportation partnerships with TNCs do not appear to include any meaningful equivalent service for riders who require wheelchair accessible transportation" (San Francisco Municipal Transportation Agency, 2019b).

Cities in the state of California do not have the ability to regulate TNCs, as this power rests with the state government. Prior to 2018, the state had few regulations and minimal oversight with regard to TNC access for people with disabilities. In 2018, the state enacted the *TNC Access for All Act*, which implemented a range of changes. For example:

- A \$0.05 per-trip surcharge for non-accessible rides, to support the TNC Access for All Fund; quarterly remittances will be offset by amounts spent by TNCs on improving access to wheelchair-accessible service.

- The California Public Utilities Commission will “distribute funds in the Access Fund on a competitive basis to access providers that establish on-demand transportation programs or partnerships to meet the needs of persons with disabilities, including wheelchair users who need a WAV...”
- The state is still in the process of establishing benchmarks for accessibility that, if met, will exempt TNCs from collecting and remitting surcharge funds. Exempted TNCs will need to ensure that 80% of WAV trips meet the time requirements set out by the regulations.
- TNCs will be required to share a range of data demonstrating that they are meeting accessibility requirements.
- Up to 2% of Access Fund monies may be distributed to “accessibility advocates who provide a substantial contribution” to the development of TNC and broader transportation accessibility in the state (California State Legislature, 2018).

The literature on shared mobility accessibility tends to focus heavily on mobility impairments and wheelchair use and the *TNC Access for All Act* is no exception to this rule. The *Act* does not include the words “cognitive,” “sensory,” “Deaf,” or “Autism,” to name just a few possible examples. Thus, while the state has made strides, and the city of San Francisco incorporates a range of transportation supports for people with a wide range of impairments, there is still some distance to go with respect to the accessibility of shared mobility for people with diverse disability-related needs.

## C. Helsinki

### **Transportation accessibility for people with disabilities in Helsinki**

The accessibility and use of shared mobility is inherently tied to the accessibility of fixed route transit. For people with disabilities, transit and the transitional zones between transit and shared mobility options will continue to be a central piece of the transportation puzzle. In turn, the accessibility of fixed route public transit is tied to and heavily influenced by national, regional and municipal legislation, policies and programs.

Transit access in Helsinki builds on national legislation and includes the constitution, which incorporates various protections for people with disabilities; the *Social Welfare Act*; the *Disability Services Act*; the *Act on Intellectual Disabilities*; and the *Non-Discrimination Act* (Finland Social Affairs and Health, 2020). The country's own 2019 report to the UN on its disability policy and programs acknowledges major gaps in the accessibility of built environments. On transportation, the Finnish government concedes that “persons with disabilities do not in practice enjoy the same possibilities for movement or the freedom to choose a form of transport most suitable for their situation as all other citizens do and have at their disposal. Because transport services are inaccessible, the principle of equality is only partially realised in many cases” (Finland Social Affairs and Health, 2019).

According to the regional transit provider in Helsinki, most buses and more than half of trams are low-floor and the city is gradually replacing inaccessible metro trains with low-floor vehicles. All transit timetables indicate which services are operated with low-floor vehicles (Helsinki Region Transport [HSL], 2020). The city's transit system has been hailed as highly reliable with excellent coverage throughout the city thanks to well-connected intermodal transport. The Deloitte City Mobility Index rates the city as a “top performer” on mobility accessibility (Dooley, 2018).

Helsinki's leading transportation goal is to eliminate the need for personal car ownership by 2025 by integrating all forms of shared and public transportation into a single payment network. Helsinki's plan included the on-demand minibus service Kutsuplus, a pilot of which ended and was not renewed due to a judgement that the cost-to-service ratio was unsustainable in the economic environment of the time (Helsinki Region Transport [HSL], 2016). While in operation, Kutsuplus was priced between taxi and transit service and was used by people with a wide range of income levels and travel needs. The service has been well-

researched and continues to inform the development of new shared mobility options. (Haglund, Mladenovic, Kujala, Weckstrom, & Saramaki, 2019).

### **Mobility as a Service for people with disabilities in Helsinki**

As in Berlin, MaaS in Helsinki revolves around an integrated travel planning and payment app, Whim, which offers one-stop access to public transport, city bikes, e-scooters, taxis (often discounted) and rental cars – but not Uber (Lyft is not available in Helsinki). Various payment plans are possible, from pay-as-you-go to a monthly payment allowing unlimited access to all included transportation modalities (Whim, 2020b). (Whim is also available in other jurisdictions, including Antwerp, Vienna, Singapore and Tokyo.) In part thanks to this functionality, a recent report positions Helsinki as “the most successful manifestation of MaaS” in the world (Automotive World, 2018).

Interestingly, Whim includes access to the Kajon, TaksiiHelsinki and Lahitaksi taxi services, each of which charge substantial additional fees for people who need personal assistance, including the following:

- A surcharge of € 16 (about \$25 CAD) for customers who require personal assistance and a wheelchair-accessible vehicle.
- A surcharge of € 32 (about \$50 CAD) for those who require assistance, a wheelchair-accessible vehicle, and who need help managing stairs or a lift (Kajon, 2020 ; Lahitaksi, 2020; Taksiihelsinki, 2020).

For individuals with disabilities who require the use of an accessible taxi to attend a health care visit, Kela (the social insurance institution for Finland) may cover the cost (Kela, 2020). Additionally, individuals considered “severely disabled” under the *Disability Services Act* may be eligible for subsidized transportation and assistance services for any purpose (i.e. beyond health care visits). However, an individual is not able to choose the mode of transport. This decision is made by the municipality, which administers the federal program at the local level (Invalidi Liitto, 2020).

In Espoo (pop. 272,000), the country’s second-largest city (located a half hour away from Helsinki by train), ViaVan and the Helsinki Regional Transit Authority have partnered to offer on-demand rides from regional train and local Metro stations. The main objectives of the pilot project, started in late 2019, are to reduce reliance on personally owned vehicles and to increase the use of public transit. “Passengers can book a ride through the ViaVan app directly to or from Metro and train stations in the service area. Once a ride is booked, Via’s technology

matches multiple passengers heading in the same direction into one of eight high-capacity vehicles and dynamically routes these vehicles in real-time” (SmartCitiesWorld, 2019). The vehicles are wheelchair accessible (ViaVan, 2019).

Finland introduced new legislation governing transport services (the *Transport Services Act*) in the country in 2018. Some hailed this legislation as “a great step towards creating true mobility-as-a-service” (MaaS Alliance, 2017). However, others considered it a step back with respect to transportation for people with disabilities. Relevant changes included:

- Price liberalization, which allows surcharges for assistance for people with disabilities (described above).
- Cancellation of the need for driver training with respect to disability.
- Liberalization of the types of vehicles that can be used as taxis.
- Decrease of requirements for taxi accessibility (Invalidi Liitto, 2018).

It is early to tell, but initial evidence suggests that taxi deregulation has resulted in difficulties for some people with disabilities (Sandholm, 2019). The availability and timing of rides whose costs are covered by the municipalities have been key issues. Another is individuals’ lack of choice when it comes to service providers. Before deregulation, municipalities made the decisions about which providers will deliver service to people who need state funding assistance and continue to do so.

## D. Berlin

### **Transportation accessibility for people with disabilities in Berlin**

The accessibility and use of shared mobility is inherently tied to the accessibility of fixed route transit. For people with disabilities, transit – and the transitional zones between transit and shared mobility options – is and will continue to be a central piece of the transportation puzzle. In turn, the accessibility of fixed route public transit is tied to and heavily influenced by national, regional and municipal legislative policy and program documents and decisions. With respect to Berlin, we can trace a line in policy that connects traditional fixed route transit and decisions about shared mobility which are still evolving in the city.

In 2013, Berlin was awarded the Access City Award, in recognition of its advances in making the city accessible to people with disabilities. This award is bestowed each year by the European Commission and “recognises and celebrates a city's willingness, ability and efforts to become more accessible” in order to:

- Guarantee equal access to fundamental rights; and
- Improve the quality of life of its population and ensure that everybody – regardless of age, mobility or ability – has equal access to all the resources and pleasures cities have to offer” (European Commission Employment, Social Affairs and Inclusion, 2020).

The evolving accessibility of shared mobility in Berlin is grounded in the city's history of attention to and action on access more broadly. In awarding the Access City prize, the European Commission praised Berlin's “strategic and inclusive disability policy, which has invested heavily in turning the formerly divided city into an accessible, barrier-free environment,” highlighting in particular the city's relatively accessible transit system.

Access for people with disabilities in Berlin builds on a number of national and municipal legislative and policy documents. While the most recent example of this is the 2017 *Act to Strengthen the Participation of People with Disabilities in Society*, as far back as 1994 the *Basic Law for the Federal Republic of Germany* held that “no person shall be disfavoured on account of his or her disability... [R]egulations that discriminate and alienate, as well as discriminatory conditions in the everyday lives of people with disabilities are not acceptable to society as a whole.” Even prior to this early legislation, a barrier-free approach to infrastructure in Berlin was set out in the 1992 document, *Guidelines for Making Berlin a More Disabled-Friendly City* (Berlin Senate Department for Urban Development and the Environment, 2013).

Currently, public works in Berlin are guided by two main documents: *Design for all – Accessible public buildings*, and *Design for all – Public outdoor space*. The first of these holds that “the city in all its diversity should be accessible without impediments” and offers specific instructions to reach this objective. Both documents engage with the challenges inherent in designing spaces and services that address mobility, perceptual and cognitive impairments. The documents have been developed in partnership with people with disabilities and consistently prescribe that people with disabilities must be involved at every step in the design process.

Appendix Table A1 in the present report presents a few sample guidelines from *Design for all – Accessible public buildings*, which illustrate the inclusive approach of these two documents.

The organization Sozialhelden ([sozialhelden.de](http://sozialhelden.de)) has created a tool ([wheelmap.org](http://wheelmap.org)) that crowdsources information about and provides ratings of the mobility- and agility-related accessibility of any and (in theory) all sites in Berlin. While the tool is accessible worldwide, its users seem to tend to be largely German, and the range of information available for the city of Berlin is impressive. The tool offers a useful adjunct to the city’s transportation options, allowing an individual to gain knowledge about potential destinations when booking (for example) a shared mobility service.

Even with the legislative, policy and design supports that exist in Germany and in Berlin, fixed-route transit in Berlin is not yet completely barrier-free:

- Nearly all urban and underground trains and buses are said to be barrier-free, though gaps and elevation differences are common when moving between underground trains and platforms.
- Many transit environments are outfitted with ramps, elevators and tactile orientation aids (including Braille signage) for people with vision impairments.
- Almost all trams are said to be barrier-free.
- Most stations can be accessed without using steps.
- For individuals with mobility impairments, the Berliner Verkehrsbetriebe (BVG) mobile app and S-Bahn website includes trip planning that can suggest (i) limited access routes (with a need for some escalator use), or (ii) barrier-free access, which is likely to result in lengthier travel times to account for non-accessible transit elements.
- Publicly available documents appear to be open and transparent about imperfect accessibility and reflect constructive engagement in addressing the resulting difficulties for people with disabilities in the city (Berliner Verkehrsbetriebe [BVG], 2019; S-Bahn Berlin, 2020).

Despite some drawbacks, it seems clear that Berlin is a world leader in fixed route transit access, which provides a foundation for the inclusive growth of shared mobility in the city. It demonstrates the utility of a strong underlying philosophy of social welfare, strong and directive national legislation protecting and enforcing the rights of people with disabilities, and a strong government hand in the control and oversight of urban mobility.

### **Mobility as a Service for people with disabilities in Berlin**

Berlin's approach to public spaces and fixed route transit seems to extend to shared mobility and to mobility as a service more broadly. This is seen in advancements regarding integrated trip planning and payment and in government leadership in creating an inexpensive and accessible alternative to Uber and other private ridesourcing services.

Thanks to the recent implementation of Jelbi, a mobile integrated transportation planning and payment application, Berlin might be said to sit near the forefront of MaaS planning. Jelbi provides access to trip data and ticketing/payment for:

- The BVG public transit network;
- The S-Bahn rail system;
- The BerlKönig shared van service (providing first and last mile connections from BVG and S-Bahn stations);
- Car sharing (short-term rental);
- Bike, kick scooter and electric scooter rental; and
- Ferries.

Jelbi does not currently offer access to taxi or ridesourcing services such as Uber or Lyft. Uber became available in the city relatively recently after municipal attempts to keep it out. While Uber WAV and Uber Assist are available in some German jurisdictions, these options do not seem to be currently available in Berlin. People with folding wheelchairs are advised by the company to order regular Uber rides and drivers are expected to accommodate and assist as needed.

The BerlKönig shared (i.e. pooled) van service, operated by ViaVan in partnership with the BVG municipal transit network, appears to be Berlin's competitive answer to Uber Pool, Lyft Shared and the like. Through the BerlKönig and Jelbi app, individuals can book shared rides in vans that are promoted as barrier-free. As a first-and-last-mile solution, it is priced well below other shared mobility providers, and is promoted as nearly as cheap as a bus trip (Berliner Verkehrsbetriebe [BVG], 2020).

Berlin has a plethora of shared mobility transportation options, including at least five one-way car rental sharing companies, multiple kick scooter, bike sharing and e-bike options, and the ridesourcing services Uber, BerlKönig and CleverShuttle. The latter two of the ridesourcing options are available only in a ride-pooling format (Wolff-Mann, 2019).

## X. Best practices or lessons applicable to the Canadian context

Drawing from what we have learned about measures that have been instituted, the following are key tools governments and transportation agencies are using to support the use of shared mobility.

### A. Accessible services

Measures instituted by governments to increase the availability of wheelchair accessible transportation beyond regular transit essentially aim at:

- a) Increasing the supply of publicly funded wheelchair accessible vehicles, quasi-accessible vehicles, and drivers trained on serving riders with disabilities as provided by public and private paratransit providers, taxis and TNCs; and
- b) Increasing the capacity of people with disabilities to use accessible ridesourcing and other services.

These two prongs have involved the following:

#### ***Governments and transportation agencies have provided the following to transportation service providers:***

- Funding for public paratransit to expand their wheelchair accessible fleets and to increase the number of drivers, dispatchers and other staff needed to provide accessible mobility on demand. Funding has also been used to cover vehicle maintenance and parking when vehicles are not in use.
- Funding (e.g., grants and low interest loans) for taxi companies to purchase wheelchair accessible vehicles and to retrofit vehicles for wheelchair accessibility. TNCs and/or their individual drivers may also stand to benefit by having access to such funding.
- Contracting with taxi companies, and partnering with TNCs and other organizations, to provide wheelchair accessible transportation to people with disabilities.
- Providing direct training, or the facilitation of training, to transportation providers on serving riders with disabilities.

