Canada's Drug Agency
L'Agence des médicaments du Canada

Health Technology Review

Aging in Place

Supporting Information

Glossary

Term	Definition
Acceptable housing	Housing that is adequate (i.e., does not require major repairs), suitable (i.e., contains enough bedrooms for the household), affordable (i.e., costs less than 30% of a household's before-tax income), and adaptable, accessible, and safe (i.e., currently meets, or can be modified to meet, the current and evolving needs of an older adult).[1,2]
Access (OCAP® and OCAS principle)	In the context of the First Nations principles of OCAP®, Access "refers to the fact that First Nations must have access to information and data about themselves and their communities regardless of where it is held."[3] It also refers to First Nations' right to manage and decide about accessing their collective information, for example, through standardized formal protocols.[3] According to the Manitoba Métis Federation's OCAS principles, Access "refers to the right or opportunity to use something that will bring benefits."[4]
Activities of daily living	Essential and routine tasks necessary for daily life that reflect an older adult's functional ability to care for themselves (e.g., personal care and hygiene, dressing, elimination and toileting, eating, and ambulating independently inside the home).[2,5]
Age-friendly cities or communities	Age-friendly cities or communities are those fostering healthy and active aging.[6] The World Health Organization has identified 8 domains in which cities or communities can contribute to healthy and active aging. These include outdoor spaces, transport and mobility, housing, social participation, civic engagement and employment, communication and information, and community support and health services.[6]
Aging in place	The ability of older adults to access the health and social supports they need to live safely in their own homes or communities for as long as they wish and are able.[7,8] For this report, we consider *older adults* as people aged 55 years and older in recognition of the diversity of older adults, experiences of aging, and eligibility criteria for available programs and services in Canada.[9-14] We acknowledge that the literature and real world data analyses typically conceptualize older adults as people aged 65 and above.[15] For this reason, much of the data we report pertains to people aged 65 and above. *Home* refers to various types of private dwellings. *The community* includes community-based housing options, such as retirement homes, supportive housing, and assisted living facilities. Aging "in place" excludes aging in long-term care facilities.

Assisted living facilities	Places of residence for people requiring frequent support with tasks related to activities of daily living.[16] Residents of assisted living facilities do not require medical monitoring, nursing care, and supervision typically provided in a long-term care facility.[17]
Autonomy	The right to self-governance and self-determination, including being an active participant and in control of one's own body, care, and life decisions. Aspects of relational autonomy recognize the socially embedded nature of persons, and the social, political, and economic conditions that are a background to autonomy.[18]
Care provider	A person trained and paid to provide care to people with needs related to aging (e.g., personal support workers, nurses, physicians, paramedics, social workers, care navigators and coordinators, medical translators, occupational and physical therapists, etc.).[19]
Caregiver	An unpaid family member or friend who provides care to an older adult to address needs related to aging. Caregivers provide care because of a relationship they have with an older adult, not because of a job or career.[19] Double-duty caregivers provide unpaid care to a family or friend while also being employed as a care provider.[19]
Caregiver burden	Multifaceted strain (e.g., physical, emotional, psychological, social, and/or economic) perceived by a caregiver from caring for another person over time.[20]
Comorbidity	The presence of 2 or more diseases or conditions in a person at the same time.[21]
Control (OCAP® principle)	According to the principles of OCAP®, the principle of Control "affirms that First Nations, their communities, and representative bodies are within their rights to seek control over all aspects of research and information management processes that impact them."[3] First Nations control of research "can include all stages of a particular research project."[3]
Disability	Under the medical model, this term refers to a limitation or loss of physiological abilities, whether apparent or not. These can be physical, cognitive, learning, and visual disabilities. Under the social model, disability is identified as a disadvantage or restriction of activity caused by systemic barriers, negative attitudes, and exclusion by society.[22]

Elders	First Nations, Inuit, or Métis persons regarded by their communities as having exceptional wisdom and who have made a life commitment to the holistic well-being of their community and Peoples.[10,23] Members of First Nations, Inuit, and Métis communities look to Elders for guidance and advice on family and community matters.[10,23]
Equity	Where everyone is treated according to their diverse needs in a way that enables all people to participate, perform, and engage to the same extent.[22]
Equity-deserving groups	Groups of people who have been historically disadvantaged and under-represented. These groups include but are not limited to the 4 designated groups in Canada – women, racialized groups, Indigenous Peoples, and people with disabilities – and people in the 2SLGTBQ+ community and/or those with diverse gender identities and sexual orientations. Equity-deserving groups often identify barriers and unequal access and deserve social justice.[24]
Holistic wellness	A state of interconnectedness, interdependence, and balance between physical, mental, emotional, and spiritual wellbeing.[10]
Home and community supports	Home and community supports include nonmedical services related to meal preparation and delivery, housekeeping, home maintenance, and transportation.[2,8,25,26] These supports may also include social care programs and services that facilitate older adults' engagement with their social and physical environments and healthy behaviours (e.g., exercise and financial education programs).[2,25,27] Untrained and typically unpaid individuals (e.g., family members, friends, and volunteers) may provide these services.
Instrumental activities of daily living	Activities facilitating independent living (e.g., using the telephone, managing medications and finances, shopping for essentials, and meal preparation).[2,5]
Inuit Qaujimajatuqangit	A term used to describe the knowledge of the Inuit directly translating to "that which Inuit have always known to be true."[28] At the foundation of Inuit Qaujimajatuqangit are 4 laws, or *Maligangit*, that include for the common good, respecting all living things, maintaining harmony and balance, and continually planning and preparing for the future.[28] Inuit Elders have also identified 6 guiding principles forming the basis of Inuit Qaujimajatuqangit philosophy.[28] These include: • *Pijitsirniq* (serving) • *Aajiiqatigiingniq* (consensus decision-making)

	• *Pilimmaksarniq* (acquisition of skills or knowledge) • *Piliriqatigiingniq* (collaborative relationships) • *Avatimik Kamattiarniq* (environmental stewardship) • *Qanuqtuurunnarniq* (resourcefulness to solve problems)[28]
Loneliness	The subjective feeling of distress experienced when a person perceives their social relationships as less satisfying than they desire.[29]
Long-term care	A range of care services that may include assistance with activities of daily living and instrumental activities of daily living.[2] Caregivers or care providers can deliver long-term care in the home or in designated buildings (e.g., retirement homes, assisted living facilities, supportive housing or long-term care facilities).
Long-term care facility	Places of residence that are typically publicly funded and provide ongoing care and services to people with care needs that cannot be addressed in the community.[17,30] For this report, these facilities exclude what we conceptualize as community-based housing options (i.e., retirement homes, supportive housing, and assisted living facilities).
OCAP® principles	First Nations principles that assert that First Nations have control over data collection processes and that they own and control the use of this information.[3] These principles include Ownership, Control, Access, and Possession (defined elsewhere in this glossary).[3] OCAP® is a registered trademark of the First Nations Information Governance Centre.[3]
OCAS principles	Principles concerning ethical research and engagement with Métis data that the Manitoba Métis Federation subscribes to.[4] These principles include Ownership, Control, Access, and Stewardship (defined elsewhere in this glossary).[4]
Ownership (OCAP® and OCAS principle)	According to First Nations principles of OCAP®, Ownership refers to the "relationship of First Nations to their cultural knowledge, data, and information. This principle states that a community or group owns information collectively in the same way that an individual owns his or her personal information."[3,4] According to the Manitoba Métis Federation's OCAS principles, Ownership refers to the legal possession of data.[4]
Palliative care	An approach to care aiming to improve the quality of life and physical, psychosocial, and spiritual wellbeing of people experiencing life-threatening conditions and their families.[31] Palliative care includes but is not limited to end-of-life care provided in the final weeks, days, and hours of life.

Polypharmacy	The simultaneous use of 5 or more prescription and non-prescription medications by a single individual.[32,33]
Possession (OCAP® principle)	According to First Nations principles of OCAP®, Possession refers to the physical control of data.[3,4] It is "the mechanism by which ownership can be protected and asserted."[3]
Retirement homes	Privately owned and operated facilities that provide residents with housing and communal activities.[16,34] Some retirement homes also provide a broader range of services (e.g., meal preparation, housekeeping, and even advanced care services such as dementia care).[16]
Self-Determination	A process enabling a person to exercise control over their own life.[35] Self-determination is characterized by and built upon 5 principles, including: • freedom to decide how to live; • authority over resources; • support to organize resources in a meaningful and life-enhancing way; • responsibility to use resources wisely; • and confirmation of the critical role self-advocates must play.[35,36]
Social determinants of health	Nonmedical factors that influence a person's ability to be physically, mentally, and socially healthy.[37] They are the conditions in which people are born, grow, work, live, and age, as well as the broader systems that influence the conditions of daily life.[10,37] Examples include education and literacy, employment and job security, social inclusion, food insecurity, structural conflict, history of colonization, spirituality, culture and language, and connection to land, geography, and physical environments, among others.[10,37]
Social isolation	A low quantity and quality of contact with others.[29]
Stewardship	According to the Manitoba Métis Federation's principles of OCAS, Stewardship relates to issues of "responsible planning and management of resources."[4]
Supportive housing	Shared accommodation settings with specially designed units for people who live independently with some personal support.[38]
Sustainability	The ability to maintain a process, function, support, or service over time.

