Moving Towards Better Health:

The Impacts of Transportation on Health and the Solutions in Hamilton

Prepared for:
PUBHLTH 708
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1.0 Key Messages

- Access to transportation is an important social determinant of health that enables older adults to age in place. Therefore, municipalities should invest resources and create plans to ensure that communities have the necessary assets to improve the aging experience.
- Transportation solutions that improve mobility for rural older adults require knowledge of needs, barriers, and preferences; collaborative partnerships across sectors; financial, human, and social capital; innovative technology; and adaptation to existing services.
- More research is needed in Canadian rural communities to evaluate the implementation of transportation solutions, and their effects on both aging in place and health outcomes.

2.0 Executive Summary

Finding transportation solutions to improve mobility for older adults living in rural areas in the City of Hamilton is an important priority to ensure that the city meets its vision. To assist Public Health Services in identifying solutions that are not only based on the best available evidence but that are applicable to the city's context, this rapid review was undertaken to answer the following research question: *Which transportation solutions or programs could improve community participation, access to services, and health outcomes for older adults living in rural Hamilton?*

To identify relevant literature, transportation, geography, and health databases were searched and grey literature was pulled from key Canadian websites on public health or aging. A total of 42 references were synthesized to inform potential transportation solutions for Hamilton.

Nine key findings are described in detail based on the results and overall conclusions of our included studies: **1)** *Identify Specific Mobility Needs And Challenges In The Hamilton Rural Community;* **2)** *Develop Skill-Building Programs;* **3)** *Adapt Existing Public Transportation;* **4)**

Develop Flexible Routing and Scheduling Options; **5)** *Explore Demand-Responsive Paratransit Services;* **6)** *Create Partnerships between Transportation and Service Providers;* **7)** *Develop Social Entrepreneurship Models;* **8)** *Leverage Technological Innovation to Integrate Transportation Services; and* **9)** *Develop a Single Information Platform for Older Adults.*

Considering the Hamilton context, the following 5 key implications are recommended as transportation solutions to improve mobility for older adults: **1)** *Create partnerships with health and/or social service providers in rural Hamilton and with higher education institutions to better understand the transportation needs, barriers, and preferences of older adults;* **2)** *Create partnerships with existing transportation services to explore the feasibility of, and resources required to, adapt existing public transit services to better meet the needs of older adults in rural settings;* **3)** *Leverage social capital in Hamilton, including volunteer drivers and social entrepreneurship models, to further develop and implement demand-responsive paratransit services;* **4)** *Explore partnerships with the technology industry to develop an integrated platform that combines a variety of public, volunteer, commercial ride-share, and active transport options;* **5)** *Develop and implement programs that offer training and education for older adults to increase familiarity with and confidence in using alternative transportation options.*

3.0 Public Health Topic

Recognizing that the number of seniors living in Hamilton is increasing, and will continue to increase in the coming decades, Hamilton Public Health Services drafted *Hamilton's Plan for an Age-Friendly City* in 2014 [1] to address the unique needs of older adults and identify priorities to ensure successful aging. The plan includes a vision, areas of focus, principles to guide policy development and service delivery, as well as 100 actions to implement the plan. Public Health Services is currently conducting a 5-year review and update of the existing plan.

Getting Around Greater Hamilton is one area of focus which includes actions to address issues of mobility, outdoor spaces, and public buildings.[1] To inform the next age-friendly plan, Public Health Services has requested a rapid review on evidence-based transportation solutions that could improve mobility for older adults who live in rural Hamilton. This rapid review summarizes the relevant literature on this public health topic and suggests recommendations for new programs or services that could enable older adults to better get around greater Hamilton.