#### ***Governments and transportation agencies have required the following from transportation service providers:***

- Transportation service providers who will be serving people with disabilities are required to undergo basic training on serving riders with disabilities.

- Taxi companies and TNC drivers are required to pay a per-km fee, or a per-trip charge, for operating vehicles that are not wheelchair accessible. Higher vehicle registration fees have also been charged where the vehicles will be used to transport people with disabilities. The revenue from these levies has supported an accessibility fund which government can use to increase the supply of accessible vehicles and disability-competent drivers, expand the availability and quality of paratransit and TNC services, make regular transit more accessible, etc.
- Service providers are required to share data with government on service use by people with disabilities, wait times, fares charged, and how the service providers are meeting their accessibility requirements.

***Governments and transportation agencies have provided the following to individuals with disabilities:***

- Transfers and other funding for individuals with disabilities to use accessible services. Funding has taken the forms of vouchers for accessible taxi services, vouchers for accessible TNC services, smart cards preloaded with amounts that individuals can use to cover TNC and other fares, and publicly subsidized fee reductions for accessible rides.
- Payment arrangements for the trips of unbanked individuals and individuals without credit cards. Tools include the facilitation of cash payments for trips and payment by dedicated credit cards such as the AMEX Bluebird card which is available to people with low incomes.
- Telephone-based ways for individuals to book rides who do not own cell phones.

## B. Private use of carshare vehicles

Government efforts to reduce widespread reliance on the use of personal vehicles and increase the use of carsharing instead have tended to pursue the following tacks:

- Increase the number of car share vehicles available to the public by making it more financially feasible for service providers to operate. This aim has been pursued through reduced or waived municipal parking fees for carshare vehicles and special arrangements for vehicle parking on-road, at terminals, in specific lots, etc.
- Incentivize the individual use of carsharing by opening up parking for carshare vehicles, reducing or eliminating parking fees, and making it convenient for the consumer to pick up and drop off carshare vehicles. Greater convenience has been fostered by expanding the number of carshare pick-up and drop-off locations (e.g., lots) within a geographic catchment area, and allowing vehicles to be picked up and dropped off anywhere at designated parking within that area.

## XI. The future of accessible shared mobility

### A. Beyond vehicles accessible to wheelchairs and service dogs

The literature on shared mobility and disability is generally dominated by attention to people with mobility impairments – specifically wheelchair users – and, to a lesser extent, people who use service animals. However, other elements of shared mobility services may act as barriers for people with various other types of impairment. For example:

“One of the defining features of TNC services is the exclusive use of apps for summoning a vehicle. Payment is also cashless and is coordinated through the dispatching company’s app. The credit card linked to the profile that summoned the vehicle is debited upon completion of the ride. This system presents many barriers for people with disabilities. Firstly, individuals who have cerebral palsy, arthritis or multiple sclerosis, for example, have dexterity challenges that can make dispatching a vehicle through the app by hand a challenge. People who are partially sighted or blind may use the voiceover in iOS and TalkBack in the Android OS, which has varying functionality depending on the app being used. Secondly, due to lower and often fixed incomes, people with disabilities are less likely to have a smartphone or use a credit card (Ward, 2016).”

The San Francisco Municipal Transit Agency (2019a) provides a useful overview of the potential opportunities and challenges created by ridesourcing services related to different types of impairment. This overview is recreated in full in Appendix Table A2 of the present report.

The researchers Julie Clark and Angela Curl have utilized an accessibility framework to assess the inclusiveness of bike- and car-sharing programs, finding “an apparent failure to deliver benefits across the demographic spectrum.” They provide the following key variables with which to evaluate any program with relevance to people with disabilities:

- Cost, including financial (e.g. rental) outlays as well as the need to have a license (for car share), a credit card, internet access, a smart phone and bank account.
- Physical access, including the suitability of cars and bicycles for people with various types of impairment, as well as the perception of physical competence suggested by the marketing of bike-sharing programs.

- Information, including the requirement of online access, and the level of cognitive ability required to understand the information provided, such as a realistic understanding of the cost of service.
- Physical location, including the need for locations in lower income areas, within realistic walking distance, etc. (Clark & Curl, 2016).

The National Center for Mobility Management ([NCMM], 2014) has developed the concept of *one-call* and *one-click* services, with an eye to simplifying the connection between people with disabilities and transportation systems. The guiding characteristic of such services is that they would be customer-centric as opposed to system-centric. “The contribution of these one-stop transportation information and scheduling services is that they facilitate a customer’s being matched with exactly the type of service that best responds to his or her needs, whether that be a public transit service or a volunteer, nonprofit, private, or shared ride service, or another transportation mode.” Essential elements of such a service include:

- Information on multiple types of transportation services;
- Information on multiple providers across a region (rather than by jurisdiction);
- Information on services (including free services) offered by multiple agencies (e.g. community disability service organizations, hospitals, public transit, etc.); and
- Information on hours of service, vehicle types, impairments addressed, ride eligibility, etc. (National Center for Mobility Management, 2014).

Navigating transportation can be a significant issue for people with intellectual and developmental disabilities.

“Limited access to affordable, reliable, and integrated transportation options limits participation by people with developmental disabilities in virtually every aspect of day-to-day life, from employment to health care to participation in religious life. Transportation is often unavailable, too expensive, or too limited. Often, people with intellectual disability rely on friends and family to get where they want and need to go. Fixed-route bus systems are the most frequent options for public transportation, but can be complex to use” (Stock, Davies, Herold, & Wehmeyer, 2019).

Further, people with developmental disabilities can rarely afford a personal vehicle, or access to ridesourcing services on a regular basis. Paratransit is an option but continues to be prohibitively expensive for many municipalities to operate, even at basic levels of service.

However, several studies have shown that people with intellectual disabilities can learn to use GPS-enabled mobile apps to successfully navigate public transit. For instance, recent work out of the University of Kansas and AbleLink Smart Living Technologies examined a technology tool called the Smart Travel Concierge System (STCS). The tool supports “pre-trip assessment, training, and planning activities to support people with intellectual disability to travel using fixed route public transportation more independently” (Stock, Davies, Herold, & Wehmeyer, 2019). While the tool is not linked to shared mobility, its current applications are nevertheless instructive with potential for application to newer forms of transportation.

## B. Connected and automated vehicle technologies

Connected and automated vehicles are garnering considerable research and development interest. Two types of connected technologies in the automotive sector are: (1) consumer conveniences connected to the Internet, and (2) vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication over dedicated short-range communications. V2V technology can warn the driver of a vehicle that is too close. V2I technology allows roadside infrastructure to communicate with vehicles, for example, to warn the driver when their vehicle is entering a collision-prone area (The Standing Senate Committee on Transport and Communications, 2018). Connected and automated vehicles are complementary technologies.

SAE International (2019) has developed a helpful graphic that shows six levels of automation for vehicles, from minimal to complete automation in all driving conditions. Time estimates vary, but the automobile industry puts automated, driverless vehicles as arriving sometime in the 2020s. In the winters of 2016 and 2017, the Intelligent Transportation Society of America (ITS), and the Transportation Research Board of the National Academies of Sciences, Engineering and Medicine (NASEM) in the US, convened discussion forums among 50 subject matter experts on “the Future of Autonomous Vehicles and the Disability Community” and “Fully Accessible and Automated Vehicles”. Discussants were from the disability community, academia, government transportation agencies, private-sector shared mobility service providers and auto manufacturers. The ITS summarized the outcomes of those discussions and follow-up interviews in the spring of 2019. That document (Bayless & Davidson, 2019) provides helpful background information on the sizeable and growing share of the American population with disabilities, and the impacts on people’s ability to drive due to physical, communicative and multiple disabilities stemming from injury and aging. The document also discusses the growing

pent up demand for transportation services among people with disabilities and an anticipated increase of interest in, demands and markets for, fully automated vehicles.

Based on the ITS and NASEM discussions, Bayless and Davidson (2019) trace some of the potential benefits of automated vehicles for people with disabilities. The authors point to the need for standards, vehicle architectures, and practices to address accessibility for specific groups of people with disabilities, and also point to problems associated with removing drivers from vehicles. The authors remind their readers of the presently important role that drivers play for some individuals with disabilities in finding their way to the vehicle, entering it, sitting safely within it, securing their mobility devices, identifying correct stops (e.g., transit stops for transfers), leaving the vehicle, and finding their way from the vehicle to where they are going. Key among the needs that would have to be addressed for the fuller development and use of automated accessible vehicles are:

- Managing emergencies and other contingencies in driverless vehicles;
- Automated vehicles that do not require the user to be responsible for any dynamic driving task, potentially even in emergency fallback scenarios;
- Not requiring the user of an automated vehicle to have a driver's license or be accompanied by someone who holds a driver's license;
- The unambiguous exchange of information between passengers and highly automated vehicles;
- Passenger-vehicle interfaces that account for the needs and limitations of people with communicative and physical disabilities in ways that are accessible and safe for everyone;
- Automated passenger support while the vehicle is in motion as well as during vehicle dispatch, parking and docking, during the management of passengers entering and exiting the vehicle, and in securely seating;
- Infrastructures and aids to personal and vehicle navigation with attention to the needs of people with mobility and vision impairments associated with door-to-door wayfinding, signage, avoidance of street clutter, and street-side pick-up and drop off;
- Addressing the transition away from personal vehicle ownership towards shared-use/ownership mobility and the applications of the *Americans with Disabilities Act* beyond traditional fixed-route public transit to encompass for-hire, demand-responsive microtransit and other newer forms of mobility;
- Fostering collaboration between ecosystem leaders in transportation, healthcare, and consumer electronics to produce accessible designs for automated vehicle systems. Mobile interfaces and associated vehicle controls need to be developed, standardized, and deployed. So do mobility aids (e.g., wheelchair ramps, lifts, stowage and fastening) and assistive technologies. The latter include refreshable Braille and auditory notification of car location and trip progress, visual cues, large print and other accessible graphic and haptic (touch based) displays, hearing aids integrated with mobile

interfaces, and oral alerts/notifications on the need for vehicle maintenance or refueling (See also Claypool, Bin-Nun & Gerlach, 2017);

- The direct design and manufacturing of fully accessible vehicles to avoid the present need for complicated and expensive vehicle retrofitting for accessibility;
- Research, standards development, and universal design strategies for advancing fully accessible and fully autonomous vehicles;
- Development of vehicles that are intuitive, simple, user-friendly and able to self-adjust to the user's needs; and
- Ongoing engagement of disability advocacy and research groups in integrating accessibility considerations into vehicle design and evaluation (see also Claypool, Bin-Nun & Gerlach, 2017).

Having described areas of notable promise and progress in the evolution of fully automated accessible vehicles, Bayless and Davidson (2019) also point out that no vehicle manufacturer has yet embarked on a complete, ground-up design to support accessibility that combines universal design with enabling interfaces to address specific user needs. The sole exception is Local Motors Low Speed Olli. This vehicle is highly accessible, but meets neither crashworthiness nor other safety standards, and is restricted for use in low-density built environments such as campuses and gated communities. Consequently, as with the accessibility of many retrofitted present-day vehicles, there is a risk that the accessible automated vehicles now in development may constitute only a costly niche market. Ideally, the vehicles would be designed, built, and marketed to benefit from bigger economies of scale, such as those associated with the large-scale development and production of fully accessible, fleet-based, shared mobility.

Ricci (2019) has also assembled a helpful document on some of the implications of connected and automated vehicles. The document contains a scholarly journal article and several other resources that were used in the Sixth EU–US Transportation Research Symposium for which Ricci was the Rapporteur. People with disabilities are significantly mentioned throughout the document. A key issue among many covered in the document is routing policies adopted by service providers. Such private sector policies may have a preferential bias towards higher vs lower income users of transportation which may directly affect accessibility for specific groups, including people who live in poor neighborhoods and persons with disabilities.

Of some interest in relation to shared mobility, Uber started up its Advanced Technologies Group in Pittsburgh and Toronto. These R & D facilities are working on applications of artificial intelligence in trucking and passenger car technology, including driverless cars. As part of that work, Uber has explored accessible driverless car options for people with mobility and visual impairments (The Standing Senate Committee on Transport and Communications, 2017).

## XII. Challenges and opportunities unique to Canada

Several key considerations are needed for building on the strengths addressing limitations of shared mobility for people with disabilities in Canada. For instance, the regulatory system involves thirteen provincial/territorial governments and thousands of local governments. The federal government has not played a major role in this unevenly implemented approach to regulation. In addition are Canada's vast geographical expanses, widely varying types of communities, and population diversity. Many people live in rural communities. Often in such communities, and even in many smaller urban ones, there is no public transit or inter-community bus service, or the communities are underserved by these services, and ridesourcing is only beginning to emerge. Microtransit and carsharing are often fledgling enterprises, where present at all. Disability issues often have limited priority in transportation planning and policy development. People with disabilities and older adults are among the most transportation-disadvantaged in small communities and even in larger ones.

### A. Complex regulatory environment for taxis and ridesourcing

The federal, provincial, and municipal levels of government all have a share in the transportation of passengers in Canada. The federal government has constitutional authority for overseeing international and inter-provincial transportation of passengers by air, rail, interprovincial bus and maritime carriers. In mid-1980's to the 1990's, the Government of Canada minimized its regulatory oversight of the transportation system. Key ports were devolved, and railways and air carriers were privatized. Many responsibilities fall now to federally incorporated, autonomous Crown corporations responsible for air and rail terminals and marine ports. These corporations operate at arm's length from the federal government, even though the federal government is their sole shareholder. Through various cost-shared funding programs, the federal government has provided funding for the national highway system and some local roads. The federal government directly owns and operates all land border crossings and most international bridges or delegates their operation to Crown corporations and other operating authorities. All vehicles made for sale in Canada and all vehicles imported into Canada must meet the Canada Motor Vehicle Safety Standards. Provincial and territorial governments are generally responsible for maintaining highways and regulating within-province transportation. Municipal governments in many parts of the country are responsible for maintaining local roads and regulating local transportation services. Private sector firms play a crucially important role in operating various transportation services within this system (Transport Canada, 2020a, 2020b, 2020c, 2020d; Ruppenthal & Galer (2015); *Canada Transportation Act* (S.C. 1996, c. 10); *Accessible Canada Act* (S.C. 2019, c. 10); *Motor Vehicle Transport Act* (R.S.C., 1985, c. 29 [3rd Supp.]).

The regulatory environment for the transportation of passengers by ground taxis and TNCs is complex in Canada (Olateju et al., 2019). The federal government has authority over truck and

bus carriers that carry goods or passengers across provincial or international boundaries, but has entered into agreements with the provinces and territories to regulate extra-provincial truck and bus carriers on behalf of the federal government (Transport Canada, 2020b). On the tax front, the federal government requires ridesourced drivers to register for, charge and remit the HST/GST on the fares they collect (Uber, 2020c; Canada Revenue Agency, 2017). Aside from these measures, the federal government has not played a major role in regulating ridesourcing or taxis in Canada. It has not played a major role in regulating other forms of shared mobility, either, such as carsharing, microtransit or bikesharing.

