Prioritization of Older Adult Fall Prevention Indicators in Ontario

Published: October 2022

Key Findings

- In Ontario, falls pose a serious public health threat to older adults. Across the continuum of fall risk for older adults, several sectors play a role in preventing falls; however efforts are disconnected across the province.

- The Ontario Fall Prevention Collaborative (OFPC) was established in 2019 to facilitate a system-wide approach to fall prevention in Ontario. The OFPC emphasized the need for population-level indicators on fall prevention for surveillance and to inform the implementation and evaluation of interventions.

- An environmental scan with a Modified Delphi process was used to identify, prioritize and specify population-level fall prevention indicators.

- The prioritized list of indicators includes:

    1. rate of emergency department visits due to a fall,

    2. direct and indirect costs associated with fall-related injuries,

    3. proportion of dedicated fall prevention leads, at a system level,

    4. proportion of older adults with a comprehensive falls risk screening and assessment completed,

    5. rate of hospitalizations due to a fall,

    6. rate of mortality due to a fall,

    7. number of 911 calls transported vs. not transported,

    8. proportion of falls by place of occurrence.

- A prioritized, specified list of indicators for fall prevention among older adults is a much-needed resource for fall prevention practitioners across sectors and can be used to inform programs of public health.

Objectives and Scope

Falls are a serious public health issue in Ontario. Fall prevention initiatives have shown effectiveness at reducing healthcare costs associated with falls,[1] however, a disconnected approach across sectors in Ontario has hampered the understanding of the impact of fall prevention efforts. The Ontario Fall Prevention Collaborative (OFPC) was established by the Ontario Neurotrauma Foundation in 2019 to facilitate a system-wide approach to fall prevention in Ontario.[1] The OFPC emphasized the need for population-level indicators for surveillance and to inform the implementation and evaluation of interventions. These indicators can serve across the public health approach to prevention, most importantly as system performance measures for fall prevention in Ontario. The objective of this project was to identify, prioritize and specify population-level fall prevention indicators.

Background

Falls are a frequent experience for older adults (adults ages 65+) in Canada; 20-30% of older adults fall every year.[2] Falls have immediate physical consequences, including injuries and represent the leading cause of injury-related emergency department visits and hospital admissions among older adults in Canada.[2] In 2019-2020, there were 199,683 emergency department visits by older adults who had experienced a fall.[3] A portion of these are serious enough to require hospital admission. For older adults, falls can be a significant turning point towards frailty and overall health decline.[2] Furthermore, fall-related injuries represent the highest cost of all injuries to Canadians at $10.3 billion in direct and indirect health costs.[4]

In Ontario, every year since 2011, falls have accounted for over 65% of injury-related hospitalizations among adults ages 65 to 74 and over 80% for those over 75 years.[5] Falls have long-term physical consequences for older adults, including requiring injury rehabilitation, the acceleration of age-related physical decline, chronic pain, decreased mobility, and increased dependence on care.[2] Falls also have long-term, non-physical consequences for older adults, including social isolation, reduced self-esteem and self-efficacy, depression, and reduced engagement with life.[2]

The impact of fall prevention programs and how to improve them in Ontario is unknown.[1] The OFPC was established to implement an integrated, efficient, and cost-effective approach to fall prevention in Ontario. The Collaborative is comprised of fall prevention professionals from public health, primary care, long-term care, home and community care, and pre-hospital care.[1] To facilitate a system-wide approach to fall prevention programming in Ontario, the OFPC expressed the need to identify, prioritize, and specify population-level indicators. As a partner in this work, Public Health Ontario (PHO) set to address this need.

Methods

We conducted an environmental scan including a Modified Delphi process of older adult fall prevention indicators. The process included two phases: 1) a peer-reviewed and grey literature search to identify indicators from relevant government, public health, and injury prevention sites; and, 2) a Modified Delphi process that included consensus development and specification of the list of prioritized indicators through consultation with members of the OFPC and experts in the area of injury indicators. The third stage of this work will evaluate a set of indicators in practice with a sample of public health units in Ontario.

Phase One

The goal of the literature search was to identify and compile a list of indicators and data sources for older adult fall prevention reporting and evaluation in Ontario. The approach to developing the list of indicators is previously published;[6] however in short, indicators were identified using relevant vocabulary and key words. Information on each indicator was extracted from the literature and included the source document, geographic location, year, indicator type (e.g., policy, outcome) and data source. Finally, each fall-prevention practitioner from the OFPC was asked to populate a list of indicators currently used in their sector. They were also asked to indicate the data sources used to populate each indicator. The search strategy for both the peer-reviewed and grey literature searches are available upon request.

Phase Two

Based on the list of indicators identified from Phase One, a Modified Delphi approach was used to finalize the list of indicators. This process included refining the list across a series of consultation exercises including completing two online surveys, a prioritization process and expert consultation. We used previously published methods[7,8] to complete this phase, informed by our fall-prevention experts.

SURVEYS

First, an online survey was administered to fall-prevention practitioners from the OFPC that asked them to recommend indicators that were not previously identified in the literature search or as already used in any health sectors, but that they believed could be useful to their work. Then, a second survey was administered that asked participants to score each previously identified or recommended indicator on a scale of 1-9 (do not agree to extremely agree) based on three criteria: usefulness, feasibility, and ability to prompt action. These criteria reflect the critical functions of indicator collection and reporting, namely, how useful an indicator is at informing decision-making, how feasible it is to collect and report on, and how likely it is to prompt action in fall prevention. Criteria were chosen based on expert consultation and previous work in this area,[7-9] and were used to ensure that the indicators support the goals of fall prevention work in Ontario, and ultimately improve fall-related health outcomes. Scores for each indicator and criterion were summed and averaged. Scores were then used to determine the total score for each indicator *across* the three criteria and across sectors. The list of indicators across the three criteria from the online survey were then used in a consultation process with our team of experts to further refine the list.