Trauma- and violence-informed care

An approach to care that acknowledges the experience of trauma and violence and its impacts on health and actively works to prevent traumatizing or re-traumatizing people in health care contexts.[39] Alongside acknowledging and understanding the experience of trauma and its impact, principles underpinning trauma- and violence-informed care include:

- creating environments that are physically and emotionally safe;
- fostering opportunities for choice, collaboration, and connection;
- and providing strengths-based and capacity-building approaches that support coping.[40]

Methodology

Literature Searches

Exploratory Literature Searches

To supplement recommended reports from our expert partners and to inform topic refinement and question development, information specialists conducted five exploratory searches between October 5 and November 28, 2023. Our exploratory searches aimed to generate an overview of emerging technologies that facilitate aging in place and to identify sources of information about key components of the health system context in Canada in relation to aging. We identified:

- Ongoing trial registry records in ClinicalTrials.gov for upcoming technologies to support aging in place
- Review articles in Ovid MEDLINE published in the past five years on technologies to facilitate aging in place or the factors that lead to long-term care admission
- Editorials in Ovid MEDLINE and reports from the past two years on the factors that lead to long-term care admission
- Reports from the past 10 years on care models in North America
- Health system data sources in Canada

Our team used the results to guide consultations with decision-makers and collaborators, to inform the description of the context in Canada, to supplement consideration and integration of available Real-World Data (RWD) and Real-World Evidence (RWE), and to identify established strategies and initiatives to support aging in place.

Targeted Literature Searches – Strategies and Initiatives to Support Aging in Place

Using an iterative approach, information specialists conducted targeted searches between March 4 and April 19, 2024, for evidence of strategies and initiatives identified by the exploratory literature searches. Targeted searches about the strategies and initiatives were limited to English language publications published since January 1, 2021. We identified:

- Scoping reviews in Ovid MEDLINE and Ovid PsycINFO
- Reports from targeted web searches about comparable health systems
- Systematic reviews, rapid reviews, and scoping reviews for key initiatives in Ovid MEDLINE
- Reviews about economic considerations in OVID MEDLINE

Targeted Literature Searches – Indigenous Peoples and Communities

To capture literature about Indigenous Peoples, in consultation with experts who had identified literature from National Indigenous Organizations, we performed a targeted search for the concepts of seniors, aging in place, and First Nations, Inuit, and Métis Peoples and communities. We searched Ovid MEDLINE,

Scopus, and topic specific databases and websites focused on Indigenous health information (e.g., Circumpolar Health, First Nations Information Governance Centre, National Collaborative Centre for Indigenous Health, iPortal: Indigenous Studies Portal Research Tool, Arctic Health Publications Database, Open Polar). Our full list of Indigenous health information sources is available upon request. We also hand searched journals not available in our selection of databases: American Indian and Alaska Native Mental Health Research; First Peoples' Child & Family Review; International Indigenous Policy Journal; IK: Other Ways of Knowing; Indigenous Policy Journal; International Journal of Circumpolar Health; Journal of Indigenous Research; Native Social Work Journal; and Rural and Remote Health. The targeted search for literature about aging in place for Indigenous Peoples and communities was limited to English-language publications from January 1, 2014, to the search date of April 5, 2024.

Targeted literature searches contributed to the summaries of evidence on aging in place strategies and initiatives, economic considerations relevant to aging in place in Canada, and barriers that may challenge the implementation of aging in place initiatives in Canada.

All exploratory and targeted search strategies are available upon request.

What is the Challenge? Why are People Living in Canada Unable to Age in Place?

Context and Summary of Hinderances to Aging in Place

The following section describes the approach used for the "Why Are People Living in Canada Unable to Age in Place" section in the report.

Objectives

The key objectives of the summary were to:

- Describe aging trends and sociodemographic characteristics of older adults in Canada.
- Identify reasons people are unable to age in place in Canada.

Research Questions

1. What challenges are hindering people's ability to age in their home or community in Canada?
2. What are the characteristics of and considerations relevant to particular groups in Canada with unmet needs in relation to their ability to age in their home or community?

Methods

We followed an iterative approach to source selection, identification of information, and an inductive-deductive approach to document analysis.[41]

Literature Screening and Selection

Senior healthcare decision-makers' priorities, identified during the decision-makers roundtables (February 2024), and community engagement sessions (March 2024) informed the examination, selection, and review of screened and identified documents.

Key sources of literature iteratively selected for this summary include government and policy documents (e.g., mission statements, policy briefs, legislations, federal, provincial, and territorial agreements, governmental web pages), non-government publications on aging in place (e.g., white papers, environmental scans), editorials, reports from National Indigenous Organizations, and published review articles. Refer to the "Exploratory Literature Searches" section and "Targeted Literature Searches-Indigenous Peoples and Communities" section for further details. Sources of pan-Canadian health system data were identified from the literature search and complemented by and consultation with representatives of pan-Canadian health organizations, including Canadian Institutes of Health Information (CIHI), Statistics Canada, Public Health Agency of Canada (PHAC) as well as the Canadian Longitudinal Study on Aging (CLSA).

An interactive dashboard on our project webpage was developed to present demographic patterns and care levels of older adults using Canadian and international data sources.

Data Analysis

Concurrent to source search and selection, we conducted a document analysis[41] with an inductive-deductive approach
focused on:

- Identifying challenges hindering people's ability to age in their home or their community.
- Identifying populations that are especially or particularly impacted by these challenges with careful attention to priority groups.

One researcher conducted the analysis with the support of a second, meeting regularly to discuss source selection and analysis. Following the principles of document analysis, we iteratively examined the selected sources to identify, sort and descriptively code salient population characteristics and information relevant to aging in place issues in Canada. The researcher compared data with data, and data with codes to identify similarities, differences and patterns. Patterns were clustered in thematic categories that guided further analysis in newly identified sources. The lead researcher then shared the thematic categories with a second researcher for discussion. The 2 researchers compared and adjusted the categories in regular meetings. The lead researcher then narratively summarized the categories, formulating a description of the aging trends and sociodemographic characteristics of older adults and the issues hindering aging in place in Canada. Our Strategic Partner, Indigenous Engagement and Partnerships, purposefully selected literature detailing First Nations, Inuit, and Métis Peoples' and urban Indigenous populations' perspectives using an approach detailed in the "Considerations from Indigenous Perspectives" section. With guidance from the Strategic Partner, the lead researcher integrated key considerations from these perspectives into the summary. To do so, they used an iterative, strengths-based, and distinctions-based approach detailed in the "Indigenous Considerations" section. Our Strategic Partner, Indigenous Engagement and Relationships reviewed this initial integration. Then, researchers from Archipel Research and Contracting, an Indigenous-owned and women-led company, reviewed the integration using methods detailed in the Considerations from Indigenous Perspectives section. The lead researcher addressed feedback from this review. Our Strategic Partner, Indigenous Engagement and Relationships reviewed and approved of these changes. Further refinements were made to the final draft in response to internal feedback.

What Does the Evidence Say to Support People Living in Canada to Age in Place?

Considerations From Indigenous Perspectives

Objective

The key objective of this section was to summarize key considerations, priorities, and recommendations relevant to supporting aging in place from the perspectives of First Nations, Inuit, and Métis Peoples and urban Indigenous populations in Canada.

Research Question

What are key considerations, priorities, and recommendations relevant to supporting aging in place from the perspectives of First Nations, Inuit, and Métis Peoples in Canada?

Methods

We followed an iterative, strengths-based, distinctions-based approach to identifying, selecting, and analyzing information informing this section.

- **Strengths-based approach**: A strengths-based approach focuses on "identifying and supporting the various strengths, motivations, ways of thinking and behaving, as well as the protective factors—within the person or the environment—that support people in their journeys toward well-being."[42] This approach is grounded in respect for First Nations, Inuit, and Métis People's rights to self-determination.[10,13,36]
- **Distinctions-based approach:** As noted in our Evidence Report, a distinctions-based approach recognizes and respects unique experiences, histories, and cultural identified of First Nations, Inuit, and Métis Peoples.[10,14] It also acknowledges that each group experiences distinct health challenges and requires tailored, rather than one-size-fits-all, solutions.[14]

Literature Screening and Selection

Refer to the "Targeted Literature Searches – Indigenous Peoples and Communities" section for further details on the literature search strategy. To facilitate analysis of relevant and timely sources within a rapid timeframe, our Strategic Partner, Indigenous Engagement and Partnerships (referred to for the remainder of this section as the "Strategic Partner") excluded literature from international sources and prioritized literature from the past 5 years. After reading the full-texts of remaining sources, they iteratively selected those stating First Nations, Inuit, and Métis Peoples', communities', and organizations' priorities and recommendations relevant to aging in place.