It has fallen to the thirteen provinces and territories and over 3,500 municipalities and other local governments to regulate these services. For taxis, the provinces and territories typically regulate vehicle safety and inspections, the licensing and insurance of drivers, and ensuring criminal and driving background checks for drivers. Municipalities typically regulate fares and hours of service, issue operating permits, articulate service standards, and deal with other service operation matters. However, there is considerable variation in how taxis are regulated in Canada and which order of government performs various functions. Given the distribution of regulatory responsibilities, the “system” consists of a multiplicity of regimes. Some jurisdictions apply some of the same regulatory requirements for taxis upon ridesourced drivers, such as vehicle inspections and various classes of drivers’ licenses. However, the application of such provisions has been uneven across Canada and is still a picture that is in the process of developing.

The present system has the advantage of allowing provinces/territories and local governments the flexibility to tailor their regulations so ground transportation, by taxis and other service providers, meets the needs of local residents and visitors. An advantage for TNCs is the uneven application of requirements and rules across jurisdictions, which allows the companies less fettered operation in some regions and communities than in others. A disadvantage for riders with disabilities is the uneven availability and quality of accessible services which can vary widely from one community to the next, even in the same province or territory. A general disadvantage is the difficulties that citizens, businesses, governments, and researchers experience in trying to efficiently learn about which jurisdictions are doing what in terms of their regulations.

Providing a detailed breakdown of provincial/territorial-municipal responsibilities for taxis and ridesourced transportation in each province and territory was beyond the scope of this project. Monteiro and Civettini (2007) provide a helpful but patchy overview of these measures for taxis, which is now quite dated. We were not able to find more up-to-date information consolidated into a single document even for taxis across all provinces and territories, let alone for ridesourcing. We address that issue in one of our Recommendations.

Regardless of which province/territory or order of government regulates taxi and ridesourced drivers, the drivers must abide by the rules of the regulatory regimes where they operate. The Competition Bureau Canada (2015) has observed that the regulations, although well-intended,

have contributed to restricting the supply of traditional taxi services through the municipal rationing of taxi operating licenses and plates, for example. This in turn has meant that the availability of taxi services has not kept pace with consumer demand. As consumers have had relatively few service providers from which to choose, prices have increased and the quality of service has declined. Irrespective of disability, consumers often experience long wait times and difficulties getting transportation in times of high demand such as weekends, evenings, and in bad weather. Cars may be unkempt and the service from drivers, unpleasant. It is in that context that TNCs have emerged as a competitive challenge to the taxi industry.

The Bureau urges the relaxation of some existing regulations so traditional taxi operators have the scope and incentives to be more responsive to consumer demand and so consumers will have more choices. The Bureau also recommends that further policy objectives, such as public safety regulations, should be increased for TNCs. However, the Bureau calls for regulations that are no more intrusive than necessary for consumers to enjoy the benefits of competition. Specific recommendations of the Competition Bureau are for regulators to: allow TNCs to operate; create a single “vehicle-for-hire” definition and regulatory regime for taxis and ridesourcing; adopt an “open entry” system, instead of the presently restrictive taxi licensing system, to allow any qualified applicant to operate a vehicle-for-hire; allow ridesourced drivers to receive street hails and use taxi stands; reduce the base fares of taxis; consider imposing a cap on TNCs’ “surge pricing” in times of distress; and apply safety and consumer protection rules to TNCs that are similar to those that apply to taxis. These rules include minimum insurance requirements, criminal and driving background checks on drivers, basic driver training requirements, and vehicle inspections (Competition Bureau Canada, 2015).

The Bureau acknowledges that further measures may be required to ensure enough accessible transportation for the people who need it. Applying the same regulatory measures on ridesourced drivers as on taxis, regulators would: ensure that there are sufficient accessible transportation options for residents and visitors; require that a certain percentage of fleets be able to provide accessible services; issue a separate category of plates that are available only for accessible vehicles; recognize that drivers who operate accessible vehicles typically incur higher equipment costs and spend more time with each passenger by reducing the number of overall fares the drivers need to receive (a corollary is that the drivers would be paid more per accessible trip); and offer financial incentives to drivers of accessible vehicles by subsidizing the costs of purchasing the vehicles (Competition Bureau Canada, 2015).

## B. Transportation issues in rural and remote communities

### a) *Many Canadians live in rural areas*

While the share of the Canadian population living in rural areas has continued to decline significantly since confederation, nearly one in five Canadians, or about 6.6 million people,

continue to live in these areas of the country (Statistics Canada, 2018; Statistics Canada, 2019c; Trading Economics, 2020). Statistics Canada defines a rural area as any area outside of a population centre. A population centre has a population of at least 1,000 and a population density of 400 persons or more per square kilometre (Statistics Canada, 2019b).

*b) Northern, Prairie and Atlantic regions are most likely to be rural*

The share of the population living in rural communities is highest in the Atlantic provinces, the northern territories, Saskatchewan and Manitoba. Depending on the sub-region in these provinces and territories, the rates living in rural communities vary from about a third to half the population (Statistics Canada, 2018). Even in more populated provinces, however, there are vast regions where the population density is low and where large numbers of people live in rural communities. This includes about 1.8 million in Ontario, 1.6 million in Quebec, and well over 600,000 in both British Columbia and Alberta (Statistics Canada, 2019a; Statistics Canada, 2015).

*c) Limited public transit in rural communities*

Public transit options are limited in rural Canada, with a total of about 50 busses and 100 paratransit vehicles serving all rural communities combined (Statistics Canada, 2020). Some rural areas either have no public transit, or information is unavailable about the few resources that do exist, such as in the three northern territories and rural communities in Prince Edward Island and Newfoundland and Labrador. Some other areas, such as rural communities in Nova Scotia and New Brunswick, are served by only a few busses and no reported paratransit.

*d) Limited inter-community transportation options*

The Standing Senate Committee on Transport and Communications launched a research project in 2002 to address the issues of declining inter-city bus ridership, disappearing inter-city bus services, a disjointed regulatory regime for those services, and a possible federal role in leading the deregulation of the services (Standing Senate Committee on Transport and Communications, 2002). The quality of intercity bus service to people with disabilities was among the issues tabled. A 2011 paper by Transport Canada reported ongoing difficulties with the supply of intercity buses in Canada (Transport Canada, 2011). Companies that were reported as running into difficulties were Greyhound and Acadian bus services. The latter served New Brunswick and Prince Edward Island. Acadian was taken over by Orleans Express but shut down operations in 2012 (CBC News, 2012). Greyhound began closing down its unprofitable routes in the US and Canada beginning in the 1990s (Cox, 2014) and sought permission to shut down its operations in Western Canada in 2018 (Dimoff, 2018). Greyhound subsequently shut down the remainder of its Canadian operations in major Ontario and Quebec corridors in May 2020. Greyhound cited falling ridership due to COVID-19 as the main reason

for the Ontario and Quebec closures (Dickson, 2020). Local and regional bus services continue to service some routes abandoned by major carriers, independently and through partnership agreements with those carriers.

*e) Difficulties with transportation in Indigenous communities*

A recent statistical report by the First Nations Information Governance Centre (2018) describes several sociodemographic and health-related difficulties experienced by people who were surveyed from First Nations reserves and northern communities. Many of the people surveyed live in rural areas (45.5%) or in remote or special access communities (15.6%). Rural communities are defined in that report as from 50 km to 350 km from the nearest service centre that has year-round road access. Remote communities are defined as more than 350 km from the nearest service centre that has year-round road access. Special access communities are defined as having no year-round road access to a service centre. The high cost and other challenges related to transportation contribute significantly to the difficulties people in First Nations communities experience in obtaining the food they need and in maintaining mental health. Transportation difficulties also prevent many adults and children in these communities from receiving the health care they require, including treatment for diabetes.

*f) Older adults and people with disabilities most adversely affected in rural communities*

For older adults living in rural communities, transportation is among the essential conditions for maintaining social participation and successfully aging in place (Carver, Beamish, Phillips, & Villeneuve, 2018). However, older adults, people with disabilities, and people living on low incomes, along with women and youth, are particularly disadvantaged when it comes to transportation in rural communities (Marr, 2015). As the likelihood, types, and severity of disability increase with age (Cloutier, Grondin, & Lévesque, 2018; Morris, Fawcett, Brisebois, & Hughes, 2018; Arim, 2017) and as people with disabilities are more likely than others to have low incomes (Cloutier et al., 2018; Morris et al., 2018), it makes sense to infer that many people with disabilities experience multiple disadvantages in transportation. Even if they could gain access to and use public transit in rural communities, people with more severe levels of disability would on average experience more difficulties than others with those services (Arim, 2017). Ensuring provision of accessible transportation in rural communities for people with disabilities and older adults has been a longstanding and often costly challenge (Litman, 2003; Clark & Leipert, 2012; Marr, 2015).

*g) High dependence on personal vehicles and the non-availability and unreliability of personal networks in rural communities*

Small-sample research indicates that aging drivers in some rural Canadian communities are often highly dependent on their personal vehicles. For example, research based on a convenience sample of older drivers in New Brunswick (N=60) found that most respondents would rely on friends and family for about half of the trips they undertake as the driver, and would simply not take trips about a third of the time if they did not have access to a vehicle and would walk or use a bike the rest of the time. The most difficult trips for participants to find alternate arrangements for were for non-discretionary trips such as medical appointments, shopping and personal errands. Survey respondents did not select transit as a viable alternative for any trip, probably because public transit options were few and far between. The researchers recommended that consideration be given to community-supported, member-based rural shuttle services, with volunteer and paid drivers, that build on informal social networks and which can provide service when friends and family are unavailable (Hanson & Hildebrand, 2011).

However, the availability of family and friends to provide informal assistance for transportation is not a given. In their research into the transportation issues experienced by older rural dwellers in Appalachian Kentucky, Choi, Schuster and Schoenberg (2019) found a multitude of challenges. These include not only the onset of age-related impairments which reduce driving capacity as people get older, but also non-existent public transportation for many communities, long wait times for the few transportation services that are available, scheduling problems, high costs, long distances, and difficult road conditions between isolated communities. These difficulties are all aggravated by the disintegration of personal networks and the increase of social isolation which has resulted from the out-migration of younger family members to urban communities in search of better educational and economic opportunities. The diminished sense of personal responsibility for the well-being of older family members is another aggravating factor. Those researchers suggest that, among potential solutions, policy makers should consider increasing the priority given to rural ridesharing by increasing the provision of transportation services through partnerships between government, the non-profit and private sectors. The researchers also recommend that policy makers should consider and leveraging information and communication-based transportation management systems to help maximize the use of the scarce transportation resources that do exist in rural communities.

*h) Extent of reliance on personal vehicles across high- and low-population regions of Canada*

Considering the significant share of the Canadian population that lives in rural and remote communities in Canada, we wanted to ascertain whether people in rural communities are more (or less) dependent on their personal vehicles for travel. An answer to that question would help

gauge the extent of need for, and potential attractiveness of, alternatives to personal vehicles in rural vs urban communities. Such alternatives could include ridesourcing, carsharing, ridesharing and microtransit.

We reviewed the contents of several surveys in Canada: the Frontier Counts (FC) from the Canada Border Services Agency; the Census; the National Travel Survey (NTS); the Quarterly Motor Carrier Freight Survey (MCFS); and the Canadian Vehicle Survey (CVS). We found that these surveys lack up-to-date information about personal vehicle use. Other researchers have also found that publicly available information on personal vehicle use in Canada is incomplete, particularly for rural communities (Hansen & Hildebrand, 2011; Marr 2015).

Although discontinued in 2009 and lacking indicators for disability and rural vs urban communities, we considered that the CVS was a potentially useful source of information. It supports limited analysis of different patterns of vehicle use and passenger travel across larger and smaller communities. Using Tables 3-1 and 4-1 of the most recent publication available for the CVS (Statistics Canada, 2010), we calculated per-person estimates of kilometers driven for vehicles weighing up to 4.5 tons in each province and territory in 2009. Most of these vehicles were cars (55%), vans (13%) and SUVs (13%). We also calculated the average number of passenger-kilometers travelled that year by drivers and other passengers, by province. Our Table 2 (below) shows the results. Chart 1 presents a rank ordering of those numbers based on vehicle-kilometers travelled, from highest to lowest.

The chart shows that similar distances were driven in all regions except the northern territories and British Columbia, where the average distances were notably lower than elsewhere, and in Nova Scotia, where the average distance driven was considerably higher.

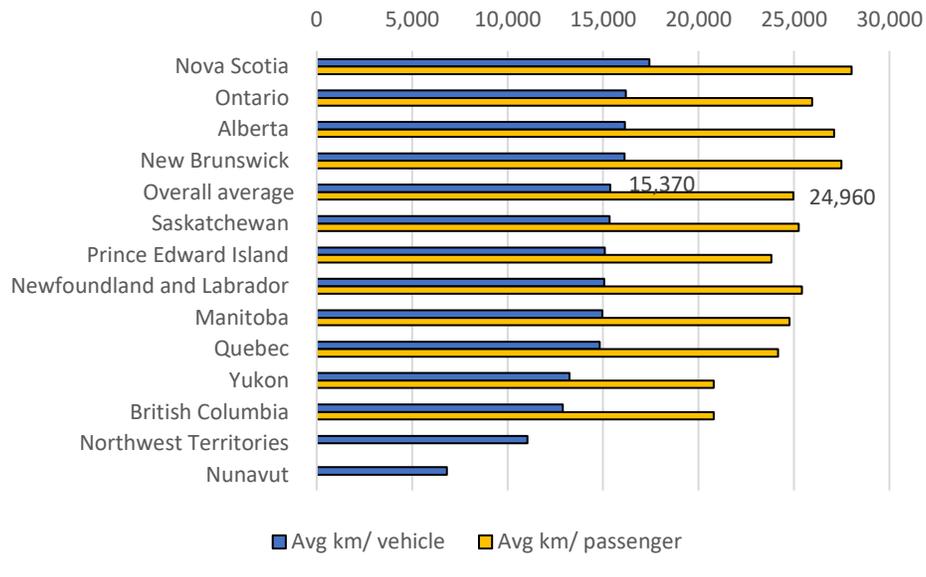
**Table 2. Average kilometers driven per motor vehicle and travelled per passenger in Canada, 2009**

	Est. kilometers (millions) driven in vehicles up to 4.5 tons	Est. passenger kilometers (millions) travelled in vehicles up to 4.5 tons	Est. number of "in scope" vehicles up to 4.5 tons	Avg kilometers driven per vehicle	Avg passenger kilometers travelled per vehicle
Overall average	303576.1	493050.7	19,755,945	15,370	24,960
Newfoundland and Labrador	4367.6	7370.9	290,098	15,060	25,410
Prince Edward Island	1229.9	1941.5	81,499	15,090	23,820
Nova Scotia	9370.2	15066.9	537,694	17,430	28,020
New Brunswick	7765.2	13242.6	481,760	16,120	27,490
Quebec	68133.1	111014.8	4,593,169	14,830	24,170
Ontario	116076.7	186001.3	7,166,834	16,200	25,950
Manitoba	10027.3	16592.4	670,133	14,960	24,760
Saskatchewan	11007.3	18118.1	717,639	15,340	25,250
Alberta	41672.1	69956.6	2,581,262	16,140	27,100
British Columbia	33310.1	53745.5	2,583,861	12,890	20,800
Yukon	353.8		26,713	13,240	
Northwest Territories	236.6		21,424	11,040	
Nunavut	26.3		3,858	6,820	

Source: Statistics Canada. (2010). *Canadian Vehicle Survey: Annual – 2009*

### Chart 1. Average kilometers driven per motor vehicle and travelled per passenger in Canada, 2009

Source: Statistics Canada. (2010). Canadian Vehicle Survey: Annual – 2009



The findings cannot be explained by a single factor such as population density, which is a major component of the rural-urban distinction (Statistics Canada, 2007). For instance, the average distances driven were low in the northern territories which consist of only a few, fairly small population centres and many low-population rural communities. However, the average distance driven was also low in British Columbia, which has several large urban centres and a relatively high provincial population. Nova Scotia accounted for the highest average distance driven. Yet, Nova Scotia is a relatively small province population-wise, has only a few major urban centres and many rural communities.