PRIORITIZATION PROCESS

A third-party focus group consultant was hired to conduct a prioritization activity with key members of the OFPC. A sample of participants from the OFPC were recruited for this activity, including at least one representative from each sector represented in the OFPC. In preparation for the activity, participants were given resources including the list of indicators, previously refined from the online survey. Participants spent 60 minutes discussing each indicator and completing a pairwise ranking exercise. Each indicator was compared to each other on which was a priority, based on one of the three previously used criteria: ability to prompt action for fall prevention in Ontario. This criterion and methodology were chosen based on expert consultation and previous work in this area.[9] Scores were recorded for each comparison, with 1 point for each comparison won (a total of 136 comparisons). During the prioritization process, participants were advised to think about which indicators should be prioritized *across* sectors (over what is a priority within just their sector), in addition to those that are most likely to prompt action. Participants had the opportunity to ask questions for clarification on indicator descriptions and were presented with the final list of prioritized indicators for final thoughts and feedback.

The prioritized indicator list developed from the pairwise comparison activity was presented to our team of experts. Feedback was collected specific to the pairwise comparison matrix, including a process that further refined the list of indicators. Finally, the list of prioritized indicators was sent to the OFPC members for a final round of consensus. This included their level of agreement on the list of indicators, specific to the changes made from the pairwise comparison activity. Participant questions and concerns were addressed, and their feedback/input was incorporated into the final indicator list and specification tables.

INDICATOR SPECIFICATION TABLES

Specific information regarding each indicator was organized into specification tables to be used as a resource for fall prevention practice in Ontario. Information within the tables includes the indicator's importance and use in fall prevention, relevant key terms, methods and data sources used to calculate the indicator, where the data can be found, potential categories for sub-analyses, and any limitations. The information detailed in the tables was adapted from the Association of Public Health Epidemiologists in Ontario (APHEO) core indicators,[10] Public Health Ontario's Injury Snapshot Technical Notes,[5] and the *Measuring Injury Matters* report.[11,12]

The inclusion of the use and importance of each indicator in the tables provides a justification for the indicator and identifies why it is important for use in older adult fall prevention. It also suggests how the indicator results should be interpreted and used in practice. Any terms included in the indicator title or description were defined to ensure equal comprehension across sectors that may use the indicator specification tables as a resource. Methods of calculation were included, with the numerator and denominator needed to calculate it identified for rate-based indicators. Data required to calculate the indicator was also identified, regardless of its availability. Links to data sources were included to improve navigation and prompt use of the indicator specification tables in fall prevention practice.

Results

Phase One

The peer-reviewed and grey literature search identified indicators across seven sectors, available in the original report[6]. This original list included many indicators that were identified across multiple sectors, resulting in significant duplication. Additionally, the original list included some concepts that were not determined to be 'true indicators', defined for this purpose as a measure that can be populated with a meaningful numerator and denominator, and from which a specification table can be developed. As a result, a summarized version of this list including only true indicators, and with duplicates removed, is available in Table B1 of Appendix B. In the table, each identified indicator is listed and the sectors from which the indicators were identified are marked with an 'X'. Sectors include public health, pre-hospital care, hospital care (emergency and acute care), rehabilitation care, home and community care. Most of the indicators include data from regional, provincial sources and national sources and were specific to hospital (acute) care, long-term care, and the public health sector.

Phase Two

SURVEY

The survey results included responses from 19 injury prevention practitioners from several sectors in Ontario. Sectors included: academia, public health, rehabilitation care, injury prevention not-for-profit organizations, regional health authorities, home and community care, hospital (acute) care, and 'other' (e.g., self-employed). Roles within each sector varied from involvement in research to local public health practice. The indicator ranked the highest across the three criteria was the 'rate of hospitalizations due to a fall'. When comparing the scores across sectors for each criterion, the respondents still ranked this indicator as the highest. Two indicators consistently ranked lowest for each criterion and across sectors. These were 'disability-adjusted life years due to a fall' and 'number of 911 calls transported vs. not transported (i.e., to hospital).' The other indicators varied in their priority level based on how respondents assessed their usefulness, feasibility, and ability to prompt action for fall prevention. The three highest-ranking indicators were 'rate of hospitalizations due to a fall,' 'rate of emergency department visits due to a fall,' and 'proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)' with scores of 8.02, 7.39, and 7.39, respectively.

PRIORITIZATION PROCESS

Following the indicator scoring survey, we held several guided discussions with participants from the OFPC and experts to collect feedback on the list of indicators from the survey. Throughout this process, some indicators were re-worded and refined for clarity and relevance, and some were removed where it was determined that they were not useful or actionable. Additionally, some indicators were combined as they were determined to be iterations of broader indicators. For example, '30-day repeat emergency department visits' was identified as a sub-category of the 'rate of emergency department visits' indicator, so they were combined. This process produced the list that was then used at the final prioritization activity and can be found in Table B2 of Appendix B.

At least one member from each sector participated in the final prioritization activity (n=9). The results of the pairwise comparison activity were recorded in a pairwise comparison matrix. Three indicators received the same score, leading to discussions on the final list regarding which indicators were more actionable and relevant to older adult fall prevention practice. For instance, 'proportion of older adults with a comprehensive falls risk screening and assessment completed' and 'rate of hospitalizations due to a fall' received the same score; however, discussion led to consensus on the 'proportion of older adults with a comprehensive falls risk screening and assessment completed' indicator as being more actionable for fall prevention.

Expert consultation post-prioritization, provided input on the pairwise comparison results. Feedback also included necessary considerations for many indicators when creating indicator specification tables (Appendix C). Based on low scores in the pairwise comparison matrix, one indicator was excluded from the final list, 'disability-adjusted life years due to a fall'. Given the low score and agreement that the indicator was less relevant to older adult falls compared to fall-related disability among younger populations, it was removed from the final prioritized list. The final list of indicators, prioritized for use in fall prevention practice in Ontario can be found in Table 1, below.