Of note, the "Considerations from Indigenous Perspectives" section also includes considerations from 2 earlier citations, including:

- 1 capturing distinct social determinants of health for Inuit Peoples[43]
- 1 detailing Métis perspectives on aging in place[44], which was captured in the exploratory search informing the "Why Are People in Canada Unable to Age in Place?" section.

Reflexivity

In line with qualitative research best practices, before and throughout the analytical and writing process, the lead settler researcher practiced reflexivity by creating memos about their prior experiences, assumptions, and knowledge relevant to Indigenous aging well and in aging in place.[45] They used these memos to reflect on how their previous understandings might influence their analysis and challenged assumptions that were not grounded in the literature or a strengths-based lens.[45] They engaged in iterative and frequent discussions with the Strategic Partner to further challenge their assumptions and seek guidance on prioritized content, interpretations, and framing.

Data Analysis

The Strategic Partner and lead researcher had frequent, iterative discussions throughout the data analysis and writing process. To produce a narrative description that remained as close to the content of the literature as possible, they adopted an analytical approach informed by inductive qualitative content analysis.[46] They used a strengths-based and distinctions-based lens to prompt sensitivity to information relevant to supporting First Nations, Inuit, and Métis Peoples in their well-being and emphasizing their distinct needs and priorities, respectively.

The Strategic Partner first read the included literature, highlighting key passages and lines relevant to aging in place and creating memos on initial impressions and insights.[46] They shared their memos with the lead settler researcher. The researcher read and re-read passages highlighted by the Strategic Partner and additional passages contextualizing this information. The researcher highlighted additional phrases relevant to the research question and added to the memos shared by the Strategic Partner. These memos allowed the researcher to note similarities in the focus of priorities and recommendations (i.e., the strengths or challenges they intended to maximize or address). This informed their creation of categories of priorities and recommendations. The researcher coded specific priorities and recommendations under these categories while continuing to create memos. While doing so, they noted similarities in focus under priorities falling under the overarching categories, which informed their creation of subcategories. They constantly compared text assigned to codes within and across different sources to determine if they consistently applied codes. They expanded upon or modified the categories and subcategories as necessary to capture new information. Finally, they produced a narrative description of the characteristics of the identified categories and subcategories, using a distinctions-based approach to highlight specific priorities and recommendations. They shared this narrative description with the Strategic Partner, who provided feedback on its accuracy and completeness. The researcher modified the narrative description based on this feedback.

Peer Review by Archipel Consulting

The CDA-AMC project team shared a draft of the Evidence Report with Archipel Consulting. The lead researcher addressed feedback relevant to the "Considerations from Indigenous Perspectives" section. The Strategic Partner reviewed and approved of all changes made in response to Archipel Consulting's review. Further refinements to the final draft were made in response to internal feedback.

Archipel provided the following statement regarding their review methods:

This document [i.e., the Aging in Place Evidence Report] was shared with 4 Indigenous Archipel staff for review, the reviewers were representative of the 3 designated Indigenous Peoples in Canada. Therefore, the reviewers included a First Nations, Inuk, Métis, and Elder (First Nations) reviewers. Reviewers were asked to consider the following 6 areas in their review:

- Cultural relevance
- Proper language use
- Historical context
- Flagging anything inappropriate, harmful, or incorrect
- Methodology of paper
- And anything else that was relevant to mention

Each reviewer conducted their review separately and without consulting with each other to ensure distinct perspectives as it related to the *Aging in Place Evidence Report*.

Summary of Systematic Reviews

To provide clinical evidence relevant to aging in place, a targeted literature search was conducted to identify systematic reviews. Refer to the "Targeted Literature Searches- Strategies and Initiatives to Support Aging in Place" section for further details. The systematic reviews align with the summary of hinderances to aging in place and leverage existing work published by the National Institute on Aging, which identified 12 categories of initiatives that are relevant to aging in place.[2] Each of these categories also align with the summary of hinderances to aging in place. When we did not identify systematic reviews that align with these 12 categories of interest, we included scoping reviews and rapid reviews. The 12 categories of interest are listed in the Initiative Category section of Table 1**.** The outcomes of interest for these reviews align with ICHOM priority patient-centred outcomes and CIHI indicators when possible.

Objective

The key objective of the summary of systematic reviews was to identify and describe what has been published in the literature about the effectiveness of interventions aimed at helping older adults age in place.

Research Question

What initiatives are effective at helping older adults living in the community age in place?

Methods

Two researchers performed a pilot screening of 20 articles based on the criteria in Table 1 to ensure the screening strategy was consistent and functional. Adjustments to the screening criteria were made as necessary. Following the pilot screening, 2 researchers screened 1077 results based on title and abstract and identified 122 studies for full text screening. There were 50 studies eligible for inclusion. Screening was not performed in duplicate. When more than 1 relevant study was identified for one of the 12 categories of initiatives, 1 researcher critically appraised the systematic reviews using the AMSTAR 2 checklist and selected the best 1 or 2 studies for inclusion per category, based on relevance, comprehensiveness, and quality. We also added 1 additional study in a category that combined 2 or more types of interventions which spanned across the 3 the other categories. One researcher extracted data about the year, country, synthesis approach, population, intervention, comparators, and outcomes of the reviews. Data was reported narratively.

Table 1: Selection Criteria- Summary of Systematic Reviews

Criteria	Description
Population	Adults aged 55 years and older
Initiative Category	• Chronic Disease Prevention and Management • Dementia Support Programs • Falls Prevention • Assistive Devices and Home Modification Programs • Home Oxygen • At-home Care and Support Services • At-home Palliative Care • Reablement • Support for Unpaid Caregivers • Housing • Transportation • Social Isolation & Loneliness
Setting	Community or home
Country	Any country
Comparator	Any comparator, no comparator
Outcomes	• Aging-in-place • Polypharmacy • Falls • Loneliness and Isolation • Activities of Daily Living

Criteria	Description
	• Pain • Mood and Emotional Health • Autonomy and Control • Carer Burden or Caregiver Distress • Participation and Decision-making • Frailty • Time Spent in Hospital • Vital Status • Place of Death • Wait Times for Home Care Services • Hospital Stay Extended Until Home Care Services or Supports Ready • New Long Term Care Residents Who Potentially Could Have Been Cared for at Home
Timeframe	2020 to present
Study Design	Systematic reviews. If no systematic reviews identified: scoping reviews, rapid reviews.

Summary of Innovation and Technologies

Objectives

The key objective of the summary of innovation and technologies is to identify and provide examples of devices and technologies that may support aging in place.

Research Questions

What innovations and technologies are available to support aging in place?

Method

We leveraged AgeWell publications and expert opinion to identify examples of technologies and innovations that may support aging in place. We categorized the technologies identified based on how it relates to the 12 categories of interest identified by the National Institute of Aging. We highlighted specific technologies or innovations for each of the categories of interest in the main report. Other technologies identified can be seen in Table 22. To note, we did not assess the performance of identified technologies and their impact on the health and wellbeing of older adults.

Scan of International Initiatives

Objectives

The key objectives of the summary of International Initiatives are as follows:

- To identify and describe lessons learned from international initiatives that aim to support aging in place.

Research Questions

What can Canada learn from international initiatives that aim to support aging in place?

Methods

We conducted an environmental scan of reports published by governments, non-profit organizations, and agencies to identify international initiatives (e.g., strategies, care models, insurance schemes) that promote aging in place. Refer to the "Targeted Literature Searches- Strategies and Initiatives to Support Aging in Place" section for further details. We collected information about nationwide or widespread initiatives in health systems comparable to Canada. We focused our summary on initiatives with mention of outcomes, key success factors, or lessons learned.

Economic Impact and Considerations

To provide economic evidence relevant to aging in place in Canada, a targeted literature search was conducted to identify economic evaluations (including cost-effectiveness and costing studies). Refer to the "Targeted Literature Searches- Strategies and Initiatives to Support Aging in Place" section for further details. The economic evaluation literature search aligned with the results of the clinical review, with a focus on economic evidence pertaining to current programs and services relevant to aging in place across jurisdictions.

Objectives

The key objectives of economic evidence literature review are as follows:

- Describe existing economic evaluations (i.e., cost-effectiveness analyses, cost-utility analyses, cost-benefit analyses, costing studies) relevant to aging in place in Canada.
- Identify key economic considerations, including economic barriers and opportunities at the individual and health systems level.

Methods

A single reviewer screened 182 titles and abstracts and identified 39 studies for full text screening. Included studies were those that presented at least one economic outcome (cost or cost-effectiveness) related to an initiative targeting community-dwelling older adults and could be categorized into one of the 13 initiative categories. The economic review identified 8 studies to summarize that met the inclusion criteria. Data was synthesized narratively.