4.0 Current Knowledge

According to the World Health Organization, an age-friendly community has "policies, services, settings, and structures that support and enable people to age actively".[2] Transportation is included among the key domains and indicators of an age-friendly community because it enables people to access services and programs that support health and well-being[3]. A recent scoping review that investigated the association between the neighbourhood environment, mobility, and social participation found evidence that those health outcomes are positively associated with access to transportation [4]. While having a car or a driver's license enables mobility and social connection [4], driving cessation can lead to a loss of independence with adverse social, psychological, and health outcomes.[5-7] Furthermore, driving cessation is generally associated with declining physical performance, sensory dysfunction and cognitive decline which also limit their ability to use conventional public transport options.[5 8] A resource guide developed by the UK Department of Transport and outlined in the Passenger Transport Executive Group report [43] outlined affordability, availability, accessibility and acceptability as the most important aspects of public transit for older adults. These themes are echoed by multiple studies evaluating this population's preferences and priorities.[9-13] It is important that communities support the

development and implementation of a variety of convenient and safe transportation options to ensure that older adults have access to health/social services and to their communities.

Municipalities that include both urban and rural areas face unique challenges in having to plan age-friendly communities for older adults with different needs and experiences. Older adults living in rural communities face limited availability of transit options, gaps in infrastructure, and large distances between programs or services that necessitate driving - all of which create logistical challenges and a perception of economic infeasibility when developing transit alternatives.[14-16] Access to transportation in rural communities is a social determinant of health, and a driver of the ability to age well in place.[15 17] Defining the mobility needs and of rural older adults, the contextual challenges of developing transit in rural settings, and the resources that can be leveraged to meet these challenges are necessary in order to adequately plan rural age-friendly communities.

5.0 Public Health Question

This rapid review synthesizes evidence from relevant literature to answer the following research question: *Which transportation solutions or programs could improve community participation, access to services, and health outcomes for older adults (>55 years) living in rural Hamilton?*

6.0 Synthesis

The literature search produced 37 studies from relevant databases and 5 reports from the grey literature that met the inclusion criteria. See Appendix for more details of the database search strategy, grey literature search strategy, and relevant limitations.

Finding #1: Identify Specific Mobility Needs and Challenges in the Community

Rural communities have unique needs and challenges which may differ depending on cultural, social, and demographic characteristics, as well as neighbourhood design and availability of

infrastructure. Multi-sectoral collaboration and resource support are highly important in order to identify the unique needs or older adults in rural communities and develop effective and sustainable transportation solutions.[18-20] Tools for Age-Restricted Community Connectivity Assessment (ARCCS) – which uses geospatial analysis, environmental scans, surveys, and transit analyses – are available [21] and can be used to identify opportunities for short- and long-term interventions and planning. Other innovative approaches and research study designs can be used to increase awareness of rural transportation needs and preferences: travel or trip diaries [22]; interviews and focus groups to identify priority actions [14]; discussion forums to validate identified solutions [23]; and health impact assessments with feedback from community [24]. Soliciting input from stakeholders, including older adults, rural service providers, and community organizations, and identifying priorities are crucial to making meaningful and impactful changes.

Finding #2: Develop Skill-Building Programs

Community education or training programs on transportation, travel teaching, and trip planning were commonly identified as solutions to improve the use of alternative transport modes. Travel training involves fostering independent travel skills by helping non-riders become comfortable using transportation services and can bridge gaps and build confidence in inexperienced transit riders. Training programs educate older adult riders about route planning, service navigation, vehicle and service options and how to explore the range of transport solutions available, as well as protocols for scheduling and riding services.[25-27] They may be focused on teaching or hands-on training such as bus buddying. Sharing information about driving cessation may also be helpful for service providers and family members of older adults.[28] These types of transportation-based education programs have been found to reduce transportation-related anxiety and have a potential to increase perceived availability and accessibility.