Table 1: Final Prioritized List of Older Adult Fall Prevention Indicators for Practice

Ranking	Indicator
1.	Rate of emergency department visits due to a fall
2.	Direct and indirect costs associated with fall-related injuries
3.	Proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)
4.	Proportion of older adults with a comprehensive falls risk screening and assessment completed
5.	Rate of hospitalizations due to a fall
6.	Number of 911 calls transported vs. not transported
7.	Rate of mortality due to a fall
8.	Proportion of falls by place of occurrence

INDICATOR SPECIFICATION TABLES

The specification tables for each indicator in Table 1 can be found in Appendix C. The specification tables provide information on the importance and use of each indicator, as well how the data should be interpreted and used in practice. We provide operational definitions of each indicator as well as key terms included in the indicator title or its description, to ensure equal interpretation across sectors that may use the indicator specification tables as a resource.

The methods of calculation for each indicator are also included. The numerator and denominator needed to calculate the indicator are identified for rate-based indicators and sources of data required to calculate each indicator have been identified, regardless of data availability. Where available, links to data sources and existing documents that report on that indicator are included to improve navigation and use of the indicator specification tables in practice.

The most relevant data source to populate some of the prioritized indicators is the Canadian Institute for Health Information (CIHI) administrative data set that includes emergency department visits and hospitalizations across causes. This data set can be also used to populate the place of fall occurrence; however, the quality of the data in this case is unknown. Some indicator specification tables do not have a data source listed under regional, provincial, national, and/or global levels of analysis. This means that there is no known data sources available to populate that indicator; a common limitation identified across several indicators. Although the potential subcategories and methods of stratification can vary across indicators, participants identified several prioritized strata including socioeconomic status or level of marginalization, geographic location or facility, and demographic characteristics such as race, age, sex, and dwelling status.

Discussion

This environmental scan and Modified Delphi process developed and prioritized indicators to prompt action for the prevention of falls among older adults in Ontario. The indicators can be used to better understand the true burden of fall-related injuries among older adults and inform both population-level intervention and evaluation. Further, specification of the prioritized indicators can provide the guidance necessary for those working in older adult fall prevention to use the indicators in practice. There were several older adult fall prevention indicators identified from the literature review, reportedly used across heath care sectors and across the continuum of fall risk prevention for older adults (i.e., primary to tertiary prevention).

This project demonstrated clear differences in setting priorities for fall prevention indicators, across sectors. For example, participants expressed that certain indicators are more or less of a priority, as you move across the continuum of prevention. For primary care, risk screening and assessment was prioritized. Local data specific to the proportion of older adult fall patients without a screening and assessment completed by a primary care physician or falls risk assessment clinic provides practitioners with a targeted population to address. However, fall risk screening and subsequent intervention are informed by clinical practice guidelines (CPGs).[13] Currently, it is difficult to ascertain if CPGs are used in Ontario, how they are used, and by whom.[13] This was an important consideration discussed in our participant and expert consultations as without existing CPGs used systematically across Ontario, this indicator may be less useful for practitioners to action.

One of the most significant actions from the consultation processes was to refine the list of indicators from the literature search to the prioritization activity. For example, several indicators were derivatives of a higher order indicator (e.g., rate of emergency department visits v. rate of emergency department visits due to a fall across levels of marginalization). This also included 'length of stay in a hospital for a fall-related injury' as a sub-category of the rate of hospitalizations related to a fall. Interestingly, expert opinion noted this indicator is often considered by practitioners as a proxy measure of injury severity; however, length of stay in hospital, particularly in older adults may be confounded by existing comorbidities. Literature in this area demonstrates that as age increases, the length of stay in hospital increases,[14] which may be more of a function of the interaction of comorbidities with the fall-related hospital admission. Furthermore, data shows that the average length of stay due to a fall is approximately 40% longer than the average length of stay for other causes of hospitalization for Canadians ages 65 years and over.[14] Another consideration in length of stay for inpatient older adults may be differences attributable to discharge to home versus long-term care. Evidence suggests that increased length of stay for older adults, post fall hospitalization, may be reflective of delays in arranging community or other support services for those that live at home, compared to those in assisted living.[15] This is concerning as older adults with increased length of stay are also at an increased risk of inpatient falls,[16] supporting literature that previous falls are a significant predictor of subsequent falls, outside of the inpatient context.[2] Another sub-category of the rate of hospitalizations was specific to the number of femur, hip, pelvic, and vertebral fractures. This was considered important data for older adult falls as previous literature demonstrates that these fractures are a strong predictor of life-long disability and even death.[17]

Specification on the level of analysis for cost associated with fall-related injuries was based on expert opinion. As health care costs are affected by the size of the population and the number of falls per population, specification of this indicator should include both direct costs (e.g., direct expenses to the healthcare system) and indirect costs (e.g., costs to society due to loss of productivity in the workforce) presented at a provincial or national level.[4] Finally, the proportion of injuries by the place where a fall occurred is the indicator currently ranked as the lowest priority, across sectors in Ontario. This finding is of interest as during the consultation process with participants, the need for information specific to location of injury for older adult falls was emphasized. Currently, previous reports such as those published by the Public Health Agency of Canada demonstrate that 50% of the hospitalizations from falls in older adults were from a fall occurring in the home.[2] What is unknown; however, is where in the home the fall took place, how the fall occurred, or the rate of falls in home versus in other older adult living arrangements.