Included reviews were not assessed for bias or quality, nor were the primary studies included in the reviews. Further, a thorough assessment of the generalizability of the studies to contexts in Canada was not completed (e.g., relevance of target populations, included costs). Findings of the included studies have been reported as they were reported.

What Are Implementation Considerations that Support Aging in Place Initiatives?

This section aimed to summarize key considerations related to systemic factors supporting or limiting the successful implementation of aging in place initiatives and strategies in Canada. We summarized the transcript, chat, and whiteboard of one engagement session held in April 2024 with 6 health policy and implementation specialists. All participants were actively engaged in the field of policy and research in Canada, with a dedicated focus on aging populations. To summarize the key considerations discussed during the session we used an iterative approach informed by content analysis.[46]. The Engagement Summary document details the approach to and full summaries of this session.

Detailed Findings

Summary of Systematic Review – Supporting Information

Table 2: Summary of Systematic Reviews, Scoping Review, and Rapid Review

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
Systematic Reviews						
Nick et al. (2021)[47] Narrative synthesis 1997 to 2019	Chronic Disease Prevention and Management	USA Canada, Finland, Germany, Korea, Netherlands, Spain, Sweden, Thailand, UK, USA	9 RCT 3 Quasi-experimental **Intervention:** Telemonitoring technologies for remote monitoring and management of patients **Comparator:** Usual or standard care, alternative treatments, no intervention	Adults with heart failure living in the community. Mean age: ≥55 years	Self-care behaviours, proxy measures for self-care behaviours	"Overall, telemonitoring had a positive effect on self-care behaviour among adult, community-dwelling patients with heart failure. Longitudinal studies are needed to determine how long these interventions are effective."
Wasan et al. (2024)[48] Narrative synthesis Jan 1980 to Mar 2022	Chronic Disease Prevention and Management	UK Canada, Italy, Norway, Singapore, Spain, USA	5 RCT 8 NRS **Intervention:** Interventions conduced in a primary healthcare setting or in the community and involved holistic	Adults with at least 2 co-existing chronic medical conditions. Mean age: ≥60 years	Unplanned healthcare use.	"Community-based interventions have potential to reduce emergency department visits in patients with multimorbidity"

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
	Chronic Disease Prevention and Management	UK Canada, Italy, Norway, Singapore, Spain, USA	management of the patient. **Comparator:** No comparison.			
Mohler et al. (2020)[49] Narrative synthesis and MA Up to Sep 2019	Dementia Prevention and Support	Germany, Spain USA	5 RCT **Intervention:** Personally tailored activities. **Comparator:** Usual care, attention control	People living with dementia living in the community and their caregivers Mean age range: 71 to 83 years	**People Living with Dementia:** Challenging behaviour, quality of life, depression, affect. **Caregivers:** Depression, burden, quality of life.	"Offering personally tailored activities to people with dementia living in the community may be one approach for reducing challenging behaviour and may also slightly improve the quality of life of people with dementia." "For depression and affected of people with dementia, as well as caregivers' quality of life and burden, we found no clear benefits of personally tailored activities."
Lee et al. (2020)[50] Narrative synthesis and MA Up to Mar 2019	Falls Prevention	Korea Australia, Canada, Denmark, Finland, Japan, Malaysia, Netherlands, New Zealand, Singapore, Spain, Sweden, Taiwan, UK, USA	45 RCT **Intervention:** Multifactorial interventions to prevent falls. **Comparator:** Usual care	Healthy and high risk community-living older adults Age: ≥60 years	Fall rates, number of people experiencing falls	"Active multifactorial interventions had positive effects on fall rates and the number of people experiencing falls. Thus, healthcare workers, including nurses, should be involved in planning falls prevention programs so that

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
						older adults can be provided with optimal care; multifactorial interventions that include exercise and environmental modification are particularly effective in reducing falls."
Walton et al. (2020)[51] Narrative synthesis Up to Jan 2019	At-Home Care and Support Services	Australia Australia, Canada, Netherlands, USA	13 NRS **Intervention:** Home-delivered meal service **Comparator:** No home-delivered meal service	Older adults living at home	Nutritional intake	"The increased total energy intake is a positive influence on malnutrition risk in frail older adults and the increased protein intake supports good health, promotes recovery from illness and assists in maintaining functionality in older adults. Additionally, there was a particular increase in calcium intake, which is relevant in aging, especially for bone health"
Shepperd at al. (2021)[52] Narrative synthesis and MA Up to Mar 2020	At-Home Palliative Care	UK Norway, UK, USA	4 RCTs **Intervention:** Home-based end of life care	People referred for end-of-life care. Mean age of included studies: ≥55 years	Place of death, unplanned admission to hospital, participant health outcomes, patient satisfaction,	Research that assesses the impact of home based end of life care on caregivers and admissions to hospital would be a useful addition to the evidence base, and might inform the delivery of these services."

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
			Comparator: Combination of services that could include routine (not specialized) home care, acute inpatient care, primary care services, and hospice care		caregiver outcomes, staff views on the provision of services, hospice care	"The evidence included in this review supports the use of home-based end of life care programs for increasing the number of people who will die at home.
Lee et al. (2023)[53] Narrative synthesis and MA Up to Mar 2020	Reablement	Korea Australia, Finland, Germany, Norway, Sweden, Switzerland, Taiwan, UK, USA	**Intervention:** Multicomponent home-based rehabilitation, home exercise **Comparator:** In-hospital rehabilitation, active control, usual care	Older adults who underwent surgery for hip fracture Age: ≥60 years	Muscle strength, balance and mobility, ADL, Fall efficacy, QoL	"Multicomponent home-based rehabilitation is comparable to in-hospital rehabilitation regarding improvements in muscle strength, gait speed, balance, ADL, and QoL"
Raemdonck et al. (2022)[54] Narrative synthesis Up to April 2022	Support for Unpaid Caregivers	Belgium Canada, Hong Kong, Indonesia, Netherlands, Spain, USA	7 RCT 6 NRS (3 pre-post studies) 1 MM **Intervention:** Empowerment-oriented interventions **Comparator:** Wait list, usual care, provision of or funds for respite care, no treatment	Informal caregivers of older adults Mean caregiver age (range): 50 to 70 years Mean care receiver age (range): 73 to 84 years	Physical well-being, psychological well-being, confidence in providing caregiving, carer-care receiver relationship, social support, caregiving situation.	NC

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
Shekelle et al. (2024)[55] Narrative synthesis and MA Jan 2011 to June 2011	Social Isolation and Loneliness	USA Australia, England, Finland, Hong Kong, Israel, Japan, Netherlands, Spain, USA	36 RCT 24 NRS **Intervention:** Interventions to reduce loneliness **Comparator:** NR	Community-living older adults from high income countries Mean age: >55 years	Loneliness	"Low-to-moderate certainty evidence exists that group-based treatments, internet training, and possibly group exercises are associated with modest reductions in loneliness in community-living older adults."
Sheth et al. (2023)[56] Narrative synthesis 2000 to April 2022	Assistive Devices and Home Modification Programs	USA England, France, Germany, New Zealand, USA	12 RCTs **Intervention:** Geriatric home modification interventions incorporating OT practice **Comparator:** NR	Community-living older adults Age: 60 years or older	Outcomes related to older adults' functional status, including: independence, ADLs, IADLs, falls, functional efficacy, health-related quality of life, home safety, hospitalization, institutionalization, mortality	"Overall, occupational therapist-driven home modifications supplemented with clinical, physical activity, and/or behavioural components saw the greatest success."
Crocker et al. (2024)[57] Narrative synthesis and NMA Up to Aug 2021	Interventions Spanning Multiple Categories	UK Australia, Belgium, Canada, China, Denmark, England, Finland, France, Germany, Hong Kong, Italy, Japan, Netherlands, New Zealand, Norway,	129 RCT or Cluster RCT **Intervention:** Community based complex interventions **Comparator:** Usual care, placebo, attention control, or a	Older people living at home at time of study entry. Mean age: ≥65 years	**Primary outcomes:** Living at home, ADLs/IADLs, hospital admission, care home placement, homecare services usage, costs, and cost effectiveness.	"The intervention most likely to sustain independence is individualized care planning including medicines optimization and regular follow-up reviews resulting in multifactorial action. Homecare recipients may particularly benefit from this