Finding #3: Adapt Existing Public Transportation Options

Existing transportation services can be adapted to meet the needs and limitations of older adult users by implementing design, organizational, and infrastructure modifications.[8 29] All elements of the transport chain need to be considered, from door to door, in order to meet requirements of accessibility, affordability, availability, and acceptability.[8 27] The following adaptations are recommended for public transportation: 1) **Provide information** to older adults on available transit options and how to adapt route planning tools; 2) **Provide education for public transit staff**, including transit drivers, to ensure courteous and patient service, as well as safe driving practices to increase the comfort level and acceptability of these services to older adults; 3) **Adapt bus vehicle design** with well-illuminated and clear route numbers on the front, back, and sides of buses; raised boarding platforms; wheelchair accessibility; priority seats and wheelchair space; unobstructed aisles; handrails; and audible/visible information for transit stops 4) **Adapt transit stop design** with provision of shelter and seats; clear signage; clear route maps; and schedules; and 5) **Adapt infrastructure on buses** to support older adults who use mobility devices and bicycles to and from transit stops and to provide space for them in public transit vehicles.

Finding #4: Develop or Improve Flexible Routing and Scheduling Options

Municipalities should consider route-deviated and demand-responsive transport models. Deviated-route services are flexible options that allow a fixed-route service (e.g., public bus) to make deviations from its route in order to pick up or drop off passengers at a convenient location upon request. It merges the positive attributes of traditional fixed-route service (i.e., price and frequency) with those of more specialized paratransit services.[25 30] According to a recent systematic review, flexible transport options with route-deviated services increased both accessibility and acceptability in rural areas, as did demand-responsive shared rides.[27] Such flexible routing

options are also more cost-effective than individualized paratransit. If there are existing demand-responsive transport models, research methods from the literature can be used to identify gaps in level of service being provided to locate new areas that might benefit from this service.[31]

Finding #5: Explore Demand-Responsive Paratransit Services

Paratransit services are flexibly scheduled and routed transit services, such as Dial-A-Ride, that offer personal door-to-door or curbside service with smaller vehicles and flexibility in destination.[25 27] Demand-responsive solutions may vary across, and delivery methods, but are particularly suited to the rural and older adult context. They are appropriate for low-demand areas with broad geographical boundaries and low population densities, are able to accommodate older adults with disabilities or mobility challenges, and have been shown to supplement traditional transit systems in meeting mobility needs of older adults[25 32]; however, despite subsidies and co-payments, price may be a prohibitive factor for some older adults.[9]

Finding #6: Create Partnerships between Transportation and Service Providers

Many studies recommended novel partnerships as a potential solution to improve rural transportation.[11 13 25 33] In some rural settings, commercial services (such as Uber and Lyft) have partnered with specialized healthcare providers to provide mobility solutions and have collaborated with senior and community centres to provide technology tutorials and discounted rides in others.[15 29] Specific services for non-emergency medical transportation have also been developed in partnership with municipal and regional transportation services; one example is federally qualified primary health-center affiliated transportation programs which provide older adults with access to primary care services.[34] Where commercial platforms are not financially viable, there is opportunity to develop volunteer-based programs through non-profit organization

[5 35] create committees or alliances to improve coordination of transportation information and services [13], and to affiliate volunteer services with transportation providers to expand the spectrum of options available to older adults.[13 29] Building coalitions with a range of stakeholders and sharing resources is key to enhancing community connectedness and mobility.

Finding #7: Develop Social Entrepreneurship Models

Rural communities have unique social assets including a culture of community and peer support, advocacy groups, community centres, and strong community values that inform the behaviour and outlook of older adults.[14] In the US, social entrepreneurship models have been used to leverage existing social capital in rural communities and their municipalities.[15] One promising case study is the "Feonix Mobility Rising" non-profit [15], which is offered in rural communities and uses a blended model of traditional ride-sharing service, volunteer driver program, and a mobility management operator. This model has the potential to create jobs in the community, accommodate users with a broad-spectrum of mobility needs, and both offer and integrate diverse transit options through the central operator. The non-profit is now partnering with mobility providers and technology companies to facilitate expansion into more communities. Another example is the New Freedom program which has provided funds for a non-profit senior centre to offer van service for older adults with disabilities by using their drivers, volunteers, and organization vans.[32]