Important to this process was feedback from participants to not limit the prioritizing process to existing indicators. Fall prevention practitioners across sectors valued the need for indicators that may not currently exist, or have existing data sources to populate them that may better reflect their work in fall prevention. This resulted in four of eight indicators in the list not currently publicly available in Ontario, and three of eight that do not have existing data sources. This creates a challenge to fully realize and evaluate the use of these indicators in practice; however, it is important to consider ways to access data to populate the indicators in future work in this area. Finally, it was noted that the ability to interact with the data (e.g., display the data into sub-categories via data visualizations) allows injury prevention practitioners the specificity needed to target high risk populations, as well as to design and appropriately evaluate fall prevention programming.

Limitations and Strengths

A strength of this work comes in its novelty to Ontario. This is the first time a list of prioritized and specified indicators has been made available to fall prevention practitioners. This can facilitate the systematic use of indicators for reporting and program implementation and evaluation across the province. Our methods were informed by experts, using a previously published process for developing injury prevention indicators[7,8] specifically for older adult fall prevention.[9] An additional strength includes the iterative engagement of practitioners across the process. The results were revised based on participant feedback, and extensive effort was made to include experts and practitioner representatives.

There are; however, some limitations to this work. The literature review included only sources published in English; therefore, some relevant non-English sources may have been excluded. Secondly, the survey results were limited by low participation rates (n=19 respondents). This was due to the redeployment of many fall prevention practitioners to the COVID-19 pandemic response. Third, during the consultation process to prioritize indicators, there was a disproportionate contribution to the discussion across sectors. As a result, we implemented the pairwise comparison activity to determine the prioritized indicators to overcome this limitation. The pairwise comparison allowed for equal participation and equal weight placed on each participant's response. The previously published literature review provided a list of 75 indicators.[6] This list contained many duplicated indicators that were considered for prioritization, thus needing refinement by our project team. As previously noted, there are three prioritized indicators where data to populate them is not currently accessible or available. Future work should include plans to access data to populate these indicators. Finally, there is a lack of a 'gold standard' set of indicators for older adult fall prevention. A 'gold standard' set of indicators could be used to validate the performance of the indicators in practice. Future work includes evaluating the use of the indicators in this report with public health practitioners in Ontario.

Implications for Practice

A prioritized, specified list of indicators for fall prevention among older adults is a much-needed resource for fall prevention practitioners, across sectors. Referencing one set of indicators for system performance measurement can increase collaboration across sectors, streamlining program implementation and evaluation efforts, and better reflect the true burden of falls and fall-related injury for surveillance. Further, the use of new indicators, previously not used in practice can better reflect the work of local public health units for fall prevention. Providing the infrastructure to support interaction with the data and indicators presented in this project, can reduce the duplication of fall prevention efforts across sectors. This includes the ability to disaggregate indicators by age, sex, level of marginalization, and geographical location. This level of information can provide public health units with data unique to those at higher risk of falls and severe fall-related outcomes.

Conclusion

An environmental scan and Modified Delphi process were used to establish a set of prioritized, specified indicators for older adult fall prevention practice. The prioritized list of indicators include outcome indicators such as the rate of emergency department visits, hospitalizations, and mortality due to a fall, and risk related indicators such as the proportion of older adults with a comprehensive falls risk screening and assessment completed. The highest priority was given to the rate of emergency department visits and the least priority to the proportion of falls by place of occurrence.

A breadth of indicators exist for older adult fall prevention, yet there lacks guidance for their systematic use in Ontario. There is potential for significant impact on public health practice from this project, including making an impact on the burden of fall-related injury in Ontario. The next step of this project includes evaluating a subset of the prioritized indicators in practice in Ontario. This will be done in collaboration with practitioners from public health units in Ontario, the Association of Public Health Epidemiologists of Ontario (APHEO), the OFPC and injury prevention experts. We will evaluate the use of the indicators in practice for older adult fall prevention programming and evaluation. The evaluation will also assess the feasibility and sustainability of generating, analyzing, and reporting on the full list of indicators.