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
		Malaysia, Singapore, Spain, Sweden, Switzerland, Thailand, USA	different complex intervention that met criteria.		**Secondary outcomes:** Health status, depression, loneliness, falls, mortality	intervention. Unexpectedly, some combinations may reduce independence."
Rapid Review						
Huggins et al. (2023)[58] Rapid Review of SR Up to Dec 2020	Support for Unpaid Caregivers	Canada NR	19 SR **Interventions:** • Psychosocial • Key workers • Technology-based • Multicomponent • Care management/ care coordination • Psychoeducational • Exercise and health promotion **Comparator:** No comparator	Informal caregivers for older adults living with dementia	• Burden • Depression and anxiety • Social outcomes, • Knowledge and skills, • Health and well-being, • Quality of life, • Health care services utilization (caregivers and person living with dementia)	NC
Scoping Review						
Martinez et al. (2020)[11] Scoping Review 1989 to 2018	Housing	Canada Canada, France, Spain, UK, USA	2 NRS 2 MM 2 Qualitative	Older adults who participated in homesharing programs as the home provider	• Benefits of homeshare participation for older adults • Challenges of participating in homeshare for older adults	"Results indicated that older adults benefitted from the increased companionship, support in completing daily tasks, and increases in well-being associated with homesharing. Navigating boundaries with respect to

First Author, Year, Synthesis, Search Dates	Category of Focus	Country of Publication; Countries Included	Types of studies, Intervention-Comparator	Population	Outcome(s) Reported	Conclusions by Authors
			Intervention: Homesharing **Comparator:** No comparator	Age: ≥65 years	• Intergenerational Engagement • The Key Role of Agency Facilitation	sharing space, time, ad interpersonal relationships was a challenge with homesharing. Agency facilitation was reported as key to supporting a positive homeshare experience for older adults."

ADL = activity of daily living; MA = meta-analysis; MM = mixed methods; NC = no conclusion; NMA= network meta-analysis; NR = not reported; NRS = non-randomized study; OT = occupational therapist; QoL = quality of life; RCT = randomized controlled trial; SR = systematic review

Table 3: AMSTAR 2 Ratings for Each Included Systematic Review

References	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Overall Rating
Crocker et al. (2024)[57]	Y	Y	Y	O	Y	Y	Y	O	Y	Y	Y	Y	Y	Y	Y	Y	High
Lee et al. (2023)[53]	Y	O	Y	O	Y	Y	O	Y	Y	N	Y	N	Y	Y	N	Y	Low
Lee et al. (2020)[50]	Y	N	N	Y	Y	Y	O	O	Y	N	Y	N	Y	Y	Y	Y	Low
Mohler et al. (2020)[49]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	High
Nick et al. (2021)[47]	Y	Y	Y	O	Y	Y	O	Y	Y	N	No MA	No MA	Y	Y	No MA	Y	Moderate
Raemdonck et al. (2022)[54]	Y	Y	N	O	Y	N	O	O	O	N	No MA	No MA	Y	N	No MA	Y	Moderate
Shekelle et al. (2024)[55]	Y	O	N	Y	Y	Y	Y	O	Y	N	Y	Y	Y	Y	Y	Y	Moderate
Shepperd et al. (2021)[52]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
Sheth et al. (2023)[56]	Y	O	Y	O	N	N	O	O	Y	N	No MA	No MA	N	Y	Y	Y	Low
Walton et al.(2020)[51]	Y	O	Y	O	Y	Y	N	O	O	N	No MA	No MA	Y	N	No MA	Y	Low
Wasan et al. (2024)[48]	Y	N	Y	O	Y	Y	N	O	Y	N	No MA	No MA	Y	N	No MA	Y	Low

Y= yes; N = No; NR = not reported; O = partial yes; No MA = no meta-analysis

Domains of the AMSTAR 2 tool: 1 = eligibility criteria contained all PICO components; 2 = contained a statement that the methods were established a priori and noted deviations from the protocol; 3 = explained selection of study designs; 4 = comprehensive literature search strategy; 6 = study selection done in duplicate; 7 = list of excluded studies with justification; 8 = included studies described in detail, 9 = satisfactory technique for appraising study-level risk of bias; 10 = reported funding sources of included studies; 11 = if meta-analysis were performed, methods were appropriate; 12 = if meta-analysis was performed, potential impact of study-level risk of bias was assessed; 13= accounted for risk of bias of included studies when interpreting results; 14 = satisfactory explanation for and discussion of heterogeneity in results; 15 = if a quantitative synthesis was performed, there was an adequate investigation of publication bias; 16 = reported conflicts of interest.

Quantitative Findings from Studies with Meta-Analyses

Table 4: Dementia Prevention and Support: Outcomes Associated with Personally Tailored Activities — Challenging Behaviour and Caregiver Burden

Study citation	Outcome, No. Studies in Analysis	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
Mohler et al. (2020)[49]	Challenging Behaviour 4 studies	SMD	-0.44 (-077 to -0.10)	0.01	Significant decrease in challenging behaviour.
	Caregiver Burden 3 studies	MD	-0.62 (-3.08 to 1.83)	0.62	No significant effect on in caregiver burden.

MD = mean difference; SMD = standardized mean difference.

Table 5: At- Home Palliative Care: Outcomes Associated with Home Based End-of-Life Care — Dying at Home

Study citation	Outcome, No. Studies in Analysis	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
Shepperd et al. (2020)[52]	Dying at home 2 Studies	RR	1.31 (1.12 to 1.52)	0.0005	Home based end of life care increased the likelihood of dying at home.

RR = risk ratio.

Table 6: Fall Prevention: Outcomes Associated with Multifactorial Interventions Compared to Control or Usual Care — Rate of Falls

Study citation and study design	Subgroup	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
All Groups					
Lee et al. (2020)[50]	All Groups	RR	0.68 (0.58 to 0.81)	<0.01	Significantly lowered rates of falls
Participant Fall Risk					
Lee et al. (2020)[50]	High Risk	RR	0.66 (0.52 to 0.84)	<0.01	Significantly lowered rates of falls
	Healthy	RR	0.72 (0.58 to 0.89)	<0.01	Significantly lowered rates of falls
	Frail	RR	1.41 (0.98 to 2.02)	0.06	Did not significantly lower rates of falls
Intensity of Intervention					
Lee et al. (2020)[50]	Active	RR	0.64 (0.51 to 0.80)	<0.01	Significantly lowered rates of falls

Study citation and study design	Subgroup	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
	Referral	RR	0.77 (0.58 to 1.02)	0.07	Did not significantly lower rates of falls
Inclusion of Exercise					
Lee et al. (2020)[50]	Exercise	RR	0.66 (0.54 to 0.80)	<0.01	Significantly lowered rates of falls
	No Exercise	RR	0.74 (0.51 to 1.08)	0.12	Did not significantly lower rates of falls
Inclusion of Environmental Modifications					
Lee et al. (2020)[50]	Environmental Modifications	RR	0.65 (0.54 to 0.79)	<0.01	Significantly lowered rates of falls
	No Environmental Modifications	RR	0.82 (0.55 to 1.21)	0.31	Did not significantly lower rates of falls

RR= risk ratio

Table 7: Fall Prevention: Outcomes Associated with Multifactorial Interventions Compared to Control or Usual Care — Number of People Experiencing Falls

Study citation and study design	Subgroup	Measure of Effect	Effect Size (95% CI)	p value	Interpretation
All Groups					
Lee et al. (2020)[50]	All Groups	RR	0.83 (0.72 to 0.95)	<0.01	A significantly lower number of people experienced falls.
Participant Fall Risk					
Lee et al. (2020)[50]	High Risk	RR	0.84 (0.69 to 1.01)	0.06	Did not have a significantly lower number of people experiencing falls.
	Healthy	RR	0.77 (0.62 to 0.95)	0.02	A significantly lower number of people experienced falls.
Intensity of Intervention					
Lee et al. (2020)[50]	Active	RR	0.73 (0.60 to 0.89)	<0.01	A significantly lower number of people experienced falls.
	Referral	RR	0.97 (0.80 to 1.17)	0.76	Did not have a significantly lower number of people experiencing falls.
Inclusion of Exercise					
Lee et al. (2020)[50]	Exercise	RR	0.79 (0.66 to 0.95)	0.01	A significantly lower number of people experienced falls.
	No Exercise	RR	0.88 (0.70 to 1.11)	0.28	Did not have a significantly lower number of people

Study citation and study design	Subgroup	Measure of Effect	Effect Size (95% CI)	p value	Interpretation
					experiencing falls.
Inclusion of Environmental Modifications					
Lee et al. (2020)[50]	Environmental Modifications	RR	0.80 (0.68 to 0.95)	<0.01	A significantly lower number of people experienced falls.
	No Environmental Modifications	RR	0.96 (0.81 to 1.14)	0.64	Did not have a significantly lower number of people experiencing falls.

RR= risk ratio

Table 8: Reablement: Outcomes Associated with Multicomponent Home-Based Rehabilitation — Daily Activity

Study citation	Intervention, Comparaton, No. Studies in Analysis	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
Lee et al. (2023)[53]	I: Multicomponent home-based rehabilitation C: In-hospital rehabilitation 2 Studies	MD	-2.70 (-9.80 to 4.40)	0.46	There is no significant difference in daily activity between multicomponent home-based rehabilitation and in-hospital rehabilitation.
	I: Multicomponent home-based rehabilitation C: Usual care 3 Studies	MD	2.21 (0.65 to 3.77)	<0.001	Daily activity significantly improved for the multicomponent home-based rehabilitation group compared to usual care group.