Perhaps the lack of roads, impassible routes and poor winter weather conditions result in greater use of non-motor vehicle travel in some regions, such the northern territories. But other factors, such as a provincial culture and transportation systems that assign high priority to walking, bicycling and other non-motorized modes of travel, might better account for the low average distance driven in BC. The age of vehicle owners may also help account for some of the differences. For instance, the population in Nova Scotia, as in the rest of Atlantic Canada, is older on average than elsewhere in Canada. Nova Scotia is a province with comparatively high use of personal vehicles. People in Northern Canada, particularly the Northwest Territories and Nunavut, are considerably younger on average than elsewhere in Canada (Statistics Canada, 2017b, 2019a). Personal vehicle use in the north is comparatively lower than elsewhere. Vehicle ownership tends to be highest among people 45 years and older (Statistics Canada, 2010: Table

6-1).<sup>2</sup> The extent of vehicle ownership by age group helps explain the comparatively high personal vehicle use in Nova Scotia and the lower use in the north.

### **Difficulties with shared mobility in rural communities**

The potential of shared use mobility to address transportation challenges in rural communities is only beginning to be tapped. Presently, several difficulties need to be addressed because shared mobility business models were originally devised for travelers in urban communities. For instance, aside from carsharing not being widely accessible to people who use wheelchairs, carsharing has not been widely adopted in rural communities (Godavarthy, Hough, Libberton, & Koff, 2019). Hindrances to widescale adoption have been the comparatively low demand and longer driving distances in rural communities (Illgen & Höck, 2020). Although microtransit has proven popular in some major US cities, it has yet to be widely implemented in medium-sized cities or smaller communities and its applicability and usefulness in rural areas is largely unknown (Godavarthy, Hough, Libberton, & Koff, 2019).

In terms of ridesharing, its drivers are widely acknowledged as low-paid workers with poor, if any, employment benefits (e.g., Malos, Lester, & Virick, 2018; Mishel, 2018). Yet the business model of ridesourcing companies presumes that the driver will be able to earn enough from their fares to make it worth their while to provide the service. Return trips are one means for drivers to secure enough fare revenue. Accordingly, ridesourcing services have operated sustainably where trip distances are short, where many trips are taken within a small geographic area, and there are good chances for the driver to earn return fares. That is, the model works best in urban communities. In small rural communities, ridesourcing trips may be too short for the driver to secure enough revenue per trip. Conversely, the trips may be very long, which can be expensive for riders and which works against the likelihood of return fares for drivers. Researchers have estimated that fare revenues for ridesourced drivers in some rural communities are significantly negative. That is, ridesourced trips in rural communities cost the drivers over \$12 per trip on average (Rodier & Podolsky, 2017).

In response, Rodier & Podolsky (2017) have proposed higher ridesourcing fare structures for rural communities. But even such a fare structure would leave drivers with a median hourly pay of up to \$6.20 per trip, without taking people with disabilities into account. It has been surmised that, if public transit were replaced entirely by ridesourcing in rural communities, the number of trips would increase and the cost-per-trip for riders would decrease (Rodier & Podolsky, 2017). To date, however, not many rural communities with public transit have been willing to gamble on testing this approach. Some TNCs have been able to provide on-demand flexible trips through partnerships with public transportation agencies. However, it has been problematic for these companies to provide people with and without disabilities similar service

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<sup>2</sup> However, the age of drivers does not seem to be the main factor that accounts for differences in the driving patterns. For instance, while PEI's population is older on average than in many other parts of the country, the average kilometers driven in that province are below the national average.

and equivalent response times when wheelchair-accessible vehicles are factored into the picture. Accordingly, the partnerships have mostly engaged a third-party wheelchair-accessible provider along with the TNC partner. Owing to low demand, it may also be more difficult to use ride-splitting in rural than urban communities (Godavarthy, Hough, Libberton, & Koff, 2019).

Even if viable, ride-splitting would not in itself address the underlying challenge of making wheelchair accessible vehicles and disability confident drivers available to the relatively low number of people likely to need them in communities with low populations. For instance, we performed an analysis of a large Statistics Canada survey on disability and found that about 1% of the general population in rural communities use a wheelchair (manual or motorized) or scooter for mobility. About a quarter of these people used a taxi to get around their community in the reference year. Data were not captured on the frequency of use. If we were to assume all these taxi users would need an accessible taxi, then in a mid-sized urban community of 30,000 people, only about 75 people per year would need an accessible taxi because of disability. In light of the low potential ridership, the high cost of starting up an accessible transportation service in a small community presents a financially daunting challenge. A wheelchair accessible vehicle can cost anywhere from USD \$55,000 to \$100,000 to purchase (Rains, 2020). The conversion of a regular van to an accessible one, excluding the van's purchase price, can cost from \$15,000 to \$40,000 (MoveMobility, 2020). Such figures do not include maintenance, operating costs, or payment of a driver. A great many Canadian communities have populations of less than 10,000 people (Pruderer, 2009). The scenario based on a community of 30,000 people described above would be more financially workable than scenarios for communities where the population counts are very low.

Chan, Sadoway, Tzentary and Gulecogu (2017) have recommended that, to meet demand and increase efficiency in rural and smaller urban areas, shared mobility options should be integrated with specialized and conventional fixed route transit. The approach could extend to include non-emergency medical transportation and similar services that link isolated groups to activity centres. However, this recommendation presumes the availability of conventional and specialized transit which are not available in many communities.

### C. Limited priority of disability issues in regional transportation planning and policy development

People with disabilities and older adults continue to receive little attention in some regional transportation planning documents on shared mobility, even in regions with sizeable populations. For instance, the Region of Waterloo consists of nearly 618,000 people. The Region comprises the cities of Cambridge, Kitchener, and Waterloo, and the townships of North Dumfries, Wellesley, Wilmot, and Woolwich (Region of Waterloo, 2020). The Region recently issued "Moving Forward – Preparing for New Mobility in Waterloo Region" (Region of

Waterloo, 2019a). This is a supporting document for the Region's 2018 Transportation Master Plan (IBI Group, 2020b). The supporting document is based on an assessment of the transportation network (IBI Group, 2018) and is reflected in a transportation demand management planning document (Noxon Associates, 2018). A significant focus of the Transportation Master Plan is "new mobility." The supporting document explores new mobility in more detail than the Master Plan and defines new mobility as those including auxiliary taxis (i.e., ridesourcing companies or TNCs), carshare and bikeshare, microtransit, connected vehicles, autonomous vehicles and connected and autonomous vehicles. Our detailed examination of these documents found very few mentions of people with disabilities, older adults, seniors or issues of accessibility for these groups. We used a variety of search terms in our analysis.

This is not to say that the Waterloo Region is ignoring people with disabilities or older adults. The Transportation Master Plan recounts how all buses in the Region are now "low floor" for wheelchair accessibility (p. 3-3). Elsewhere in that document there is mention of the intention to explore the "curbside needs" of "the accessibility community" and to review "the availability of pick-up / drop-off and accessible parking locations for the disabled with the Region's Grand River Accessibility Advisory Committee" (p. 5-12). Concerning older adults/seniors, the document presents the opportunity "for the Region to encourage sustainable transportation patterns by providing ... accessible and demand-responsive transit options" (p. 3-13). Otherwise, however, the travel-related needs and issues of people with disabilities are not explicitly mentioned in the Master Plan and receive passing mention in other documents. Interestingly, however, the transportation needs of people with disabilities and the Region's obligations under the *Accessibility for Ontarians with Disabilities Act* were flagged in a 2017 background report for the Region (IBI Group, 2017).

The purpose of providing these details is not to criticize the Region of Waterloo. However, the Region consists of three good-sized cities, several towns, and their surrounding rural communities. The Region's population approaches that of the Hamilton metro area and is similar to the populations of London and Windsor and their surrounding areas taken together. The somewhat vague attention paid to people with disabilities by the Region in its planning for newer forms of transportation reflects a longstanding problem: important issues for people with disabilities, such as affordable, accessible transportation that will meet their needs, can sometimes fall "between the cracks" in planning and policy development, even when organizations representing people with disabilities have been formally consulted.

## XIII. Recommendations

### A. Ensuring the accessibility of shared mobility services

In this section of the report we provide a summary of issues as context for our recommendations, considerations for policy makers for furthering accessible shared mobility services, and the overall regulatory approach and other matters policy makers may want to consider. We also provide recommendations for future research on accessible shared mobility. We have tagged our recommendations according to whether they can be framed as short-, medium-, or longer-term goals.

#### 1. Summary of issues

Interview participants provided several benefits of shared mobility for people with disabilities and older adults, which are echoed in the literature.

- Key benefits of *ridesourcing* are that it provides greater flexibility, convenience, and predictability than paratransit and is usually quicker than paratransit or regular transit. Ridesourcing usually costs less than taxis and has potential for greater personalization of service than regular transit, paratransit, or taxis.
- For brief personal use of a vehicle, people who do not require an accessible vehicle may find *carsharing* a more convenient option than regular car rental. Carsharing is economically efficient in that the consumer pays only for their actual use of a vehicle. People who opt entirely for carsharing vs personal vehicle ownership avoid the ongoing costs associated with owning a vehicle, which may be parked and unused most of the time.
- Owing to the relative newness of *microtransit*, we were not able to find much research on its benefits for people with disabilities. The people we interviewed also had limited experience with this form of shared mobility. However, microtransit holds promise of enabling people with and without disabilities to travel within and between communities that are not served or underserved by public transit and inter-community buses. This is only possible if microtransit is appropriately regulated for accessibility.
- Drawbacks of shared mobility have received attention in the literature and have also been experienced by people we interviewed for this project:
  - *Ridesourcing*. Ridesourcing is unavailable in many communities across Canada. Where available, ridesourcing frequently lacks the accessible vehicles that many people need. Where accessible vehicles are available, there may be a significant

delay for the rider to be picked up. Drivers frequently seem to have little if any training on how to effectively serve people with various disabilities.

Moreover, the software for booking and paying for rides may not be accessible to people with visual impairments or manual dexterity difficulties. The software may not be useable by people who cannot afford cell phones or do not have credit cards. Riders with some disabilities (e.g., hearing, speech) may have difficulties communicating with their drivers, especially in times such as in the COVID-19 pandemic, where drivers and riders are obligated to wear face masks.

We also found that there are challenges with complaint mechanisms for ridesourcing. Riders who want to lodge a complaint about service may experience difficulty locating and speaking directly with a company representative. If they manage to lodge a complaint, the company may not inform the rider about the status of their complaint or how the company is handling it. Thus, there are challenges with accountability to riders with complaints.

- *Carsharing*. The lack of wheelchair accessible *carshare* vehicles is the key problem that simply deters people with mobility impairments from using this shared mobility option. Where available, accessible carshare vehicles may not be available on demand but instead may require a day or more advance notice. When vehicles are available, they may be littered, contaminated by allergens such as fragrances and tobacco smoke, or parked in locations that are inconvenient, inaccessible, seem unsafe, or which are not accurately indicated on the companies' digital platforms.
- *Microtransit*. Previous literature has little to say about the drawbacks of microtransit for people with disabilities. We conjecture that this is because accessible microtransit vehicles and well-trained drivers are few and far between, which discourages people with mobility impairments from using the service where it is available. People with less noticeable forms of disability, such as in the areas of learning or mental health, may be using microtransit, but do not show up as such in the literature. Interviewees had little to say about the drawbacks of this form of shared mobility, although several of the respondents have disabilities that are not mobility-related.

The regulatory system for furthering accessible shared mobility is complex. The system involves thirteen provincial/territorial governments and thousands of local governments. Canada's geographical expanses, widely varying types of communities, and population diversity within jurisdictions, are considerable. Many people live in rural communities. Often in such

communities, and even in many smaller urban ones, there is no public transit or inter-community bus service, or the communities are underserved by these services. Ridesourcing is only beginning to emerge in such communities. Microtransit and carsharing are often fledgling enterprises, where present at all. Disability issues often have limited priority in transportation planning and policy development. People with disabilities and older adults are among the most transportation-disadvantaged in such communities.

## 2. Considerations for policy makers

The following section provides several inter-related recommendations for the consideration of policy makers to ensure accessible shared mobility services. These recommendations have been developed against the backdrop of the benefits and drawbacks of shared mobility, Canada's vast and varied geography, many small communities, complex regulatory systems, diverse populations, disadvantages experienced by people with disabilities and older adults in transportation and policy development, and the possibility of automated vehicle development that does not squarely face and deal with issues of accessibility. Key recommendations are for policy makers to:

- a) Develop a vision of a well-integrated and accessible transportation system that is equitably available to all (short-term goal);
- b) Ensure an adequate supply of wheelchair accessible vehicles is available for people who need them (medium- to longer-term goal); and
- c) Ensure ridesourced and microtransit drivers receive proper training on how to effectively serve people with disabilities (short-term goal).