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Appendix A

Figure A1: Flow diagram describing the process of indicator list development and prioritization, beginning from the Environmental Scan and culminating at the final, prioritized list of indicators.
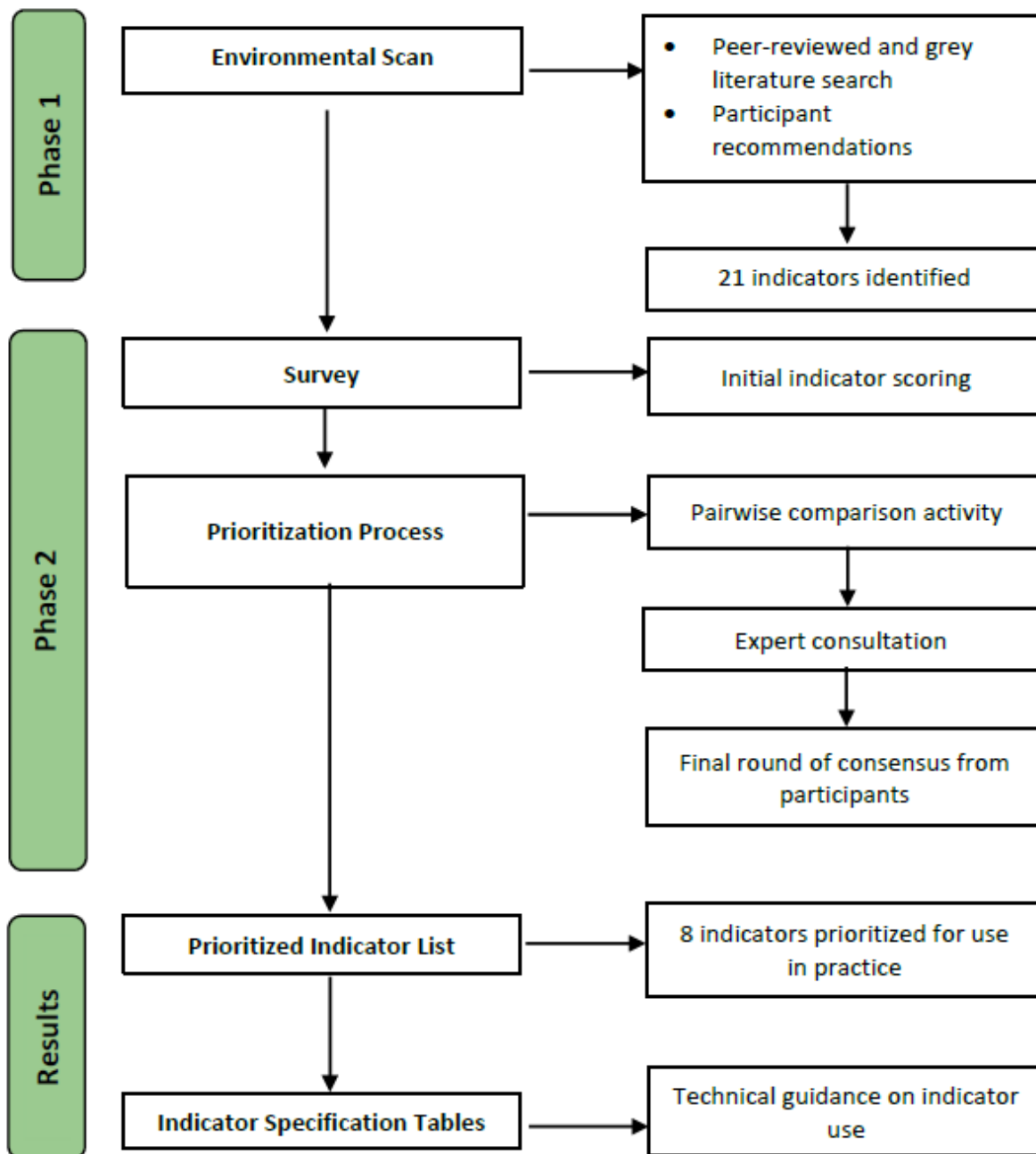
Appendix B

Table B1: Summarized Indicators from Peer-reviewed and Grey Literature Search for Older Adult Fall Prevention

Number	Indicator	Public Health	Pre-Hospital Care	Hospital (ED)	Hospital (acute)	Rehab Care	Home, Community Care	Long-Term Care
1	Rate of emergency department visits due to a fall	X		X		X		X
2	Rate of hospitalizations due to a fall	X		X		X		
3	Rate of mortality due to a fall	X			X			
4	Proportion of fall-related injuries by activity associated with fall	X						
5	Disability Adjusted Life Years (DALYs) due to a fall	X						
6	Direct and Indirect costs associated with fall-related injuries	X						
7	Proportion of Public Health Units that include fall prevention in their strategic plans/frameworks	X						
8	Proportion of total 911 calls due to a fall transported to hospital vs. not transported		X					
9	Rate of serious fall-related injury hospitalizations			X	X			X

Number	Indicator	Public Health	Pre-Hospital Care	Hospital (ED)	Hospital (acute)	Rehab Care	Home, Community Care	Long-Term Care
10	Length of stay in hospital due to a fall-related injury				X			
11	Proportion of patients with a completed falls risk assessment by setting (i.e. hospital, long-term care, home and community care).				X		X	X
12	Proportion of fall patients who received post-fall interventions				X			
13	Percent of organization-wide compliance with fall precautions				X			
14	Proportion of healthcare facilities implementing fall prevention education programs to staff				X			X
15	Average wait time for surgery following a fall-related injury					X		
16	Rate of falls within a specific setting (i.e. hospital, long-term care, home and community care)				X		X	X
17	Proportion of residents with restraints							X
18	Rate of patient transfers from long-term care per 1000 patients				X			

Number	Indicator	Public Health	Pre-Hospital Care	Hospital (ED)	Hospital (acute)	Rehab Care	Home, Community Care	Long-Term Care
19	Proportion of strength and balance programs available, specific to older adult fall prevention					X		
20	Proportion of home risk assessments completed					X		
21	Fall prevention score (assigned at a system level) based on actions taken toward fall prevention							X

Table B2: Prioritized List of Indicators across Sectors and Three Criteria: Usefulness, Feasibility, and Ability to Prompt Action, Survey Results

Rankings	Indicator
1	Rate of hospitalizations due to a fall
2	Rate of emergency department visits due to a fall
3	Proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)
4	Proportion of older adults with a comprehensive falls risk screening and assessment completed
5	Proportion of falls by place of occurrence
6	Rate of mortality due to a fall
7	Direct and indirect costs associated with fall-related injuries
8	Disability-adjusted life years due to a fall
9	Number of 911 calls transported vs. not transported

Appendix C

INDICATOR SPECIFICATION TABLES

Table C1: Rate of Emergency Department Visits Due to a Fall

Indicator	Rate of Emergency Department Visits Due to a Fall
Operational Definition	The number/rate per 100,000 of emergency department visits due to a fall
Importance and Use	The rate of emergency department (ED) visits due to a fall is a key indicator to describe the burden of falls on the healthcare system. Reporting on these data annually would allow users to observe trends over time and gain some perspective on the burden of falls in the population.
Key terms	**Emergency department visit:** An ED visit occurs when a person presents to the emergency department, or a hospital-based urgent care centre, either by their own means or by ambulance, and without a prior scheduled appointment
How is it calculated?	Rate of ED visits **Numerator**: Number of ED visits due to falls for adult's ages 65-84 and 85+ years. **Denominator**: the total resident population of Ontario adults aged 65-84 and 85+ years. **Method of Calculation**: (Numerator/Denominator) x 100,000
What data is needed?	Total number of ED visits due to a fall for adults aged 65-84 and 85+ years ICD-10 External Cause Codes: W00-W19 Population estimates of people ages 65 years and older
Where can it be found?	**Numerator:** The original source can be found on the Canadian institute for Health Information (CIHI) National Ambulatory Care Reporting System (NACRS). It is distributed by the Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO. **Denominator:** Population estimate (2003 to 2017) Original source: Statistics Canada Distributed by: Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO

Indicator	Rate of Emergency Department Visits Due to a Fall
	Level of Analysis: Global **Data Report** WHO Global Report on Falls Prevention in Older Age **Level of Analysis:** National **Data Source**: CIHI **Level of Analysis**: Provincial **Data Source**: PHO Injury Snapshots National Ambulatory Care Reporting System metadata (NACRS), CIHI **Data Report**: Integrated Provincial Fall Prevention Toolkit
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls in older adults, ED visits due to a fall can be analyzed by other variables such as: **Socio-economic status or level of marginalization** **30-day repeat ED visits due to a fall** **Geographic location** **Demographic characteristics such as age, sex, and dwelling status**
Limitations	Falls that require ED visits tend to denote more serious falls and injuries. As such, this indicator provides some information toward the burden of falls in older adults.

Table C2. Direct and indirect costs associated with fall-related injuries

Indicator	Direct and indirect costs associated with fall-related injuries
Operational Definition	An estimate of the direct and indirect healthcare costs associated with fall occurrences and fall-related injuries
Importance and Use	Falls among older adults create substantial direct and indirect healthcare costs. These costs can be used to directly estimate fall burden on the healthcare system. This indicator can be expressed as cost per fall or cumulative costs stratified by direct and indirect healthcare costs. This indicator can provide information regarding the cost of falls/fall-related injuries in comparison to other health outcomes (e.g., cardiac arrests).
Key terms	**Direct healthcare cost:** accrued when using a good or service that is provided directly by the healthcare system. **Indirect healthcare cost:** all other costs associated with an ail that do not come directly from using the healthcare system, such as societal costs through productivity loss, informal caregiving resulting in days off work, and premature mortality.

Indicator	Direct and indirect costs associated with fall-related injuries
How is it calculated?	**Cost Per Fall** **Numerator**: total amount of direct and indirect healthcare costs attributable to falls for people ages 65 and older for the fiscal year. **Denominator**: total number of injurious falls that require interaction with the healthcare system for people ages 65 and above during the fiscal year. **Method of Calculation**: Numerator/Denominator
What data is needed?	Direct healthcare costs attributable to falls for people ages 65 and older per fiscal year Indirect healthcare costs attributable for people ages 65 and above per fiscal year Total number of injurious falls that require interaction with the healthcare system for people ages 65 and older by jurisdiction during the fiscal year
Where can it be found?	**Level of Analysis:** Provincial **Data Report**: Parachute
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls, costs can be stratified by: • **Indirect versus direct healthcare costs**
Limitations	There is limited publicly available data for this indicator. Indirect costs are crude estimates only.

Table C3. Proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)

Indicator	Proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)
Operational Definition	A dedicated fall prevention lead at a system level, responsible for fall prevention programming.
Importance and Use	Strategic planning to decrease falls is an important way to organize a collective and system-based response to falls across a region or province. The first component of this involves being able to identify dedicated fall prevention lead positions within the jurisdiction of interest. This indicator can be used to demonstrate a strong commitment to fall prevention.
Key terms	**System:** An entity with multiple components, parts, and organizations that work together to achieve or provide something, for example, the healthcare system **Strategic Plan:** A comprehensive proposal geared towards action that can decrease falls at a population level
How is it calculated?	**Quantitative** **Numerator:** Number of systems or units with a dedicated fall prevention lead **Denominator:** Total number of systems or units within the specified level **Method of calculation:** (Numerator/Denominator) x 100 (expressed as a %)
	Qualitative Use qualitative methods and practitioner engagement to report on the level of adoption and adherence to fall prevention strategic plans by organization/group/system/area. In addition, information gathering in conjunction with other indicators to discern the effect on fall prevention among adults age 65 years and older.
	Measures of success outlined in strategic initiatives from the fall prevention lead position Look to the guidelines provided in the strategic initiative to calculate this measure.
	Quantitative measure of adoption and adherence Number of other organizations, groups, areas, or systems that have adopted strategic frameworks and combine this information with other indicators outlined in this report or the strategic initiative to gauge success of that adoption. Can compare to organizations, groups, areas, or systems that have not adopted or adhered to the guidelines to evaluate success, but consultation of an Evaluation Specialist is recommended.

Indicator	Proportion of dedicated fall prevention leads, at a system level (e.g., public health unit)
What data is needed?	Qualitative information from practitioners Publicly available information on organizations, groups, areas, or systems that conform to the strategic framework
Where can it be found?	**Level of Analysis:** Provincial: **Data Report**: Public Health Ontario **Level of Analysis:** Regional **Data Source:** Regional Geriatric Program of Eastern Ontario
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls among older adults in Ontario, practitioners can consider: **Existence and enforceability of a policy regarding training for fall prevention practitioners** **Availability of evidence-based programming for fall prevention** **Availability of a strategic plan/framework/organization aimed at fall prevention** **Systems and resources in place to support fall prevention**
Limitations	This indicator is difficult to quantify and there is a possibility for highly variable evaluation methods. This indicator should be used to demonstrate how the system is functioning.