MD = mean difference.

Table 9: Reablement: Outcomes Associated with Home Exercise vs. Usual Care — Muscle Strength, Balance, Mobility, Daily Activity, and Quality of Life

Study citation	Measurement Tool or Test No. Studies in Analysis	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
Muscle Strength, Balance, and Mobility					
Lee (2023)[53]	Knee extensor 3 Studies	MD	19.65 (9.78 to 29.51)	<0.0001	Knee extensor strength was significantly improved in home exercise groups.

Study citation	Measurement Tool or Test No. Studies in Analysis	Method of Measurement	Effect Size (95% CI)	P value	Interpretation
	Grip strength 2 Studies	MD	0.64 (-12.80 to 14.08)	0.09	There was not a significant difference in grip strength between groups
	Berg Balance Scale 3 studies	MD	1.08 (0.51 to 1.65)	0.0002	There was a significantly increased Berg Balance Scale score in the home exercise group compared to the usual care group.
	Time up and Go Test 5 Studies	MD	-4.86 (-7.48 to -2.24)	0.003	Home exercise group showed significantly reduced Timed Up and Go compared to the usual care group.
	6-minute walk test 3 studies	MD	76.98 (36.10 to 117.85)	0.0002	Home exercise group showed significant improvements in the 6-minute walk test compared to the usual care group.
	Gait speed 4 studies	MD	0.15 (0.03 to 0.27)	0.01	Home exercise group showed significantly improved gait speed compared to the usual care group.
Daily Activity					
Lee (2023)[53]	Barthel index or modified barthel index 4 Studies	MD	3.53 (1.22 to 5.83)	0.003	Home exercise group showed a significant increase in ADL compared to the usual care group.
Quality of Life					
Lee (2023)[53]	Physical component score 2 Studies	MD	3.46 (2.40 to 4.52)	<0.00001	Quality of life (physical component score) significantly improved for the home exercise group compared to the usual care group.

MD = mean difference.

Table 10: Social Isolation and Loneliness: Outcomes Associated with Interventions to Decrease Social Isolation — Reduction in Loneliness

Study citation	Intervention Group	Method of Measurement	Studies	Effect Size (95% CI)	P value	Interpretation
Shekelle et al.[55]	Group-based treatment	SMD	11 RCT	-0.25 (-0.42 to -0.08)	NR	Group-based treatment may decrease loneliness.
			5 NRS	-0.46 (-0.86 to -0.07)	NR	
	Internet training	SMD	5 RCT	-0.22 (-0.30 to -0.14)	NR	Internet training may decrease loneliness.
			5 NRS	-0.33 (-0.86 to 0.21)	NR	
	Group exercises	SMD	1 RCT	-0.52 (-1.20 to 0.16)	NR	Group exercises may have a change of very sightly improving loneliness.
			3 NRS	-0.13 (-0.28 to 0.01)	NR	

NR = not reported, NRS = non-randomized study; RCT = randomized controlled trial; SMD = standardized mean difference.

Table 11: Interventions Spanning Multiple Categories: Outcomes Associated with Multicomponent Interventions — Living at Home

Study citation	Intervention Group	Method of Measurement	Effect Size (95% CI)	Interpretation
Crocker et al. (2024)[57]	Multifactorial action and review (follow ups) with medication review	RR	1.01 (1.00 to 1.02)	Probably results in slight increase in chance of living at home
	Multifactorial action with medication review	RR	1.04 (0.96 to 1.06)	May result in increase in chance of living at home
	Cognitive training, medication review, nutrition, and exercise	RR	1.03 (0.98 to 1.05)	May result in increase in chance of living at home
	Activities of daily living training, nutrition, and exercise	RR	1.03 (0.97 to 1.05)	May result in increase in chance of living at home
	Risk screening	RR	0.99 (0.97 to 1.01)	May result in very slight reduction in chance of living at home
	Education and multifactorial action and review with medication review	RR	0.99 (0.96 to 1.01)	May result in very slight reduction in chance of living at home
	Education and multifactorial action and review with self-management strategies	RR	0.91 (0.97 to 1.01)	May result in reduction of chance of living at home.

RR = risk ratio

Economic impact and considerations

Chronic Disease Prevention and Management

The systematic review conducted by Romano et al.[59] summarized economic evaluations of deprescribing interventions for community-dwelling older adults 65 years of age and older. This systematic review searched online databases from inception to 2021 and included studies that reported economic outcomes of deprescribing interventions in the community or primary-care setting. The systematic review included 14 primary studies (Table 12). Primary studies included in the systematic review included studies from the following jurisdictions: Europe (n = 9), North America (n = 3, including 2 from Canada), South America (n = 1) and Asia (n = 1).

Table 12: Summary of Included Primary Studies in Systematic Review Conducted by Romano et al.[59], N = 14 Studies

Study Characteristic	Number of studies
Data source of effectiveness measurement	
Randomized controlled trial	11
Other	3
Comparators	
Usual care	10
Usual care with additional educational material	2
Other	2
Perspective of analysis	
Third party public payer	11
Societal	2
Hospital	1
Cost categories[a]	
Intervention costs	14
Medication	11
Emergency department	12
Hospitalizations	13
Outpatient services or medical staff (e.g., physicians, nurses, physiotherapists)	14
Institutional care (e.g., rehabilitation, long-term care facilities)	3
Laboratory / diagnostic tests	4
Indirect costs (e.g., informal care, travel time)	2

[a] Indicates the number of studies that included each cost category out of 14 included studies.

The majority of interventions were medication reviews (n = 12), and the remaining 2 were patient education programs. Study populations differed across primary included studies. Across all studies, the

target population was real (i.e., based on participants of an efficacy study) or hypothetical (i.e., simulated population) community-dwelling older adults. Some studies were focused on those with a specific number of prescribed medications, a threshold of number of chronic conditions, or by type of medication (e.g., sedatives or NSAIDS). All of the included studies used a time horizon of 12 months or less (ranging from 2 months to 12 months).

Overall, cost-effectiveness results suggested that deprescribing initiatives may offer good value to the health care system. Of 7 economic evaluations conducted in community pharmacy settings, deprescribing initiatives were found to be dominant (i.e., provide improved health at a lower cost; 4 studies) or were associated with incremental cost-effectiveness ratios (ICERs) ranging from $18,708 to $52,389 per QALY gained (presented in 2019 US dollars; 3 studies). There were 6 studies conducted in outpatient, general practices, primary care and geriatric clinics for which the findings ranged from the initiatives dominating usual care (2 studies), and the remainder had ICERs that ranged from $434 to $42,846 per QALY gained (2019 US dollars).

The two studies that were conducted using data from Canada are summarized in Table 13. Both studies found that the deprescribing initiatives being assessed were likely to cost the health care payer less and offer improved health outcomes (i.e., the initiatives were dominant compared to usual care).

Table 13: Additional Details and Study Findings From the Two Studies Conducted Using Data From Canada[59]

Study details and findings	Turner et al., 2021[60]	Sanyal et al., 2020[61]
Study population	Community-dwelling adults aged 65 years or greater, long-term sedative users (>3 months prescription claims) for insomnia management	Hypothetical community-dwelling adults aged 65 years or greater, long-term oral NSAID users (>90 days supplied in the previous 120 days)
Time period of data collection	2014 to 2018	2014 to 2018
Intervention type	Patient education	Patient education
Comparator	Usual care	Usual care
Effectiveness outcome	QALY	QALY
Perspective	Third party public payer	Third party public payer
Time horizon	12 months	12 months
Cost categories	Pharmacist intervention, sedative medication, doctors visits, emergency department visits, hospital admission	Pharmacist intervention, sedative medication, doctors visits, emergency department visits, hospital admission
Incremental Costs	-$1,153.31	-$850.34
Incremental effectiveness	0.0769	0.1078
Cost-effectiveness	Dominant intervention (i.e., provided more health benefits and had lower	Dominant intervention (i.e., provided more health benefits and had lower

Study details and findings	Turner et al., 2021[60]	Sanyal et al., 2020[61]
	incremental costs than the comparator)	incremental costs than the comparator)

NSAID = non-steroidal anti-inflammatory drugs; QALY = quality-adjusted life-year.

Dementia Prevention and Support

The systematic review conducted by Walsh and colleagues assessed the economic impact (including cost-effectiveness and return on investment) of interventions delivered at the community or population level targeting known risk factors for dementia.[62] The aims of the interventions were to act on the modifiable risk factors in order to prevent or delay dementia diagnoses later in life.