Related considerations for policy makers are the needs to:

- d) Engage in ongoing, substantive, community-specific consultations with people with disabilities at all levels in planning, program development, and evaluation concerning the services they need and the transportation difficulties that need to be addressed. (This recommendation can begin as a short-term goal to inform the vision, and will require implementation over the long-term);
- e) Introduce measures to enable people with disabilities and older adults on low incomes to afford travel by shared mobility services;
- f) Ensure rider safety and good quality shared mobility services through various consumer protection measures (which can be started as a short-term goal that will likely require

attention through the medium-term for long-term roll out); and

- g) Ensure basic standards are met (which involves several short-term through longer-term goals).

- a) *Developing a vision of a well-integrated and accessible transportation system that is equitably available to all*

- Our interviews and the literature indicate the need for governments to adopt a well-integrated vision for transportation services. This vision should reflect how public and private transportation services function together for all travelers irrespective of disability, gender, age, racialization, indigeneity, or other differences. As stated by one of the interview respondents for this project:

*“Public transportation should be the core of the mobility mix. Other modes can fill in other aspects. TNCs [transportation network companies] are not competition but fit... Embrace the promise of using new technology, partnerships, and business models through PPPs [public-private partnerships]. Develop working agreements and shape them with principles of equity and accessibility. Look at it all as an ecosystem.... a good combination of public transportation, ride hailing -- seamless mobility -- in a safe, green way, not leaving people behind.”*

- Consistent with the National Transportation Policy as stated in the *Canada Transportation Act*, the federal government should take steps within its jurisdiction to ensure people with disabilities have reasonably comparable (equitable) access to accessible transportation, regardless of where they happen to live in Canada. Provincial/territorial government could use their influence to ensure ridesourcing and other shared mobility service providers provide services that are in the public interest.
- Where local transportation is regulated by provinces/territories, they should devolve the powers that local governments and agencies would need to develop and implement their own accessible transportation strategies.
- In communities with few or no public transportation services, local governments have an important role to play in ensuring transportation providers serve the public interest (e.g., TNCs, taxi companies, carshare companies, microtransit companies, transportation

co-ops, and non-governmental organizations that provide, or are prepared to provide, transportation services).

*b) Ensure an adequate supply of wheelchair accessible vehicles is available for people who need them*

The limited capacity of service providers to make accessible transportation services available, or the perception of limited capacity, is a key issue in many communities.

- Provincial/territorial and local governments should consider adopting regulatory support for a coordinated service model, that would enable people who need a wheelchair accessible vehicle to obtain it on demand, along with a qualified driver, from any “pooled” local provider that has such vehicles and drivers available. The pool would include taxi and ridesourcing companies, paratransit providers, and NGOs that provide transportation services, e.g., in smaller communities.
- Regardless of whether accessible vehicles are provided by taxi companies, ridesourcing companies or other providers, provincial/territorial governments in collaboration with local governments should ensure a threshold number of accessible vehicles are operating in the community that are sufficient to meet the demand for service.
- Provincial/territorial governments should work with local governments, and perhaps with the federal government, to put in place accessible transportation services within, between and around rural and smaller urban communities that lack such services.
  - For accessible transportation services needed between unserved and underserved rural and smaller urban communities, governments should focus on communities where there is significant need and demand that do not fall clearly within the mandate of any particular local government to address, and which would likely exceed the financial capacity of any one local government to address.
- Provincial/territorial governments should explore, with local governments, shared mobility service providers in the private and voluntary sectors (e.g., ridesourcing, carsharing, microtransit) and, at the federal government level, the financial and other supports transport organizations would need so they can *increase* the supply of wheelchair accessible vehicles.
  - Incentives could include fare “top ups” for augmenting the incomes and vehicle-related expenses of owner-drivers, low/no-interest and forgivable loans for purchasing accessible vehicles and retrofitting standard vehicles, and more favourable tax treatment. Tax measures could include, for instance, depreciation

rules that support investments by small entrepreneurs (including ridesourced drivers) in new accessible vehicles and retrofitted vehicles, and in making accessibility alterations to regular vehicles, for their local and inter-community transportation services.

- Governments could consider using and redistributing the levies they impose upon companies and drivers for failure to provide accessible transportation as a revenue source for bolstering the supply of accessible vehicles. This would include using the fund for transportation in rural and outlying communities where the low numbers of drivers may allow for only minimal contributions to the fund. A variety of service providers could be funded from this source. Providers could include ridesourcing companies, individual owner-drivers, cab companies, other non-governmental organizations that provide transportation, and public transit agencies.<sup>3</sup>
- Provincial/territorial governments should explore with local governments and shared mobility service providers the financial and other means of support the organizations would need to gradually *expand* their wheelchair accessible services to unserved and underserved rural and smaller urban communities.
- Governments should ensure that partnerships entered into with TNCs, taxi companies and other providers of accessible local transportation are with service providers that have enough accessible vehicles and drivers on the road to enable people with disabilities to use local transportation within a reasonable period of time, i.e., without having to book rides a day or more in advance.
- Governments should consider entering into partnerships with local service organizations seeking to provide accessible transportation in under-served areas.
  - Governments should also ensure these organizations are provided enough funding to defray the administrative costs of recruiting, training, booking and coordinating drivers and helping drivers to cover the costs of vehicle retrofits, maintenance, insurance and other expenses for accessible vehicles.

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<sup>3</sup> We see no compelling reason why applicants for the funding should be required to be licensed taxi drivers with vehicles that are already accessible. See, for instance, the City of Toronto's bylaw 546-13.2 (City of Toronto, 2020). These rules effectively block TNC drivers from accessing the fund who are seeking to purchase accessible vehicles or retrofit their non-accessible vehicles. That said, governments should ensure that a portion of the funding flows to cab companies that seek to improve their provision of accessible vehicles. While some of the funding could be used to increase the availability of paratransit services, separate attention is needed to improve the quality and responsiveness of those services.

- The National Transportation Policy, as stated in the *Canada Transportation Act*, lays out the federal intention to achieve a transportation system that is “without undue obstacle to the mobility of all persons” and “accessible without barriers to persons with disabilities.”
  - Where provinces/territories or local governments are having difficulties delivering on the aims and spirit of the National Transportation Policy, the federal government could consider using the federal spending power (e.g., through block transfers and cost-sharing) to encourage and support provinces/territories and local governments to devise more accessible local transportation arrangements.
  - With the recent withdrawal of Greyhound from its remaining operations in Ontario and Quebec, and with the absence of accessible alternatives, and given the fledgling status of local microtransit services, the exercise of a federal role in passenger ground transportation seems most needed within underserved rural and smaller urban communities, and between those communities.

*c) Ensure ridesourced and microtransit drivers receive proper training*

We found that there is a lack of consistent training for ridesourced drivers on providing effective service to people with disabilities.

- Provincial/territorial governments should consider imposing a firm, jurisdiction-wide duty for ridesourcing companies to provide training to drivers on defensive driving and effective communication and service for people with disabilities.
  - The duty could require that ridesource drivers take and provide evidence of this training in exchange for licenses to provide service. The duty could also require that ridesourcing companies engage people with disabilities in co-designing and co-delivering the disability-related components of the training.
- Provincial/territorial governments should consider developing a jurisdiction-wide core curriculum for the driver training.
  - As was pointed out by one interview respondent, the training should cover “the basics” for serving people with a variety of disabilities. Such basics would include, for example: how to communicate and interact with a person who is Deaf, blind, Deaf-blind or who has an intellectual disability; how to securely fasten a wheelchair in a vehicle; how to assist someone with a visual or mobility impairment into and out of a vehicle, etc. People with disabilities should be involved in co-designing and co-delivering the training.

- There may be a role for the federal government, with the provinces/territories and an advisory group of people with disabilities, in reviewing the features of disability-related driver training that is provided in a variety of jurisdictions in Canada and elsewhere. The aim would be to identify key content and pedagogical methods that would be useful for the ridesourced drivers of diverse people with disabilities.

*d) Engage in ongoing, substantive, community-specific consultations with people with disabilities at all levels in planning, program development, and evaluation, concerning the services they need and the transportation difficulties that need to be addressed*

A clear recommendation that emerged from the literature and community consultations we conducted for this project was that shared mobility service providers and governments should consult with people with disabilities about their needs and about the transportation and related issues that require attention. Provincial/territorial and local governments should consider that, in exchange for permission to operate, ridesourcing, carsharing and microtransit providers *must* consult people with disabilities about services that would be beneficial to them, problems with services that need to be addressed, and practical solutions.

- The Shared-Use Mobility Center and National Center for Mobility Management (2020) provide greater specificity to this recommendation. They urge that governments and service providers should involve people with disabilities in the planning, design, operations, and evaluation of shared mobility services. Such involvements at multiple stages will help ensure that policies and practices embed considerations for riders with disabilities throughout the design and operation of programs.
  - The Shared-Use Mobility Center and National Center for Mobility Management also recommend that, when developing policies or programs, governments and other stakeholders must consider the unique characteristics of neighborhoods where shared mobility services will operate. Local mobility needs, travel patterns, topography and the incidence of particular types of disability should all be taken into consideration. If such factors are not considered, a policy or program is unlikely to meet its intended goals. Aside from producing valuable information, involving the community in the policy and program development process can also help build necessary community support for transportation initiatives.

- Arguably, such community-level consultations are particularly necessary in rural communities where transportation services tend to be scarce and where there is a strong need for creative, practical solutions.

Health care, transportation and housing are basic requirements for everyone, including people with disabilities. A major problem is that ministries responsible for such areas typically work in ‘silos.’

- Provincial/territorial ministries whose services touch upon transportation should be involved in stakeholder consultations and should be taking a broad view and conducting their planning accordingly.
  - For example, if the ministry responsible for health plans to centralize health care in one community, it should be working with the ministry responsible for transportation to figure out how people with (and without) disabilities will be able to get to and from that community. The ministry responsible for housing should be asking how people can affordably live in, or near, the new health-service area.

*e) Address low incomes for the travel of people with disabilities and older adults*

People with disabilities, especially those who have disability-related expenses, often face difficult tradeoffs between paying for accessible transportation or other basic necessities such as food, shelter, clothing, and non-insured aids/devices and medications. Governments have historically played an important role in income redistribution. Governments could target their actions to help address the low incomes that leave many people with disabilities and older adults without the funds they require to use accessible transportation services.

- Provincial/territorial governments should explore, with local governments, shared mobility service providers, and perhaps with the federal government, how to implement a transfer system that will cover the difference between what low-income riders with disabilities can afford to pay for service and the revenue that service providers (and their drivers) need for providing the service.
  - Such a system should operate ‘in the background’ of whatever financial transaction the individual rider engages in with the shared mobility service provider.
  - This transfer would be exempt from “claw backs” through the tax system and provincial/territorial social assistance programs. The maximum amount of the individual transfer could be determined in consultation with knowledgeable representatives from the disability community.

- A common mechanism for indirect transfers is for transit agencies to directly subsidize TNC trips, and for transit agencies and TNCs to collaboratively market TNC discount codes.
- Another mechanism would be for government to issue a transportation ‘smart card,’ which the rider would use. Government would replenish the card, or authorize trips up to a set financial amount, at various intervals e.g., quarterly. The rider would be free to use the card with a variety of service providers including taxi companies, TNCs, carshare companies, public transit, and voluntary organizations that provide transportation.

*f) Consumer protection*

- Provincial/territorial governments should consider imposing a jurisdiction-wide duty for shared mobility service providers (e.g., ridesourcing, carsharing, microtransit) to establish, and clearly communicate, the availability of an accessible telephone line and online chat function for fielding complaints about services from consumers with disabilities (short-term through medium-term goal).
  - These services should provide a prompt connection with an organization’s representative so the consumer does not have to wait to present their concern.
  - Provincial/territorial governments should also consider requiring service providers to provide people who register complaints with periodic updates on the status of their complaints, steps taken to address the complaints, etc. Provincial/territorial and municipal governments could use this information for their own transportation planning.
- Provincial/territorial governments should impose a jurisdiction-wide duty to require, and to follow up and ensure, that ridesourced drivers have passed a safe driving and criminal record check and that the drivers meet required standards for working with ‘vulnerable’ populations (short-term goal).
- Provincial/territorial governments should consider imposing a jurisdiction-wide duty for ridesourcing companies to require a protective screen between the driver and passenger sections of vehicles. Such a measure would help improve the safety of drivers and riders, including mutual protection from communicable illnesses and viruses in times of pandemic (short-term goal).
  - Ridesourced drivers’ vehicles are not always used exclusively for providing transportation services. They may also be used for the driver’s personal and family transportation. Accordingly, provincial/territorial governments should

work with local governments and ridesourcing companies to devise workable approaches for financing and installing easy-to-remove and re-install protective screens.

*g) Ensure basic standards are met*

Governments have an important role to play in ensuring industries and other regulated entities meet basic standards.

- Provincial/territorial governments should ensure local governments, and the transportation service providers operating in those communities, abide by the requirements of provincial/territorial legislation and regulations that govern motor vehicle safety, insurance, driver licensing, criminal background checks, and service accessibility (long-term goal).
  - Provincial/territorial governments should provide practical, concrete guidelines that support local governments and transportation service providers to meet their legal obligations (medium-term goal).
- For the purposes of people using wheelchair accessible transportation that is publicly funded, definitions of 'disability' may presently be designed so that wheelchair accessible vehicles are sent to people who may need some level of support, but who do not require vehicles that are fully wheelchair accessible (short-term goal).
  - Provincial/territorial governments should consider implementing a working definition of 'disability' that indicates, but is not circumscribed by, the person's need for wheelchair accessible transportation. This is important in determining the need for wheelchair accessible vehicles given the demand, cost and limited supply of such vehicles in many communities.
  - The definition would allow a person to qualify fully as a person with a disability for a range of services, without also needing to qualify as someone who requires a wheelchair accessible vehicle when they do not actually need such a vehicle for travel. In terms of transportation, the designation would provide individuals ready access to vehicles that are, for example, scent-free or with drivers who use clear face masks to communicate with people who are Deaf or hard of hearing. The designation could also serve as an access tool for services and assistive devices from non-transportation providers such as attendant services, sign language interpreters, personal support workers, service dogs, or various technologies for mobility,

communication and learning, etc.

- The federal government should encourage vehicle manufacturers to follow universal design principles in the design and manufacturing of motor vehicles. An increased supply of accessible vehicles will help meet community needs and demands. Vehicle features that might receive attention include adjustable seat height and back, swivel seats, adjustable steering wheels, suitable adjustable distances from seat to pedals, suitable and perhaps adjustable vehicle floor distance above the road, rear doors that open wide enough for easy entrance and exit, etc. (medium-term goal).
  - A strong federal role is particularly needed in shaping industry standards for ensuring the full accessibility of automated vehicles.

### 3. Overall regulatory approach

In terms of regulatory approach, we agree in principle with Competition Bureau Canada's (2015) recommendations that regulators should enable consumers to reap the benefits of competition through a minimally invasive regulatory approach to ridesourcing. However, we consider that a firm approach is needed for expanding the supply of accessible vehicles and for ensuring the proper training of drivers. Both needs are clearly indicated in the literature and by the people we interviewed for this project. Jurisdictions in North America with notably good practices are dealing with these issues through regulatory measures.