Table C4. Proportion of older adults with a comprehensive falls risk screening and assessment completed

Indicator	Proportion of older adults with a comprehensive falls risk screening and assessment completed
Operational Definition	The number or percentage of fall risk assessments that are completed in primary, acute, or long-term care settings following patient/resident presentation, hospital admission, change in medical status, or medical event such as a fall.
Importance and Use	Fall risk screening and assessment in older adults is a fall prevention strategy demonstrating significant positive results in the scientific literature. Following hospital or long-term care admission, a change in medical status or occurrence of a medical event changes a patient's or resident's fall risk. The results of the screening assessments help health professionals make decisions about appropriate fall prevention efforts needed to reduce the risk of a fall or subsequent fall. A falls risk screening and assessment should include questions about one's general health and plans for subsequent intervention. Questions regarding the patient's family history, current medications, age, weight, height, and posture can inform their risk of falling.
Key terms	Falls Risk Screening Assessment: a tool that is used to evaluate an individual's likelihood of experiencing a fall or fall injury in his/her/their current state in order to inform decisions about appropriate fall prevention efforts for that individual in a long-term care or acute care setting.
How is it calculated?	Numerator: Number of fall risk assessments completed for those aged 65 and older in acute care or long-term care settings. Denominator: Number of admissions, changes in medical status, and medical events for those ages 65-84 and 85+ in acute care or long-term care settings. Method of Calculation: Numerator/Denominator x 100 (expressed as a %)
What data is needed?	Total number of falls risk screening assessments completed for people ages 65-84 and 85+ Total number of admissions, changes in medical status, and medical events for people ages 65-84 and 85+ Comprehensive data gathering of fall risk assessment clinical practice guidelines and use

Indicator	Proportion of older adults with a comprehensive falls risk screening and assessment completed
Where can it be found?	**Level of Analysis:** National: **Data Source**: CIHI Canadian Patient Safety Institute (Acute) Canadian Patient Safety Institute (LTC) **Level of Analysis:** Provincial **Data Source**: NQuIRE (viw RANO) **Data Report**: Health Quality Ontario
Potential Sub-Analyses* ***Note: These are suggestions of potential stratification categories, and not an exhaustive list.**	To inform a more detailed understanding of falls risk screening and assessment, this indicator can also be stratified by: Type of assessment Geographic location or facility Demographic characteristics such as age, sex, socioeconomic status, and dwelling status To inform a more detailed understanding of the public health response to falls among older adults in Ontario, practitioners can also consider: Availability of a quality improvement initiative focused on formalizing a standardized falls screening program
Limitations	This indicator has limited application beyond acute care and long-term care settings. This indicator can be used to assess fall prevention efforts in the community and in the primary care sector use which typically only follows an emergency department visit and subsequent discharge. The number of fall risk screening and assessments completed locally and provincially is significantly impacted by clinical practice guidelines (CPGs). As such, implementing provincial CPGs in this regard would make use of this indicator more appropriate. Other limitations include accuracy of data collection surrounding admissions, changes in medical status, and medical events. Data for this indicator are not publicly available.

Table C5. Rate of hospitalizations due to a fall

Indicator	Rate of hospitalizations due to a fall
Operational Definition	The number/rate per 100,000 of hospital admissions due to a fall
Importance and Use	Falls that require hospitalization tend to be more severe and have more severe long-term health consequences than falls that do not require hospitalization. Hospitalizations can also have long-term implications for older adults, such as transitions to more dependent care. This indicator estimates the hospitalization burden generated by falls.
Key terms	Hospitalization: occurs when a person is admitted to hospital for a period of time usually lasting at least overnight, with the intent to discharge as soon as medically appropriate.
How is it calculated?	Rate of hospitalizations Numerator: Number of hospitalizations due to falls for adults' ages 65-84 and 85+ years. Denominator: the total resident population of Ontario adults ages 65-84 and 85+ years. Method of Calculation: (Numerator/Denominator) x 100,000
What data is needed?	Total number of hospitalizations due to a fall for adults ages 65-84 and 85+ years-old ICD-10 External Cause Codes: W00-W19 Population estimates of adults aged 65-84 and 85+ years-old

Indicator	Rate of hospitalizations due to a fall
Where can it be found?	Numerator: The original source can be found on the Canadian institute for Health Information (CIHI) National Ambulatory Care Reporting System (NACRS). It is distributed by the Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO.
	Denominator: Population estimate (2003 to 2017)
	Original source: Statistics Canada
	Distributed by: Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO
	Level of Analysis: Global:
	Data Report: WHO Global Report on Falls Prevention in Older Age
	Level of Analysis: National:
	Data Source: CIHI
	Level of Analysis: Provincial:
	Data Source: PHO Injury Snapshots
	CIHI
	Data Report: Integrated Provincial Fall Prevention Toolkit
Potential Sub-Analyses* ***Note: These are suggestions of potential stratification categories, and not an exhaustive list.**	To inform a more detailed understanding of falls, hospitalizations due to a fall can be analyzed by other variables such as:
	Length of stay in hospital for a fall-related injury
	Hospitalization due to a fall resulting in a hip, pelvic, vertebral and/or femur fracture
	Geographic location
	Demographic characteristics such as age, sex, and dwelling status
Limitations	Falls that require hospital admission tend to be more serious falls and injuries. As such, this indicator provides some information toward the burden of falls in older adults. This indicator may often be underreported, as the cause for hospitalization could be misclassified as another health outcome discovered upon admission. Length of stay can be impacted by external factors that are not a reflection of a fall or fall injury severity, such as resource availability and comorbidities in the patient.