Finding #8: Leverage Technological Innovation to Integrate Transportation Services

Technology can become a key enabler in minimizing transportation service gaps and bridging operational inefficiencies in rural communities.[15 25 27] Network mobility services include *Mobility On Demand* and *Mobility as a Service*, which integrate multi-modal networks of shared, public, private, and institutional mobility services.[15] Technology can also be leveraged to

catalyze the co-development of public and private transportation services using shared data and platforms, requiring political will and community champions.[5] Software-based integration of different transport modalities across jurisdictions affords users with a system that is resilient to gaps and fluctuations, redundant, flexible, and reliable.[15 36] It is financially sustainable since it combines revenue streams from market-rate payers as well as subsidized and shared-pay users, spreads investment costs among service providers and re-deploys resources more efficiently.[15] Importantly, it interconnects and restructures existing transit assets in the community.[25]

Finding #9: Develop a Single Information Platform for Older Adults

Integration of information, access to services and payment on one platform should be optimized in order to simplify the user experience and bridge some of the access gaps that challenge older adults.[15 27 37] An analysis of eleven ride-scheduling software programs currently supporting transport services to older adults in North America found the majority of web-based programs to be similar in features and capabilities, with the advantage of being easily configurable and customizable to meet the needs of a community service.[38] Thus, it becomes feasible to provide age-adapted, integrated information on transportation services, routes, scheduling, and planning on one platform, which may also offer navigation assistance and enable a universal payment system incorporating fare subsidies. In a review of studies from North America and Europe assessing the attitudes of older adults to technology, participants were enthusiastic about learning and accessing technologies that would help them maintain their independence and quality of life.[39] Although older adults are increasingly tech-literate, they do require some adaptations in the way information is presented and in their pre-journey information demand.[27] An integrated app- or web-based platform could be beneficial for older adults to reduce redundancy and confusion, minimize the number of actions required for travelling, and to simplify travel planning.

7.0 Implications (Recommendations)

Based on the synthesized findings, the following recommendations are made for the City of Hamilton given the rural context, resource availability, and existing policies.

1. Create partnerships with health and/or social service providers in rural Hamilton and higher education institutions, like McMaster University, Mohawk College, or Redeemer University, to conduct an environmental scan or additional research to better understand the transportation needs, barriers, and preferences of older adults.
2. Create partnerships with existing transportation services, such as HSR and DARTS, to explore the feasibility of, and resources required to, adapt existing public transit services to better meet the needs of older adults in rural settings; this may include the adaptation of information platforms, infrastructure, vehicle design, and the development of flexible routing options).
3. Leverage social capital in Hamilton, including volunteer drivers and social entrepreneurship models, to further develop and implement demand-responsive paratransit services that offer door-to-door or curbside services with smaller vehicles and flexibility in destinations.
4. Explore partnerships with the technology industry to develop an integrated platform that combines a large spectrum of public, volunteer, commercial ride-share, and active transport options to build resilience and flexibility in transit choices for older adults.
5. Develop and implement programs, in partnership with health and/or social service providers in rural communities, that offer training and education for older adults to increase familiarity with alternative transportation options and to build skills and confidence to use them.

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9.0 Appendix

The literature search from relevant databases produced 2360 studies eligible for title and abstract screening (See below for more details of the search strategy and inclusion/exclusion criteria). From this list, 2278 were excluded because they did not meet the inclusion criteria. 82 studies were then screened in full text, of which 37 studies provided evidence for a transportation solution and were ultimately included for full data extraction. The grey literature search targeted the resources and publication sections of relevant Canadian websites, resulting in the identification of 31 references eligible for title and abstract screening (See below for more details of the search strategy). Of these identified references, 22 were excluded as they did not meet the inclusion criteria. The remaining 9 references were screened in full text, of which 5 were included for full data extraction.