### 4. Other considerations

Further, companies that want the business of riders with disabilities will attend to the accessibility and functionality of booking and payment options. Such companies will ensure their digital platforms are fully compliant with up-to-date W3C guidelines. The companies will introduce payment options for people who are unbanked or without credit cards. The companies will also provide telephone-based booking options where consumers lack cell phones or are unfamiliar with how to use the advanced accessibility features of some cell phones. Companies that fail to make such options available to consumers will probably lose the business of people with disabilities who require these features. However, in the interests of equity and the accessibility of services, regulators may also want to consider including such issues within the scope of regulatory action.

## B. Recommendations for research on accessible shared mobility and related issues

In the interviews we conducted for this project, community stakeholders asked about access to the Final Report or a summary of project findings. Transport Canada should consider how it

might share this knowledge with community stakeholders who took part in this project, and more broadly with transportation policy analysts, disability-related and transportation service providers, disability advocates, academics, and individuals with disabilities.

Subject areas for future research that hinge on the availability of good-quality data are the experiences of people with disabilities, and the perspectives of product and service developers, concerning accessible transport-related smart phone apps that can be used for ridesourcing, carsharing and microtransit. Research attention is needed into all forms of shared mobility in Indigenous, rural, and small urban communities in Canada. Ideally, some of the data to be gathered would allow for multivariate quantitative and qualitative analysis such as by age, gender, age, Indigeneity, type of disability, region, etc.

Our recommendations for future research on accessible shared mobility are that the federal government should play a leading role, in collaboration with provincial/territorial and local governments, people with disabilities and older adults, in order to:

- a) Collect disaggregated data with common units of analysis across geographic regions and publish reports based on that data about accessible and inaccessible shared mobility for people with disabilities and older adults in Canada (medium-term goal based on the vision recommended, above);
- b) Support the production, gathering, organization, and distribution of research, policy, and information about effective practices on accessible shared mobility for diverse stakeholders (can be begun as a short-term goal that will require implementation over the long term);
- c) Fund R & D pilot projects on accessible shared mobility and disseminate the evaluation findings with common units of analysis across the evaluations (long-term goal);
- d) Conduct research on personal vehicle use in Canada (medium-term goal);
- e) Collect and report on broadly gathered information from the perspectives of people with diverse disabilities about the accessibility of local transportation (medium-term goal that will need to begin in the short-term); and
- f) Organize and present information about the regulation of taxis and ridesourcing in Canada (medium-term goal).

*a) Collect disaggregated data with common units of analysis across geographic regions and publish reports based on that data about accessible and inaccessible shared mobility for people with disabilities and older adults in Canada*

- Governments should work together to ensure surveys, with common units of analysis across geographic settings, are conducted into the extent of need for, use of, and unmet need for local wheelchair accessible vehicles and other forms of accessible service for people with disabilities in Canada. Common units of analysis will ensure the consistency

of the overall approach to data gathering and will facilitate comparative analysis across regions.

- Communities in which people would be surveyed could be carefully selected as samples that are representative of a province/territory as a whole.
- Reasonable and up-to-date estimates should be regularly prepared on the threshold number of wheelchair accessible vehicles that are needed to meet demand.
- The communities selected could be changed from one survey year to the next so that a fuller picture of the need for, use of, and unmet need for wheelchair accessible vehicles becomes more accurately detailed over time.
- For data to be gathered directly from the providers of ridesourced services, governments should consider using or adapting metrics already being used for measuring and assessing taxi services.
- We presently have no clear idea about the extent of people with disabilities' dissatisfaction and other problems with shared mobility services.
  - Provincial/territorial and local governments should work with shared mobility service providers to implement a system for monitoring and tracking complaints and for reporting key patterns to government.
  - Governments could consider imposing a jurisdiction-wide duty for shared mobility service providers to report specific information about complaints such as the number of complaints by category of complaint, the kinds of actions the companies have taken to address those complaints, and the number of cases satisfactorily resolved.
- A key challenge for governments is to obtain data from ridesourcing companies.
  - Provincial/territorial and local governments should continue to work with the companies to obtain the trip data that public authorities need for planning transportation services that address public interests.

*b) Support the production, gathering, organization, and distribution of research, policy, and information about effective practices in accessible shared mobility for diverse stakeholders*

A large volume of research, policy-oriented and practical materials are generated annually in the US and elsewhere on different modes of shared mobility. In the US, organizations such as

the Shared-Use Mobility Center, the National Center for Mobility Management, and the Transportation Research Board of the National Academies of Sciences, Engineering, and Medicine receive significant funding from federal and state agencies, as well as from the transportation industry and other sources. Academic research organizations also play significant roles in carrying out research and providing information to the public. Many of these organizations conduct their own research as well as contract out, organize and disseminate research produced by others. Given the vast expanse of geography across Canada, and the country's widely different communities and diverse population, making research and other information easily available about shared mobility is a significant challenge.

- It would be helpful if there were similar organizational capacity in Canada, as there is in the US, to undertake this work.
  - Given the volume of information that will need to be contended with, it will be crucially important to maintain a clear focus on, and draw attention to, the accessibility features of shared mobility services for people with disabilities and older adults.

Compared with the situation in Canada, a substantial volume of high-quality information is regularly generated by some well-organized and well-resourced organizations in the United States. Several publications and online resources stand out as good examples of descriptive reporting, with supporting statistical data and reasonably detailed case studies. These include, for example, Shared-Use Mobility Center's (SUMC) *Shared Use Mobility Toolkit for Cities*, the SUMC's weekly and searchable *Mobility Hub Newsletter*, and Appendix A in Cohen and Shaheen's (2018) *Planning for Shared Mobility*. The latter document provides profiles of cities that reflect a variety of geographic and population details, summary information on shared mobility services that are available in many communities, and noteworthy public policies and local ordinances regulating or supporting shared mobility.

- Canadian versions of such products would be a welcome addition to the research and other resources that would assist in policy and program development.

In the Census, Statistics Canada captures basic demographic information about community-level populations and households, as well as geographic information. Some of this information has been prepared as profiles of communities in Statistics Canada's Census Profiles service (Statistics Canada, 2020d; see also Shared-Use Mobility Center, 2020a).

- Such information could be drawn upon for basic community-level information, which could provide context for other information that would be gathered on shared and other mobility services in selected communities.

- Concerning data about shared mobility services, the federal government can play an important role in collaboration with provincial/territorial governments. The federal government's Service Canada has offices in hundreds of communities across the country.
  - In each community or in selected communities, a staff person at the federal Service Canada office could be annually tasked with capturing basic information and selected details about their community that correspond with the modes of mobility represented by the row labels in the figure below, which is for several American cities. The information collected could be fed into an online data platform managed by Transport Canada, who could in turn produce periodic descriptive summaries of the local transportation arrangements in various communities by province/territory. Figure 4 provides an example drawing from Cohen and Shaheen (2018).
  - Such summaries would ideally include flags or other indications of whether various services are accessible to people who are wheelchair and service animal users, who are blind, vision impaired or who need human assistance for local travel.

	Austin, TX	Columbus, OH	New York City, NY	Philadelphia, PA	Portland, OR	San Francisco, CA	Seattle, WA	Washington, DC
<b>Carsharing</b>	✓	✓	✓	✓	✓	✓	✓	✓
- Roundtrip Carsharing	✓	✓	✓	✓	✓	✓	✓	✓
- One-way Carsharing	✓	✓	✓	✓	✓	✓	x	✓
- Peer-to-Peer Carsharing	✓	✓	✓	✓	✓	✓	✓	✓
<b>Bikesharing</b>	✓	✓	✓	✓	✓	✓	✓	✓
- Public Bikesharing	✓	✓	✓	✓	✓	✓	✓	✓
<b>Scooter Sharing</b>	x	x	x	x	x	x	✓	x
<b>Alternative Transit Services</b>	x	x	✓	✓	x	✓	✓	✓
- Shuttles	x	x	x	✓	x	✓	✓	x
- Microtransit	x	x	✓	x	x	✓	x	✓
<b>Ridesourcing/TNCs</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>e-Hail Services</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Courier Network Services (CNS)</b>	✓	✓	✓	✓	✓	✓	✓	✓
<b>Mobility Aggregators</b>	✓	✓	✓	✓	✓	✓	✓	✓

✓ service available  
 x service unavailable

#### Figure 4. Shared mobility availability by city (from Cohen & Shaheen, 2018)

c) *Fund R & D pilot projects on accessible shared mobility and disseminate evaluation findings with common units of analysis across the evaluations*

In recent years, governments have lent support to research and development on shared mobility (e.g., microtransit) in smaller urban and rural communities in Canada. This work has helped shed light on models of practice that work effectively and are sustainable in terms of cost. The pilots have also helped illuminate models that are less effective and sustainable. However, the projects and the evaluations have dedicated little attention to issues of service accessibility for people with disabilities and older adults.

- Governments should continue to fund such R & D pilots and broadly disseminate the evaluation findings. Projects and research are needed on microtransit and other forms of shared mobility such as ridesourcing, carsharing, and bikesharing. Significant attention should be dedicated to service accessibility for people with disabilities and older adults. Attention is also needed on how these newer forms of mobility integrate with, or could be integrated with, traditional forms of transportation such as taxis, paratransit and regular public transit.

d) *Conduct research on personal vehicle use in Canada*

Publicly available information on personal vehicle use in Canada is incomplete, particularly in rural communities (Hanson & Hildebrand, 2011; Marr 2015). To gauge the extent of personal vehicle use in rural vs urban Canada, we reviewed the contents of several Statistics Canada surveys and found them lacking:

- Frontier Counts (FC), from the Canada Border Services Agency, captures the number of automobiles, trucks and other *vehicles entering* Canada, but not vehicular travel within Canada.
- The Census captures information on the geographic location of jobs, *people's commutes* and how commuting patterns have changed over time. However, the Census does not capture more general information on Canadians' personal motor vehicle or other ground travel.
- The National Travel Survey (NTS) captures and reports statistics on the activities of Canadian residents related to domestic and international tourism, including travel for tourism within Canada. However, the survey was developed to measure the volume, characteristics and economic impacts of *tourism* and not general-purpose personal vehicle travel in Canada.

- The Quarterly Motor Carrier Freight Survey (MCFS) captures data about the *for-hire trucking industry* and covers carriers, their operating revenues, expenses, movements and distances travelled. Data are displayed by the province and territory of the carrier's domicile. The survey does not capture data on other forms of motor vehicle travel, such as for personal use.
- Until 2009, the Canadian Vehicle Survey (CVS) measured the activity of *all on-road vehicles registered in Canada* except buses, motorcycles, construction equipment and road maintenance equipment. Although discontinued, this was a potentially useful source of information. However, it did not provide details for travel in rural vs urban communities. Nor did it include flags for the disability, indigeneity or racialization/visible minority status of survey respondents.
- Accordingly, we recommend that Statistics Canada consider reinstating the CVS. Statistics Canada should consider adding a rural-urban flag and the Census disability questions. Probes for indigeneity and racialization/visible minority status should also be included, such as questions that have been used on various cycles of the General Social Survey.
  - While Statistics Canada may want to consider adding a few questions in the Canadian Survey on Disability about personal vehicle use, that source of data would not facilitate comparative analysis of transportation patterns for people with and without disabilities.

*e) Collect and report on broadly gathered information from the perspectives of people with diverse disabilities about the accessibility of local transportation*

- It would be helpful if reliable, broad-level information were collected on the state of accessible local transportation from the perspectives of people with diverse disabilities.
  - Transportation Canada, and perhaps Employment and Social Development Canada, could work with Statistics Canada and representatives from the disability community to reinstate, and report results based, on several of the questions about the (in)accessibility of local transportation that were not asked in the 2017 version of the Canadian Survey on Disability (Statistics Canada, 2017a), but which were asked in previous versions of the disability survey. A few new questions could be added on respondents' use of ridesourcing and other modes of shared mobility, such as carsharing and microtransit. Ideally, a few questions would also probe the accessibility of the shared mobility services.
  - If a large sample of people were to be interviewed on the accessibility of shared mobility at some point in the future, the interviews would ideally reflect a mix of quantitative and qualitative questions. The data would then be amenable to

both quantitative and qualitative analysis, such as can be performed with various Cycles of Statistics Canada's General Social Survey. A significantly larger sample would allow for representative, multivariate analysis by gender, age, region, type of disability, etc.

*f) Organize information about the regulation of taxis and ridesourcing*

To the best of our knowledge, up-to-date summary information about how taxis are regulated across all provinces and territories has not been consolidated into a single document. Nor has information about the regulation of ridesourcing. However, thousands of local governments are involved with the provinces and territories in regulating these services in Canada.

- Useful research and policy tools for the federal government to consider organizing would be two tables – one for taxis and another for ridesourced services. The tables would show which orders of government exercise key regulatory functions by province and territory.
  - Table 3 provides an example of elements that would be included for taxis. Another table would show the same details for ridesourcing. The federal government would ideally collaborate with provincial/territorial governments in organizing this information.
  - The tables would facilitate quick comparative analysis of which jurisdictions are doing what, and how regulatory measures for taxis and ridesourced drivers compare within and across jurisdictions.
  
- A further level of detail to consider adding to the tables would be a listing of the key provincial/territorial statutes, regulations and policy documents pertaining to the functions indicated on the tables.
  - There may also be value for local governments if the listing were to include key local bylaws and policy documents pertaining to the functions shown on the tables. The most useful information, initially at least, would probably be for capital cities and selected other large communities.

<b>Table 3. Regulation of taxis: Key functions by province/territory and level of government (conceptual model)</b>			
<b>Regulatory functions</b>	<b>Jurisdiction *</b>		
	<b>Province A</b>	<b>Province B</b>	<b>Etc. ...</b>
Vehicle safety standards	P	P	::
Vehicle inspections	B	P	::
Vehicle licensing	P	P	::
Licensing of drivers	P	P	::
Setting driver insurance requirements	P	P	::
Criminal and driving background checks for drivers	B	M	...
Service to vulnerable populations background checks for drivers	P	X	...
Setting fares	P	M	...
Setting hours of operation	P	M	...
Collecting accessibility funds from drivers / companies for vehicles that are not accessible	M	X	...
Driver anti-discrimination training	M	X	...
Etc. ...			

\* Key:

P = Provincial/territorial government (incl. through PT transportation boards / agencies)

M = Municipal/local government

B = Both orders of government

X = Not regulated

## XIV. Summary and conclusion

This project examined the accessibility of shared mobility in Canada and was performed under contract with Transport Canada.