Table 14: Additional Details of Study Details and Findings, Organized by Risk Factor Targeted in Walsh et al., 2022[62]

Risk category	Intervention examples	General cost / cost-effectiveness results
Smoking (n = 15)	Mass media anti-smoking campaigns (10 studies) State level tobacco control plans (2 studies) National Quitlines (2 studies) Multi-faceted community intervention (1 study)	Generally economically positive results; some studies reported cost-savings, others reported favourable cost per life-year gained Reported favourable returns on investment
Education (n = 10)	Removing financial barriers to accessing education, improving resource availability (7 studies) Financial support to young people to access higher education (1 study) Meal programs in schools (1 study) Provision of pre-school and early school years (1 study)	Costs were borne outside of the healthcare system for many interventions. Results generally found favourable returns on investment, cost savings, or cost effectiveness results long term
Physical inactivity (n = 9)	Changes to the built environment, including park refurbishment, sidewalk improvement, and road closures (8 studies) Providing free leisure centre access (1 study)	All 9 studies reported favourable economic results, however, there were methodological limitations associated with some studies
Obesity (n = 5)	Changes to the school environment (3 studies) Whole-of-community intervention (2 studies)	There were mixed economic results across the 5 obesity studies in different settings
Air pollution (n = 2)	Subsidize and/or provide cleaner heating/cooking technologies (2 studies)	Results focused on China, Kenya, Nepal, and Sudan found variable returns on investment arising from reduced disease

Risk category	Intervention examples	General cost / cost-effectiveness results
		and fuel costs
Head injury (n = 1)	Three interventions to promote helmet use – legislative intervention, community-based intervention, and school-based intervention	The cost per life year gained was most favourable for legislative and community-based interventions, and considerably higher for school-based interventions
Multiple risk factors (n = 3)	Workplace-based interventions targeting multiple risk factors (2 studies) Community-based prevention program targeting multiple risk factors (1 study)	Workplace interventions were associated with large reductions in risk factors for low costs. The community-based prevention program from Sweden found null results

A second systematic review was identified that reported findings on the excess costs of dementia on a global scale.[63]. This systematic review identified 22 primary studies from a database search conducted in 2020 that were written in English or German, were published between April 1 2010 and March 31, 2020, and reported cost outcomes related to dementia. The majority of primary studies were conducted using data from North America (n = 10; no studies from Canada were identified) and Europe (n = 9). There was one study each from Australia, Asia, and South America.

Table 15: Summary of Included Primary Studies in Systematic Review Conducted by Sontheimer et al.[63], N = 22 Studies

Study Characteristic	Number of studies
Data Source for cost information	
Claims data	10
Primary data	7
Combination of claims and primary data	5
Study perspective	
Third party public payer	4
Societal perspective	3
Not reported	15
Setting	
Limited to people living in residential care	2
Limited to only community-dwelling people	5
Mixed populations	15
Cost categories	
Total	21
Inpatient	21
Outpatient	14
Medication	13

Study Characteristic	Number of studies
Long-term care facilities	6
Professional home care	8
Emergency departments	5

Cost differences and impacts on cost were assessed in multiple settings (i.e., in the community, in residential care, or a mix of both) and at various time points (time of diagnosis, time between diagnosis and death, and the time prior to death). Information on total costs of dementia were not presented, rather, the authors were able to estimate whether costs were increased for people with dementia compared to those without. This study estimated that in the time period between diagnosis and death, total costs were 119% higher for those with dementia than those without. At the time period around diagnosis, total costs were 108% higher, and for the time period around death total costs were not found to be higher for those with dementia.

Falls Prevention

The systematic review conducted by Kwon and colleagues included economic evaluations of falls prevention interventions for community-dwelling adults, with a goal of providing methodological advice for future economic evaluations in this research area.[64] This systematic review searched published and grey literature from 2003-2020 and included articles published in English that met their inclusion criteria. This systematic review identified 46 primary studies in total, 3 of which were from Canada. One has been described in this report in the Chronic Disease Prevention and Management Section,[60] and the 2 remaining studies are detailed in Table 16.

Table 16: Summary of Included Primary Studies in Systematic Review Conducted by Kwon et al.[64], N = 46 Studies

Study Characteristic	Number of studies
Intervention type (n = 101; some studies assessed multiple interventions)	
Exercise	33
Home assessment and modification	11
Medication review and modification	10
Cataract surgery	5
Vitamin D supplement	11
Other single component	6
Multifactorial intervention	17
Multiple component intervention	7
Evidence source for falls risk	
Individual level epidemiologic data	8
Published epidemiologic data and/or expert opinion	25

Study Characteristic	Number of studies
Internal intervention study evidence	9
Risk/rate from external randomized controlled trial control group	4
Health consequences modelled	
Medically attended or injurious fall	30
Fracture	22
Long term care facility admission following fall	14
Excess mortality	12
Cost categories	
Ambulatory care	29
Emergency department visits	33
Hospitalization	39
Outpatient rehabilitation	30
Short-term social care	7
Long-term care facility admissions	26
Comorbidity care	3

Table 17: Additional Details and Study Findings From the Two Studies Conducted Using Data From Canada[64]

Study details and findings	Nshimyumuzika, 2013[65]	Ontario Medical Advisory Secretariat, 2008[66]
Study population	Women aged 40+ (with subgroup aged 65+)	Community dwelling adults aged 65+
Type of analysis	Cost-effectiveness analysis, cost-utility analysis	Cost-effectiveness analysis, return on investment
Intervention	Fracture risk screening and physical activity, vitamin D and calcium, and/or osteoporosis screen and treat	Exercise; home assessment modification; vitamin D and calcium; medication modification; gait stabilizer
Comparator	Non-recipient of modelled interventions	Non recipient of modelled interventions
Perspective	Public sector payer	Public sector payer
Time horizon	Lifetime	Lifetime
Model type	Decision tree + Markov patient level model	Markov cohort model
Cost-effectiveness outcomes	No screening + physical activity dominates comparator (i.e., provides greater health gains at a lower cost); Bone Mineral Density/fracture risk assessment screening + physical activity + vitamin D & calcium results in ICER of US$52,279 relative to no screening + physical activity and dominates all other	All interventions assessed dominate comparator (i.e., provide greater health gains at a lower cost) for men and women.

Study details and findings	Nshimyumuzika, 2013[65]	Ontario Medical Advisory Secretariat, 2008[66]
	strategies.	

ICER = incremental cost-effectiveness ratio

At-home Care and Support Services

We identified a systematic review that included studies published between 2000 and 2020 that assessed the relative benefit and outcomes of adding informal care or formal care providers to the care mix among community-dwelling adults receiving care in their homes.[67] This systematic review identified 65 primary studies, 28 of which reported outcomes related to health care use and costs.

Table 18: Summary of included primary studies in systematic review conducted by Coe et al.[67]

Study characteristics	Informal care compared with formal care (n = 33 studies)	Informal care in the presence of formal care (n = 13 studies)	Formal care in the presence of informal care (n = 9 studies)	Heterogeneity based on care combinations (n = 10 studies)
Health care use and cost outcomes, n studies reporting	15 studies	6 studies	5 studies	2 studies
Cost categories	Hospitalization Medication Long-term care institutionalization Emergency department use Skilled nursing facility	Hospitalization Emergency department use Vaccination	Hospitalization Doctor visits Long-term care institutionalization	Hospitalization Doctor visits Medication
Regions/countries represented	Asia Europe Canada United States	Asia Europe Canada United States	Asia Europe United States	Asia Europe Middle East Oceana Canada United States

An additional systematic review assessed the cost-effectiveness of enhanced home care interventions for community-dwelling older adults, and included 17 primary studies that were identified in the literature up to 2020.[68] A summary of the included primary studies is presented in Table 19. There were 4 primary studies that were from Canada, and they are described in more detail in Table 20.