It is important to note that there are a few limitations of this rapid review. There is a lack of robust research on this public health topic in North America which limited the availability of relevant literature. The majority of studies focused on transportation needs or preferences of rural older adults and were qualitative in nature. Among the studies that present evidence in support of a specific transportation solution, the evidence was generally of low to moderate quality. Few studies, if any, measured the effect of transportation solutions on identified health outcomes. The following findings were synthesized from the available evidence to support improved mobility for older adults in a Canadian rural setting.

Literature search strategy and results

Our rapid review methodology was informed by the *Rapid Review Guidebook* by the National Collaborating Centre for Methods and Tools (NCCMT) as well as *the Rapid Reviews to Strengthen Health Policy and Systems: A Practical Guide*, by the World Health Organization.[40 41]

Our search strategy was developed in consultation with a research librarian within the Health Sciences Library at McMaster University. We performed searches in relevant databases: Medline, Ageline, CINHAL, PschINFO, and Web of Science (see figure 1 for our complete search strategy in OVID Medline). We also hand-searched key journals – the Canadian Public Policy collection, Case Studies in Transport Policy, Journal of Transport & Health and the Journal of Transport Geography – that give rise to articles that cover transportation topics. For our journal search, we used key terms 'elderly', 'older adult', transport*, and 'rural'.

We also conducted a search for grey literature in key Canadian websites, targeting national, provincial/territorial government-based organizations. Resource/publication sections from community or academic-based organizations linked through governmental websites were also searched. Through hand-searching we identified eligible resources/publications by screening titles with key terms such as 'elderly', 'older adult', transport*, and 'rural'.

Figure 1: Search in OVID Medline (main database), Oct 21, 2019

Database: OVID Medline Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present
Search Strategy:

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1 Transportation/ or motor vehicles/ or automobiles/ (20463)
2 (transport* or shuttle* or bus or buses or bussing or car or cars or taxi* or transit* commut*).mp. (776390)
3 1 or 2 (783400)
4 exp aged/ or middle aged/ (4882781)
5 (older adult* or senior* or elderly or geriatric* or elder* or older person* or old person* or middle aged or retire*).mp. (4517127)
6 4 or 5 (5031665)
7 Rural population/ (56526)
8 rural.mp. (158815)
9 7 or 8 (158815)
10 3 and 6 and 9 (1402)

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Relevance Assessment Criteria

We included peer reviewed articles if: (1) they were published in the last 10 years (2009 or later); (2) they provide a transportation solution, intervention or community program that improves social isolation or access to services or health outcomes; and (3) they are focused on older adults ages 55 years or older, and/or the focus is predominately rural settings. We did not place restrictions on study design.

Since the purpose of this rapid review was to find transportation solutions for Hamiltonians ages 55 years or older living in rural areas, we included research articles based in North American settings and excluded those from countries other than Canada and the United States of America. Language restriction included only articles published in the English.

Study Selection

All results from the database search were downloaded into a reference manager (Endnote X9.1) to deduplicate references. All references were uploaded into Covidence (https://www.covidence.org/home), which was used to facilitate title and abstract, and full-text screening. The first 200 references were used as a pilot to test our screening form. All records were screened by two reviewers independently, and in duplicate at title and abstract, and all disagreements were resolved through discussion. Full-text screening and data abstraction were conducted simultaneously and separately by each abstractor, and ineligible studies were excluded.

Data collection

Data was extracted in excel using a developed predetermined form. The extraction form was based on examples by NCCMT's *Rapid Review Guidebook.* We extracted relevant information including

study characteristics (i.e. year, study type, country, city/town, geography, participant age), interventions, outcomes, results and quality assessment.

Search Results (main databases)

Our search was conducted on Oct 21, 2019 in OVID Medline, Ageline, CINHAL, PschINFO, and Web of Science. At title and abstract, we screened a total of 2360 references and found 82 eligible for full-text screening. At full text, a total of 37 studies met our eligibility criteria, and included in our analysis (Figure 2).