### Summary of the project's scope and methods

Shared mobility has been defined as “transportation services and resources that are shared among users, either concurrently or one after another.” Shared mobility includes:

- Ridesourcing (which is similar to taxi services, but where independent drivers connect with riders for a fee through companies such as Uber and Lyft. This is sometimes called ride-hailing);
- Carsharing (a service for people who want to use a vehicle for a short period of time, like an afternoon, evening or weekend, and who will pay a fee for it, but do not want to go through the traditional car rental process);
- Microtransit (technology-enabled transit service that usually involves vans, minibuses and shared multi-passenger vehicles; and,
- Mobility-as-a-service (MaaS – which is the integration of various forms of transport services, trip planning and payment, into a single mobility service that is accessible on demand).

Shared mobility also includes: ride sharing (i.e. using an app to find someone travelling in the same direction); personal vehicle sharing (the sharing of privately owned vehicles between vehicle hosts and guests, for which companies broker transactions); ride-splitting (the combining of fares to reduce vehicle trips and generate savings for passengers); bike sharing and scooter sharing (on-demand access to bicycles and scooters at a variety of pick up and drop-off locations for one-way or roundtrip travel); and shuttles (corporate, regional, and local services that make limited stops and serve riders from specific employers, buildings, or residential developments).

This study focused mainly on ride-sourcing, carsharing and microtransit as these are the services that have garnered the most attention in the literature.

Our aims were to: 1) provide a comprehensive understanding of accessible shared mobility services, related policies, and barriers for persons with disabilities in Canada; and 2) provide recommendations for policy makers and identify gaps to inform future research in this area.

Our approach is described in the body of this report and included:

- A wide-ranging review of the literature, including research reports, evaluations, policy briefs, news articles, websites, and blog posts; and
- Structured but open-ended and exploratory interviews (by phone and virtually) with 23 key informants, most of whom have disabilities and are involved as senior leaders with

provincial or national disability organizations. All interviewees are knowledgeable about issues of access in transportation for people with disabilities.

Based on the interviews and the available literature on shared mobility in Canada, we have discussed accessible accommodations and services provided by shared mobility providers in Canada. We have looked at how shared mobility contributes to transportation options for persons with disabilities and seniors in Canada, and the types of barriers they encounter when accessing shared mobility. We have discussed how shared mobility is being integrated into existing transportation services and infrastructure in this country, actions taken by governments in Canada to enhance access to shared mobility, and international examples that showcase aspects of highly accessible shared mobility. From this material we have drawn to the foreground several best practices or lessons learned that could be, and indeed are being, applied in the Canadian context. We have touched on the future of accessible shared mobility, with attention to connected and automated vehicle technologies. This study has also described key challenges (and opportunities) unique to Canada for furthering accessible shared mobility including issues of service delivery in rural, remote and urban regions, and distinct governmental roles, policies and regulations. We have provided recommendations for policy makers and recommendations for future research on accessible shared mobility in Canada.

#### Summary of findings

Some forms of shared mobility are widely available across the United States. Modes most widely available are ridesourcing, carsharing, bikesharing and electric scooters. Several well-organized and well-resourced organizations in the United States regularly generate a substantial volume of high-quality information on transportation network companies (TNCs) such as Uber and Lyft, and other modes of shared mobility in that country. Comprehensive analysis has not yet been performed on the modes of shared mobility available in Canadian communities. However, several modes are appearing in some of Canada's larger communities, most notably ridesourcing, carsharing, and bikesharing. Uber and Lyft are the dominant providers of ridesourcing in the US and Canada.

People with disabilities are less likely than their counterparts without disabilities to use ridesourcing. Data are incomplete about the extent to which people with disabilities are using carsharing and microtransit. However, the available evidence suggests that several barriers are preventing people from disabilities from more widely using either mode of service.

Governments have implemented several measures to promote greater accessibility in ridesourced services. Measures generally focus on increasing the supply of wheelchair accessible vehicles through funding and regulation and ensuring the proper training of drivers on how to serve people with disabilities. Governments have also addressed the limited ability of many people with disabilities to pay for ridesourcing by subsidizing trips and through other

financial strategies. Some governments have aimed to increase the use of carsharing vs personally owned vehicles. To that end, governments have waived parking fees and introduced other measures to make it financially feasible for companies to operate and have helped make the services convenient for consumers to use by allowing vehicles to be picked up and dropped off at many points in a geographic area.

Several benefits of shared mobility for people with disabilities and older adults have been reported in the literature. Many of those benefits were echoed by the people we interviewed. However, several issues reported in the literature, and reflected in our interviews, also hamper the availability and accessibility of shared mobility for people with disabilities

*Ridesourcing.* The use of ridesourcing has increased significantly in recent years, which indicates it is meeting a need. Where wheelchair accessible vehicles are available to people who need them, and drivers know how to effectively serve people with disabilities, and that the booking and payment technologies are fully accessible, reported benefits of ridesourcing for people with disabilities include the following. (We discuss the availability of accessible vehicles, the need for driver training, and issues of booking and payment in the discussion that follows the benefits.)

- Ridesourcing can provide greater flexibility than travel by paratransit, which translates to more possibilities for impromptu social travel and for unplanned, last minute, and urgently needed travel.
- Ridesourcing can provide greater predictability than paratransit in terms of pick up and drop off times.
- Wait times for ridesourced trips are generally brief for people who do not need wheelchair accessible vehicles.
- Ridesourced wait times may be quicker than, or roughly equivalent with, wait times for wheelchair accessible taxis.
- The travel time by ridesourcing may be quicker than by paratransit or regular public transit.
- Ridesourced vehicles tend to be fairly modern, comfortable, clean and well maintained.
- The cost of a ridesourced trip is usually less than by taxi.
- In some jurisdictions, the rider can book a ridesourced trip through the paratransit or public transit system for the same subsidized cost as paratransit or regular transit, and sometimes less.
- Ridesourcing provides advance notice of the cost of a trip which will be charged regardless of traffic, construction, bad weather, and other factors that can prolong the trip.

- The rider may be able to negotiate a fare with their ridesourced driver where the trip will extend beyond the driver's usual service area.
- For some individuals, it may be less expensive to book ridesourced travel on demand than pay the ongoing cost of insurance, parking, maintenance, and fuel for a personal vehicle.
- The rider can track the ridesourced driver's progress in arriving for pick up.
- The ridesourcing service provides advance notice of the rider's estimated time of arrival at their drop off point.
- If using a cell phone, the rider has the technical capacity to share information with trusted others about the ridesourced vehicle, driver, route, and estimated time of arrival at the drop off point.
- The rider can communicate with deaf drivers through the ridesourcing company's digital platform.
- Ridesourcing payment processes can eliminate the need for a cash or credit card transaction between the rider and driver.
- Payment processes can allow several people to split the cost of a shared ride.
- The ridesourcing company's rating system lets the rider indicate to the company, and to other riders, their satisfaction with the driver for the trip just taken, thereby rewarding drivers who provide positive travel experiences and discouraging business away from drivers who provide unsatisfactory service.
- In our interviews, ridesourced drivers were often reported as courteous, willing to be helpful, and open to the rider's disability and service animal.
- There may be possibilities for the rider to establish an ongoing relationship with ridesourced drivers whose availability and skills are congenial to the rider's transportation requirements, including their disability-related needs, while travelling.
- In communities with ridesourcing and other transportation options, there is greater consumer choice for the rider.
- Ridesourcing introduces market incentives for other service providers – public and private – to improve the quality of their service or risk of losing customers with (and without) disabilities to ridesourcing.

Issues that hamper the availability, accessibility, and quality of ridesourced services for people with disabilities include the following:

- Digital platforms for booking ridesourced trips have been a problem for people with vision, manual dexterity, perception, and cognitive difficulties.
- Ridesourcing booking and payment software is sometimes “glitchy,” that is, it performs inconsistently, or is not always up-to-date in terms of meeting the most current W3C accessibility standards.
- People may not be able to book a ridesourced trip if they do not have a smart phone with data service.
- There is often low availability of accessible vehicles from ridesourcing companies for people who use larger fixed frame mobility aids such as a motorized wheelchairs, scooters, and non-collapsible manual wheelchairs.
  - Ridesourcing companies do not offer any wheelchair accessible vehicles in some communities.
- Ridesourcing companies are not operating in many communities, particularly in smaller urban and rural communities.
- People who require accessible vehicles may experience long wait times to be picked up in some communities. Ridesourcing companies may fail to provide alternatives when they cannot provide timely service.
  - Although the people we interviewed did not widely report these problems, those issues have received attention in the literature and have been the focus of lawsuits in the US.
- The rider may have difficulties locating the whereabouts of the ridesourced driver who has arrived to pick them up.
  - Our interviewees reported this as a particular problem for people with an intellectual disability. The issue can discourage personal support workers from facilitating ridesourced travel for people with an intellectual disability.
- Some ridesourced drivers have been reported as unwelcoming and unsupportive towards individuals who need personal assistance to enter or exit vehicles, and towards service dogs.
  - Such drivers may simply refuse service to a person with a disability.
  - Cases of driver discrimination have come to public attention based on ride seekers’ mobility, psychosocial, communication, and cognitive disabilities.
- Some people may experience intersectional difficulties with ridesourcing based on disability together with race, indigeneity, gender, sexual orientation, and age.

- While such intersecting difficulties have not received widespread attention in the literature on shared mobility, instances of discrimination based on each of those grounds have been reported. Accordingly, it is reasonable to infer that people with disabilities and other intersecting disadvantages are at heightened risk of experiencing difficulties.
- Ridesourced drivers are often unfamiliar with people with disabilities and lack confidence and skill in effectively serving them.
  - This seems to be a more common problem than unwelcoming and unsupportive drivers.
- Ridesourced drivers may attempt to charge a higher fee for service where the rider has a disability.
  - This practice has been ruled unlawful in many jurisdictions.
- Regular ridesourcing service fees may be prohibitive where individuals live on low, fixed incomes such as disability pensions or social assistance.
  - People without bank accounts or credit cards have had other difficulties in paying for ridesourced trips.
- While uncomfortable rides from ridesourcing companies have not received widespread attention in the literature, unsafe rides – or the perception of unsafe rides – have received some attention. In a few instances, concerns have centred on the deaths of riders.
  - It is unclear to what extent the issue of unsafe trips from ridesourcing companies is a heightened problem for riders with disabilities. However, several of our interview respondents expressed concerns about their safety in those trips. People with disabilities’ negative experiences with personal safety in taxis have a long and well-documented history. Concerns about personal safety in ridesourced travel are sensible and may be most common among people with disabilities and older adults who have not used the service.

*Carsharing.* Benefits of carsharing for people with disabilities have not received much attention in the literature. In large part, the lack of attention is because carsharing is not a mode of shared mobility people with mobility impairments seem to be using in large numbers. People with disabilities that are not mobility-based (e.g., psychosocial or mental health, learning disabilities) may be using carsharing, but we were unable to find reported numbers.

The main benefits include the following:

- It is convenient and fairly easy to obtain a carshare vehicle.
- It costs less to own, maintain and use a personal vehicle if using carsharing is used instead.
- There are potential benefits to the ecosphere through the reduction of the number of personally owned and operated vehicles on roads.

Accessibility issues in carsharing for people with disabilities revolve mainly around the following:

- There is limited availability of accessible vehicles for people who require mobility aids that cannot be stowed in a vehicle's trunk or other stowage space. Such mobility aids include wheelchairs, scooters, and fixed frame manual wheelchairs.
- Even if available in principle, there may be a lack of accessible car share vehicles, including vehicles with accessible hand and foot controls, in a city or town where mechanics lack the skills to perform the retrofits and other modifications required to make vehicles accessible.
- There are usually wait times for people who require an accessible carshare vehicle on demand, as service providers may require notice of a day or more.
- Pick up and drop off points may be inconvenient and inaccessible and may seem unsafe. These issues have not received much attention in the literature but were reported in interviews we conducted for this research. For example, a person who requires an accessible vehicle may first have to arrange for accessible transportation to the lot where the carshare vehicle is to be picked up. The lot may not be well lit at night, or its surface may be littered with debris, or may have vehicle stoppers or other obstructions to physical movement. After use, the rider would need to figure out how to get from the lot back to their point of origin. Assuming that accessible carshare vehicles are available at all in a community, then, for them to be of any practical use, some individuals will have to sort out "first/last mile" issues.
- In situations where carshare vehicles can be picked up or dropped at a variety of locations on streets, the nearest available vehicle may be a considerable walking distance away. The vehicles may not be accurately indicated on the company's digital platform. In either case, even if accompanied, people most likely to be affected are people with mobility impairments, and people who are blind, have cognitive disabilities, or who experience other difficulties in wayfinding.

- A person with a service dog may find that the additional cost, inconvenience, or indignity discourages the use of carsharing where the carsharing company requires the rider to clean the vehicle after travelling.
- Carsharing is not widely available in rural communities.

*Microtransit.* Although there have been numerous experiments with microtransit in the US and a few in Canada, accessibility issues in microtransit for people with disabilities have not received much attention in the literature. That said, potential accessibility issues are much the same as for ridesourcing. These include the inaccessibility of digital platforms for booking and paying for rides, inaccessible vehicles, driver attitudes and behaviours, and the cost of service and modes of payment, especially for people on low incomes.

Perhaps the lack of attention to such issues in the research is because microtransit must meet economies of scale to operate in an economically sustainable way. Difficulties meeting the economies of scale have hampered the widespread adoption of *any* microtransit in the US and Canada, let alone microtransit that provides accessible vehicles and drivers who are familiar with and confident serving people with disabilities.

In terms of integrating and paying for ridesourcing, carsharing, microtransit, and other forms of transportation, Mobility-as-a-Service (MaaS) has been introduced in the four case study communities we included in this report (Berlin, Helsinki, Boston and San Francisco). MaaS is also being piloted in several regions in the US. A few Canadian communities have piloted integrated access to several mobility services within single digital platforms. To date, however, progress has been slow in the wide scale implementation of MaaS in Canada and the US.

Against the backdrop of the transportation services that are in place, researchers have pointed to the potential benefits of automated vehicles for people with disabilities and older adults. Uber is making significant investments in R & D on fully automated vehicles. There are corresponding needs for standards, vehicle architectures, and practices to address accessibility for specific groups of people with disabilities. Researchers have identified problems with removing drivers from vehicles: drivers play a critically important role in assisting some individuals with disabilities in finding their way to the vehicle, entering it, sitting safely within it, securing their mobility devices, identifying correct stops (e.g., a transit stop for transfers), leaving the vehicle, and finding their way from the vehicle to where they are going. Key challenges that must be addressed for safe and accessible automated vehicles revolve around passenger wayfinding to and from the vehicle, safety within the vehicle, the communication of information between the passenger and the vehicle, the convenience and intuitive simplicity of vehicle use, vehicle compliance with disability-rights legislation, the affordability of vehicles, and the need for collaboration between various stakeholders in accessible vehicle development. Although time estimates vary, the automobile industry puts automated, driverless vehicles as arriving sometime in the 2020s. However, no vehicle manufacturer has yet

embarked on a complete, ground-up design to support accessibility that combines vehicle safety and universal design with enabling interfaces to address specific user needs.