Table 19: Summary of Included Primary Studies in Systematic Review Conducted by Flemming et al.[68], N = 17 Studies

Study Characteristic	Number of studies
Intervention type	
Alternative nursing care	4
Fall prevention	4
Interdisciplinary care coordination	4
Telemedicine / remote monitoring	2
Reablement / restorative care	2
Undernutrition	1
Health services use outcomes direction	
Positive	6
Mixed	4
Neutral	2
Not reported	5
Cost outcome direction	
Increased	5
Decreased	9
Neutral	1
Mixed	2
Cost-effectiveness outcome direction	
Positive, or cost-effective	11
Negative, or not cost-effective	4
Neutral	2
Nort reported	1

Table 20: Additional Details and Study Findings From the Studies Conducted Using Data From Canada[68]

Study details and findings	Isaranuwatcha, 2017[69]	Markle-Reid, 2010[70]	Markle-Reid, 2011[71]	Markle-Reid, 2003[72]
Study population	Community-dwelling older adults (75 years or older) who are accessing home care services	Older adults (aged 75 years or older) at risk for falls	Adults following stroke receiving community-based stroke rehabilitation.	Community-dwelling older adults who are frail.
Intervention type	Received usual care, plus monthly in-home visits by an interprofessional team with specialized training in the area of fall prevention	Standard home care, plus home visitation by a dedicated team of professionals a minimum of once	Standard home care plus additional home visitation by a dedicated interprofessional	Received standard case management plus regular in-home or telephone contacts by a

Study details and findings	Isaranuwatcha, 2017[69]	Markle-Reid, 2010[70]	Markle-Reid, 2011[71]	Markle-Reid, 2003[72]
		per month for 6 months.	team of healthcare providers to provide a comprehensive, collaborative, and evidence-based approach to stroke rehabilitation.	registered nurse.
Comparator	Usual care	Usual home care services	Usual home care services	Usual care
Perspective	Societal	Societal	Societal	Societal
Outcome for economic evaluation	Incremental net benefit and cost-effectiveness acceptability curve	Cost per service area	Cost per service area	Cost per service area
Cost-effectiveness results	Overall, the intervention was not economically favourable. However, results were more favourable in subgroup analysis of adults 85 years and older (at a willingness to pay threshold of $5,000 and a group of adults aged 75 to 84 years (at a willingness to pay threshold of $25,000).	The intervention was associated with reduced falls and similar costs as usual home care in a subgroup of male adults aged 75 to 84 years, with a fear of falling and a negative fall history. In the overall population, there was no difference in the mean number of falls between groups.	The intervention was associated with some clinical improvements, including measures of well-being and social functioning, and physical functioning at a higher total per person cost for health services.	The intervention was associated with clinically important improvements in physical and mental health at no additional expense from a societal perspective. Annual cost savings of $200,879 were predicted as a result of avoided hospitalizations for every 100 home care clients.

Reablement

The systematic review conducted by Ipsen et al.[73] identified 3 cost-effectiveness studies focused on rehabilitation interventions targeting community-dwelling older adults following hip fractures. This study provided a summary and narrative synthesis of the cost-effectiveness studies. All three economic evaluations were conducted from the health care payer perspective (i.e., considered only costs borne by the health care payer).

Table 21: Description of Interventions and Cost-Effectiveness Outcomes in the Three Included Studies Identified by Ipsen et al.[73]

Setting and year of publication	Intervention	Comparator	Cost-effectiveness findings
Australia, 2016[74]	Exercise regimen performed 3 times per week, and regularly progressed by physiotherapists. Intervention included dietary strategies such as counselling, referrals to community meal programs, and provision of commercial oral nutritional supplements.	Usual rehabilitation care.	Incremental cost-effectiveness ratio: 13,471 Euros per QALY gained. Difference in QALYs gained: 0.02 Difference in costs: 206 Euros
Norway, 2019[75]	Home based rehabilitation program starting 4-months post-surgery including 2 exercise sessions per week for 10 weeks, supervised by physiotherapists.	Usual rehabilitation care.	No health benefit, and a small incremental cost. Difference in QALYs gained: 0 Difference in costs: 242 Euros
Norway, 2015[76]	Comprehensive geriatric care in a geriatric ward with focus on comprehensive medical assessment and treatment, initiation of rehabilitation through mobilization.	Usual rehabilitation at the orthopedic ward.	The strategy was cost saving and improved health outcomes. Difference in QALYs gained: 0.09 Difference in costs: -3,528 Euros

QALY = quality-adjusted life-years

Summary of Innovation and Technologies

Table 22: Examples of Innovations and Technologies

Type of Technology	Device Name	Description
Chronic Disease Management and Prevention		
Mobile Health	Wellth	An app that supports and incentivizes healthy habits for certain conditions and mental health.
	ElderPrime, Manage My Pain	An app for users to track their health status and adhere to their care plan.
	NonnaTech, ReemoWatch VitalTracer, VivaLink	Remote biomarker monitoring devices that allow users and health care providers to view collected data and insights. The devices may vary in the biomarkers monitored.

Type of Technology	Device Name	Description
	Aetonix, Cloud Dx, Safe in Home, SeamlessMD Vesta Healthcare VitalTech,	Remote biomarker monitoring systems that allow users and health care providers to view data, as well as access virtual care or support. The systems may vary in the features offered and biomarkers monitored.
	CareAngel, MyEleanor	AI digital health assistants
Medication Management	HeroHealth, Karie, Pillsy, TrakTab	A smart medication tracker or dispenser to manage and help adhere to medication plans.
	Mango Health	An app that sends customizable reminders about medications.
Dementia Support		
Assessment Tools	PainChek	A device that aims helps providers assess pain using facial analysis technology
	Speech Analysis API	A tablet-based tool that intends to help detect cognitive impairment using speech analysis.
	BrainFx, Cogniciti, Neurotrack	Other virtual cognitive assessment platforms
Mobile Health	Data day	An app that may help self-manage care designed for individuals with dementia or mild cognitive impairment.
Brain Engagement	Akili, BrainHQ, LUC-101	Tailored digital therapies for cognitive training.
	HippoCamera, InspireD, LifeBio Memrica, Storyworth	Platforms to log and preserves memories for older adult. HippoCamera can create cues to help users with their memory.
Falls Prevention		
Assessment	Kinesis	A digital tool to evaluate risk for falls and identify potentially appropriate rehabilitation to prevent falls.
Mobility	RayMex Lift	A portable lift and rollator walker with an adjustable height and seat.
Activity Monitoring	Canary Care, CarePredict, Chirp, EchoCare Emerald*, HomeExcept*, SafeWander, Stack Care	These are monitoring systems that can help detect falls and emergencies. Some leverage AI to enhance the user's privacy, detect unusual behaviour, or deviations from routines *(marked with *)*.

Type of Technology	Device Name	Description
	Senitare*, Toch Sleepsense	
Assistive Devices and Home Modification		
Hand Support	Steadi-Two	A wearable glove that may stabilize hands
	Guided Hands	The device supports users with limited fine motor skills to perform tasks involving their hands (e.g., writing, drawing) by promoting the use of shoulders instead of hands.
Hearing Support	Sound Notifying App	An app that listens for noises and alerts when immediate attention is needed (e.g., fire alarms).
	Heard That	An app that aims to eliminate background noise.
Vision Support	Esight	Glasses for macular degeneration
	Luna Lights	Sensor activated lights to guide users during the night time
Reablement		
Digital Rehabilitation and Mobility	Heel2Toe, Kinexcs	Devices that use sensors for real-time feedback for rehabilitation
	MyndMove	A device that delivers non-invasive FES therapy to the upper body
	Sword	A platform for digital physical therapy
	Curovate	A smartphone app for a 6-month rehabilitation program
	2RaceWithMe	The device simulates a biking using augmented reality and users must "pedal" to travel.
Home Care Support Services		
Care Coordination	CareTree	A software that may support care management and coordination.
Care Delivery and CRM	Bloom, CareShip Care Guide, CareLink, Got Care, HomeTouch Honorcare, Papa, Vidal Home Care Social Support App	Online platforms to find and hire home care providers or support workers.
End of Life Care		
End of life planning	Cake, Everplans	Funeral planning platforms
	Vynca	Care planning for users with conditions in advanced stages
Support for Unpaid Caregivers		
Support and Online Community	Cariloop	A platform to access digital tools, personalized guidance, and an online community to help alleviate stress and burnout for caregivers
	Daughterhood	An online community for carers
Training	Caregiver Enabled Care Program, Care Academy	Platforms that provide training for caregivers

Type of Technology	Device Name	Description
Assistive Devices	Alta Platform	An automated system to help caregivers transfer patients.
	PostureCoach	A wearable to monitors posture and provides immediate feedback to avoid injury
Housing		
SMART technologies	K4Connect	A service that helps integrates home technologies into 1 system
	Emitto	A system to help user with mobility issues control their home environment.
Home Share	HomeSharing, Nesterly	A platform for older adults to find a roommate or to rent a space.
	FreeBird Club	A website designed for older adults to book stays during trips.
Transportation		
SMART technology	Blind Spot Sensors	The sensors turn any wheelchair into a "smart" wheelchair.
Other	GoGoGrandparent	The platform helps users access transport services and order necessities for delivery.
	MM3	This device is currently being investigated but it includes a smartwatch app that monitors mobility and predicts health outcomes.
Social Isolation & Loneliness		
Digital and Robot Companions	Buddy	A virtual companion that also helps with self-managing care
	T-top	Table top robot as a social companion
	Safe in Home	Remote companion for users to access for support
Social Media and Communication	Grandpad FamliNet	Platforms to facilitate communication with loved ones and care team.
	Kluppen, Stitch	Platforms to meet others.

AI = Artificial Intelligence; App = application; CRM = Customer Relationship Management; FES = functional electrical stimulation; OLED = organic light emitting diode.

Note: This table provides examples of technologies that may support aging in place. We extracted data from available from websites and may not be a detailed overview of features offered by the technologies and innovations identified.

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