Search Results (grey literature)

A total of 31 reference titles from websites were screened and found a total of 9 studies eligible for full-text screening. At full text, we identified a total of 5 studies meeting our eligibility criteria, and included all 5 in our analysis (figure 3).

Critical Appraisal

Four reviewers critically appraised 5 random studies using the relevant CASP tool that corresponded to the study type. Overall, it was found that studies tended to be weak-moderate. One reviewer critically appraised the five included grey literature references using a critical appraisal tool endorsed by Public Health Ontario.[42] Overall, the grey literature was found to be valid.

Figure 2: PRISMA Flow Diagram – Databases

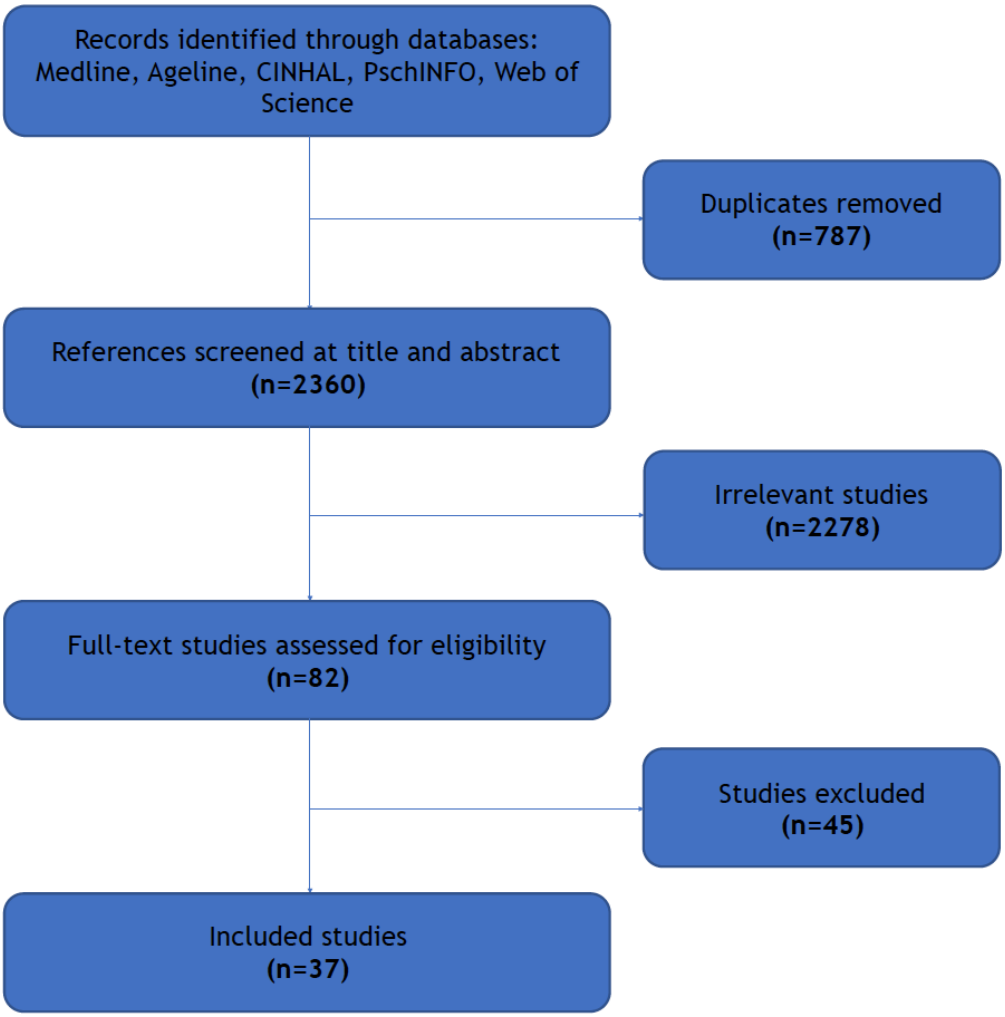

Figure 3: PRISMA Flow Diagram - Grey Literature