For all the positive developments in shared mobility in recent years, including MaaS and mobility on demand, analysts working with transportation leaders and transportation engineers have warned that many dimensions of accessibility are being overlooked. At risk of being left behind are individuals with disabilities, racial and ethnic minorities, individuals and families living below the poverty line, and older adults.

### Summary of recommendations

The regulatory system for furthering accessible shared mobility in Canada is complex. The system involves thirteen provincial/territorial governments and thousands of local governments. Canada's geographical expanses, widely varying types of communities, and population diversity within jurisdictions, are considerable. Many people also live in rural communities or small urban ones, where there is no public transit or inter-community bus service. Oftentimes, many communities are underserved by these services. Ridesourcing is only beginning to emerge in such communities while microtransit and carsharing are often fledgling enterprises, if they are present at all. Disability issues also often have limited priority in transportation planning and policy development. People with disabilities and older adults are among the most transportation-disadvantaged in such communities.

In this context, we have provided several inter-related recommendations for the consideration of policy makers for furthering the availability of accessible shared mobility services in Canada. The recommendations have been developed against the backdrop of the benefits and drawbacks of shared mobility, Canada's vast and varied geography, many small communities, a complex regulatory system, diverse population, disadvantages experienced by people with disabilities and older adults in transportation and policy development, and the possibility of automated vehicle development that does not squarely face and deal with issues of accessibility. Key among the recommendations are for regulators to:

- a) Develop a vision of a well-integrated and accessible transportation system that is equitably available to all;
- b) Ensure an adequate supply of wheelchair accessible vehicles is available for people who need them; and
- c) Ensure ridesourced and microtransit drivers receive proper training on how to effectively serve people with disabilities.

Related considerations for regulators are the needs to:

- d) Engage in ongoing, substantive, and community-specific consultations with people with disabilities at all levels in planning, program development, and evaluation, concerning the services they need and the transportation difficulties that need to be addressed;
- e) Introduce measures to enable people with disabilities and older adults on low incomes to afford travel by shared mobility services;
- f) Ensure rider safety and good quality shared mobility services through various consumer protection measures; and
- g) Ensure basic standards are met.

In principle, a minimally invasive regulatory approach to ridesourcing would help consumers to reap the benefits of competition. However, we consider that a firm regulatory approach is needed for expanding the supply of accessible vehicles and for ensuring the proper training of drivers.

The study's recommendations for research are that the federal government should play a leading role, in collaboration with provincial/territorial and local governments, in order to:

- a) Collect disaggregated data with common units of analysis across geographic settings and publish reports based on that data about accessible and inaccessible shared mobility for people with disabilities and older adults in Canada;
- b) Support the production, gathering, organization, and distribution of research, policy, and information about effective practices on accessible shared mobility for diverse stakeholders;
- c) Fund R & D pilot projects on accessible shared mobility and disseminate the evaluation findings with common units of analysis across the evaluations;
- d) Conduct research on personal vehicle use in Canada;
- e) Collect and report on broadly gathered information from the perspectives of people with diverse disabilities about the accessibility of local transportation; and
- f) Organize and present information about the regulation of taxis and ridesourcing in Canada.

#### [Limitations of this study](#)

This project has several limitations. For instance, the COVID-19 pandemic affected the scheduling and pace of some of our work and the work of the networks to whom we turned for assistance in identifying interviewees. The pandemic also affected the availability of individuals to be interviewed.

The interviews were exploratory in that they captured the experiences, observations, and recommendations on shared mobility from the perspectives of 23 knowledgeable informants.

The interviews did provide illuminating glimpses into the views of diverse disability communities across Canada. However, the small sample sizes for exploratory projects do not allow the saturation to be achieved where much larger samples are interviewed.

Specifically, more interview-based information would be preferable from a larger number of people with a wider diversity of experiences, including the Indigenous and LGBTQ2S+ communities and people who perform various roles and functions in the transportation industry. Time and resource constraints did not permit more extensive interviews to be conducted, however.

Despite the limitations of the interview-based data we gathered, we are confident that the interviews captured some of the experiences, observations and recommendations of knowledgeable people that would likely come to the foreground in a more broadly-based interview process. Many of the experiences and views that people articulated resonate with what the literature also reports.

A key difficulty that had to be overcome in the review of the literature for this project is the lack of good-quality and up-to-date information on shared mobility and its accessibility in Canada. This lack of information, and the “bits and pieces” of information that are fragmented across multiple sources, makes researching the accessibility of shared mobility in this country considerably less efficient and less able to shed light on important details than it could be. For instance, ideally we would have ready access to basic information such as how TNCs are regulated in various jurisdictions, the sizes of their fleets, the numbers of wheelchair accessible vehicles in those fleets per province/territory and even in some larger communities, the extent of unmet need for wheelchair accessible vehicles by region, other major difficulties people with disabilities experience with the (in)accessibility of shared mobility, and how those patterns vary by region of the country, age group, gender, type of disability, etc. Other researchers may well discover examples of accessible shared mobility, and patterns in usage and barriers to use, that eluded us. Our recommendations for future research would help close some of the major gaps in basic information, which would enable more efficient and ongoing policy-relevant research.

## Conclusion

In conclusion, shared mobility is offering people with disabilities and older adults a new range of transportation options that are affordable, convenient, and complementary to public transit. Shared mobility is allowing some individuals to forgo personal vehicle ownership. It is also showing potential to address many difficult transportation challenges such as the need for flexible, affordable, and accessible travel by persons with disabilities and older adults in rural, remote, and urban communities poorly served by public transit and taxis. However, despite the potential of shared mobility, barriers persist. These include the unavailability of wheelchair accessible vehicles, difficulties people experience in obtaining the accessible vehicles that may

be in the community, the attitudes and lack of background on disability among drivers, difficulties some people experience in booking and paying for rides, and the possibility of driverless vehicles being designed and manufactured without proper attention to the affordability of vehicles and to the accessibility and safety of vehicles for all.

It is our view that, if acted upon, the recommendations we have provided will help policy makers breathe life into the National Transportation Policy's vision of a transportation system in Canada that is "without undue obstacle to the mobility of all persons" and "accessible without barriers to persons with disabilities." If acted upon, the recommendations would also help bring transportation arrangements in line with the principles that inform the *Accessible Canada Act*. Those principles are about supporting: the inherent dignity of all people with disabilities; their right to equal opportunity, barrier-free access, and full and equal participation in society; their freedom to make choices; and the need for laws, policies, programs, services, and structures that take into account, and which are responsive to, people with disabilities' diverse needs and circumstances.

## Acronyms

<b>Acronyms</b>	<b>In full</b>
BVG	Berliner Verkehrsbetriebe
DAR	Dial-a-ride
FTA	U.S. Federal Transit Administration
HSL	Helsinki Region Transport
LACMA	Los Angeles County Metropolitan Transportation Authority – Metro
LADOT	Los Angeles Department of Transit
MaaS	Mobility as a service
MBTA	Massachusetts Bay Transportation Authority
MOD	Mobility on demand
NEMT	Non-Emergency Medical Transportation
NASEM	National Academies of Sciences, Engineering, and Medicine
NCMM	National Center for Mobility Management
SAE	Society of Automotive Engineers
SFMTA	San Francisco Municipal Transportation Agency
SUMC	Shared-Use Mobility Center
TNC	Transportation network company (e.g., Uber, Lyft)
WAV	Wheelchair Accessible Vehicle

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## Appendix

Table A1: Sample guidelines from Berlin - Design for All - Accessible Public Buildings (2nd ed.)

<b>Mobility guidelines</b>	<b>Perceptual guidelines</b>	<b>Cognitive guidelines</b>
<p>Connections to individual transport: Barrier-free paths should be designed to create the most direct route possible between the parking area and the main entrance of a building. Controlled access gates at the entry must provide clear passage of minimum 0.90 m for wheelchair users. The area must be marked with visual and tactile ground surface indicators for people who are blind or who have a visual impairment.</p>	<p>The following elements are important for people with sensory-cognitive impairments: The building of public facility should be easy to find and identify, for example, through signage, routing or design elements... The principal entrance should be emphasised through the use of building proportion, colour, materials and high-contrast design.</p>	<p>Intellectual/Cognitive requirements: Effective orientation in public space depends to a large extent on individual skills and knowledge. Therefore, the objective should be to design a built environment that is easily intelligible, intuitive and useful. Buildings are easier to use when their form and function work together. A simple ground plan and straightforward language on signs or in guidance systems, and in instructions for using computers or automated machines should be a priority.</p>

<b>Mobility guidelines</b>	<b>Perceptual guidelines</b>	<b>Cognitive guidelines</b>
<p>Barrier-free design of premises: Step-free access from the street-side property line to the building must be ensured (e.g., dropped kerbs). Barrier-free access to the building should be considered along with the requirements that apply to the building itself... Where there is a complex of buildings, this should include the path network between individual structures and functions.</p>	<p>Orientation aids: Extra information, for example, for people who are blind or visually impaired, can be communicated through markings on surface of the pathway. More specific information can be conveyed via tactile lettering on a handrail. Signs and other visual information should be designed so that they are easily accessible but not in the direct pathway. The closest possible reading distance should be ensured for people who have a visual impairment. Glare and reflection should be avoided through the choice of appropriate materials.</p>	<p>Plain Language: In today's society, we find ourselves increasingly confronted with a flood of information that we can only process with great difficulty or very superficially. Plain language makes it possible for people to understand content easily. This benefits everyone – not only people who have an intellectual or cognitive impairment.</p>
<p>Width of pathways: Pathways must be wide enough for people who are using wheelchairs or walking aids, including the space needed for passing. A width of 1.50 m is generally sufficient. A minimum width of 1.20 m is acceptable on pathways if they are not longer than 6.0 m. For longer pathways, wider passing points must be provided.</p>	<p>In addition to the organic abilities of the eye, visual perception of the environment also depends on external conditions, like conditions of natural light and shadow, artificial lighting, colour, and the form and structure of surfaces. The deliberate use of these elements in a design can contribute significantly to improved perception of the environment, facilitating or making it possible at all for individuals to freely navigate public spaces.</p>	<p>Rules for sentences: Use short sentences. Express only one idea in each sentence. Use simple sentences. The sentences should not be convoluted.</p> <p>Wrong: Publicly accessible buildings are generally furnished with signs facilitating communication and orientation.</p> <p>Right: There are signs in many buildings. The signs have information on them. You</p>

Mobility guidelines	Perceptual guidelines	Cognitive guidelines
		<p>can find your way around buildings by using the signs.</p>
<p>Longitudinal slope: The maximum longitudinal slope of a pathway may not exceed 3%. That gradient is manageable for wheelchair users and people with reduced mobility and does not create any particular impediment...The slope may reach up to 6% if there are intermediate landings laid out at regular intervals no more than 10 m apart with a slope of no greater than 3%.</p>	<p>In addition to keeping background noises and echo effects to a minimum, cases of mild to moderate hearing loss require effective public address systems and high-quality presentation of acoustic information. In cases of severe hearing loss (people with implants or hearing aids), hearing enhancement systems, good lighting, and visualizations are also required. Individuals with age-related hearing loss primarily require information visualization. A person who is deaf not only requires exclusive visualizations but also translation into sign language.</p>	<p>Other rules: It is good if you can use examples.  Do not write numbers out as words.  Leave out special characters.  Some examples of special characters are: §, &amp;, %.  Have texts edited or reviewed.  The reviewers should be people with learning or cognitive disabilities.</p>

Table A2: Potential ridesourcing-related opportunities and challenges for people with disabilities

Impairment Category	Related opportunities	Related challenges
<b>Hearing</b>	Audio is not needed for full functionality of the Uber or Lyft apps.	Concerns that drivers expect verbal communication.
	Assistive technology such as visible and vibrating alerts can help riders who are Deaf or hard of hearing use the app.	
	In-app features, such as the ability to enter destination, direct texting with the driver can facilitate non-verbal communication between the rider and driver.	
<b>Vision</b>	VoiceOver iOS, Android TalkBack, and wireless braille display compatibility.	Mobile applications and websites may not be fully accessible by screen readers (i.e. 508-compliant). For example, VoiceOver provides notification when a driver has arrived but does not provide updates about where the vehicle is along its route.
	Apps provide easy communication between the driver and rider.	Reports of TNC drivers refusing to pick up or not making accommodations to pick up passengers with visual impairments.
	Payment methods are simple, do not require handling cash, and provide a clear description of charges.	
	Door to door service.	
<b>Ambulatory</b>	Door to door service.	More affordable shared ride services like Uber Pool and Lyft Shared require the rider to get into the vehicle within two minutes of the driver's arrival. For people with illnesses and disabilities, quickly walking a short distance can be painful and sometimes impossible. Riders are subject to fees for not boarding the vehicle in the allotted time.
	First-last mile connections to transit.	

<b>Impairment Category</b>	<b>Related opportunities</b>	<b>Related challenges</b>
<b>Mobility</b>	Accommodations for riders who are able to safely transfer from and stow their own mobility device.	Policies do not require drivers to assist wheelchair or other mobility device users with transferring into a conventional vehicle or folding and stowing the mobility device.
		Wheelchair accessible vehicles for users who cannot safely transfer into a conventional vehicle are not widely available on TNC platforms in San Francisco.
<b>Service/support animals</b>	Uber and Lyft both have a policy that drivers should always accept riders with service animals.	Reports of drivers not accepting service animals, including drivers canceling trips when they arrive and see a service animal.
<b>Cognitive</b>	TNCs present an option that may be suitable for riders who cannot use Muni. For example, TNC riders are not required to understand routes and timetables.	Concerns about driver background checks and safety training as people with cognitive difficulties are at much greater risk for exploitation and abuse.
	Gives some family members and caregivers the opportunity to travel with individuals to services, appointments and social activities.	Some individuals with autism may have difficulty ride sharing or navigating the social implications.
	Better access to employment opportunities for individuals capable of accessing the service.	Not all people with cognitive disabilities have the credit history to apply for a credit card.
		Lack of predictability can be difficult for some (e.g. different drivers).
<b>General/other</b>	Real-time GPS tracking and sharing.	Driver rating of disabled persons may be discriminatory.
	Cashless payment.	Perfumes and scents, music and loud noises can trigger migraines, headaches, asthma attacks, nausea, sensory overload or other health flare-ups.
	On-demand service at any time of the day or night.	Some illnesses require frequent bathroom breaks.
	Better access to healthcare.	Not all disabilities and illnesses are visible.
	Increased independence and choice leading to reduced social isolation.	
	Short wait times in urban areas.	