Table C6: Rate of mortality due to a fall

Indicator	Rate of mortality due to a fall
Operational Definition	The number/rate per 100,000 of deaths that occur due to a fall
Importance and Use	Death is a severe outcome that can result from a fall in older adults. This indicator can capture mortality that is either a direct or an indirect result of a fall injury.
Key terms	**Intentional Mortality:** death that results from a cause that was intended to harm. **Unintentional Mortality:** death that results from a cause that was not intended to harm.
How is it calculated?	Mortality Rate **Numerator**: Number of deaths due to falls for adults ages 65-84 years and 85+ years. **Denominator**: the total resident population of Ontario adults ages 65-85 years and 85+ years. **Method of Calculation**: (Numerator/Denominator) x 100,000
What data is needed?	Total number of deaths due to a fall for adults ages 65-84 and 85+ years ICD-10 External Cause Codes: W00-W19 Population estimates of people aged 65-84 and 85+ years
Where can it be found?	**Numerator:** Data on mortality numbers and reasons is collected by the Ontario Office of Registrar General. It is distributed by the Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO. **Denominator:** Population estimate (2003 to 2017) Original source: Statistics Canada Distributed by: Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO **Level of Analysis**: Global: **Data Report**: WHO Global Report on Falls Prevention in Older Age **Level of Analysis**: Provincial**:** **Data Source:** PHO Injury Snapshots **Data Report:** Integrated Provincial Fall Prevention Toolkit

Indicator	Rate of mortality due to a fall
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls, mortality due to a fall can be analyzed by other variables such as: **Geographic location** **Demographic characteristics such as age, sex, and dwelling status** An alternative method of calculation is using total number of deaths as the denominator and then multiplying by 100 instead of 100,000. This gives the proportion of deaths that are attributable to a fall.
Limitations	When interpreting these data, be careful to check for age standardization. Falls that result in mortality tend to be the result of more serious falls and injuries. As such, this indicator only gives a snapshot of some falls and does not capture mild fall occurrences. The number or rate of mortalities due to a fall is likely underreported as these deaths are often misclassified as being caused by another health outcome, despite it being caused by the fall[16].

Table C7: Number of 911 calls transported vs. not transported

Indicator	Number of 911 calls transported vs. not transported
Operational Definition	The proportion of 911 calls that are related to a fall that are subsequently transported to hospital compared to 911 calls for the same reason that are not transported.
Importance and Use	Falls that result in 911 calls are usually associated with injury. The proportion of those 911 calls that require transportation to hospital are more serious and are more likely to be associated with adverse health outcomes, such as hospitalization and health decline. Therefore, this indicator can provide insight into the seriousness of falls that are occurring throughout Ontario.
Key terms	**911 Calls Transported:** 911 calls that result in the patient being transported to hospital.
How is it calculated?	**Proportion of 911 calls transported vs. Not transported** **Numerator**: number of 911 calls due to a fall that were transported for adults ages 65-74 years and 85+ years **Denominator**: the total number of 911 calls due to a fall for adults ages 65-74 years and 85+ years **Method of Calculation**: (Numerator/Denominator) x 100 (expressed as a %)
What data is needed?	Total number of 911 calls due to a fall transported and not transported for people ages 65-74 years and 85+ years ICD-10 External Cause Codes: W00-W19 Population estimates of people ages 65-74 years and 85+ years
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls, transported 911 calls due to a fall can be analyzed by other variables such as: **Geographic location** **Demographic characteristics such as age, sex, and dwelling status** An alternative method of calculation is using total number of 911 calls transported as the denominator. This gives the proportion of transported 911 calls that falls contribute compared to other reasons for 911 calls.
Limitations	There are no publicly available data for this indicator. While 911 calls that are not transported are typically less severe, this can be due to mortality on site. This should be considered when interpreting these data.

Table C8. Proportion of falls by place of occurrence

Indicator	Proportion of falls by place of occurrence
Operational Definition	The number, proportion, or rate of falls or fall injuries by activity or location.
Importance and Use	Understanding where or how falls and fall injuries are occurring provides key information when developing fall prevention strategies.
Key terms	**Canadian Community Health Survey (CCHS):** is a national survey that collects extensive health information from a nationally representative group of participants. **Rapid Risk Factor Surveillance System (RRFSS):** is a regional survey that is distributed to gather data about public health issues across Ontario.
How is it calculated?	**Proportion of falls associated with a place or activity** **Numerator**: number of falls by activity/place category for adults ages 65-74 years and 85+ years **Denominator**: the total number of falls for adults ages 65-74 years and 85+ years **Method of Calculation**: (Numerator/Denominator) x 100 (expressed as a %)
What data is needed?	Total number of falls for people ages 65-74 years and 85+ years Activity associated with falls for people ages 65-74 years and 85+ years Population estimates of people ages 65-74 years and 85+ years
Where can it be found?	**Level of Analysis**: National **Data Source:** CCHS **Data Report:** Senior's Falls in Canada (2014) **Level of Analysis**: Provincial**:** **Data Source**: CIHI **Data Report**: Emergency departments and primary care institutes may collect data on location and activity associated with a fall. This data is available through NARCS, CIHI. Population estimates are available through Statistics Canada. This information is also distributed by IntelliHEALTH ONTARIO. **Level of Analysis**: Regional: **Data Source**: RRFSS

Indicator	Proportion of falls by place of occurrence
Potential Sub-Analyses* *Note: These are suggestions of potential stratification categories, and not an exhaustive list.	To inform a more detailed understanding of falls, place of occurrence of falls can analyzed by other variables such as: **Demographic characteristics such as age, sex, and dwelling status** **Activity associated with a fall** An alternative method of calculation is looking at place of a fall occurrence associated with mortality, hospitalization, and/or emergency department visit. These methods help to gauge fall severity associated with place or activity of fall occurrence.
Limitations	This indicator may not accurately capture the proportion of activities or locations associated with fall injuries. This indicator relies on information collected and reported on patient admission or from self-report data sources such as CCHS. CCHS data does not include institutionalized older adults. CCHS data does not distinguish between falls that cause injuries and falls that do not. Not all public health units participate in RRFSS, so some regional data may not be available. RRFSS data is also for those ages 18+ and is not stratified by age.

Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Environmental scan: prioritization of older adult fall prevention indicators. Toronto, ON: King's Printer for Ontario; 2022.

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