

Fall Prevention Across the Lifespan

Development Framework

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1.0 About the Development Framework

1.1 Purpose of the Development Framework

To help achieve a vision of preventing falls and fall-related injuries across all ages in Waterloo Region, the purpose of the Fall Prevention Across the Lifespan Development Framework (Development Framework) is to enhance the Region of Waterloo Public Health and Emergency Services' (ROWPHE) capacity to achieve the following goals:

1. To promote a culture of fall prevention across the lifespan in Waterloo Region whereby professionals in public health and other community organizations across the various sectors contribute to the reduction of falls and fall-related injuries;
2. To build an introductory information base on the prevalence and burden of fall-related injury in Ontario and Waterloo Region, the risk factors for falls, and evidence-informed interventions for preventing falls across the lifespan; and
3. To facilitate the development of evidence-informed messaging, programs, and policies which support the prevention of falls and fall-related injuries across the lifespan in Waterloo Region.

A fall is commonly defined as an event in which a person "...unintentionally [comes] to rest on the ground, floor, or other lower level with or without injury".^{1(p. 386)} Addressing falls across the lifespan is a requirement of the Ontario Public Health Standards (OPHS), and a priority outlined in the 2015 Injury and Substance Misuse Prevention (ISMP) Program Review.^{2, 3} A summary of the Development Framework can be found in *Appendix A*.

1.2 How to Use the Development Framework

In response to the new structure of the Healthy Living Division (HLV), which takes an integrated, lifespan approach to addressing the OPHS, this document will highlight evidence related to fall prevalence, risk factors, and prevention interventions according to lifespan theory. The document will end with a brief discussion surrounding the valuable role that public health and the community can play in preventing falls across the lifespan.

The Development Framework is intended to be used as a resource to:

- Gather information about falls across the lifespan from a public health perspective;
- Identify opportunities to integrate fall prevention messaging and interventions into existing public health efforts;
- Assess and share fall prevention information with stakeholders; and
- To inform cluster discussion and work planning at ROWPHE.

Our families and communities are all impacted by falls. The good news is most falls can be prevented. Through many of the health promotion practices and principles carried out every day, public health can play a vital role in preventing falls for all.

Together, we can PREVENT FALLS FOR ALL!

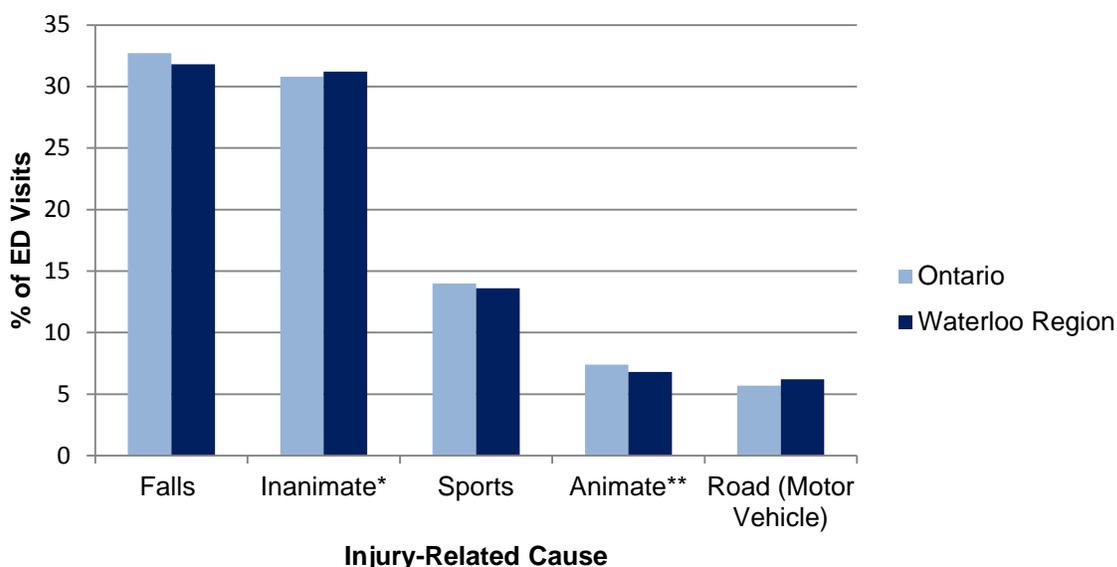
1.0 Falls Across the Ages in Ontario and Waterloo Region

2.1 Issue

Falls are one of the most significant public health issues today—affecting people of all ages in Ontario and Waterloo Region, across the lifespan.^{1,4-11} Despite other forms of injury receiving an extensive amount of media coverage, such as sport- and motor vehicle-related injuries, falls hospitalize and send more people to the emergency department in Ontario and Waterloo Region than any other form of injury.^{8,9} As illustrated in *Figure 1* and *Figure 2*, falls are the leading cause of injury-related emergency department visits and hospitalizations in Ontario and Waterloo Region, accounting for about one-third of emergency department visits (33 per cent vs. 32 per cent) and one-half of hospitalizations (59 per cent vs. 57 per cent) between 2007 and 2009.^{8,9} During this time period, falls were also the second leading cause of injury-related death in Ontario and Waterloo region, responsible for approximately one-quarter (26 per cent vs. 28 per cent) of deaths.^{8,9} More recent data from 2011 reveals that falls were the leading cause of injury-related deaths in Ontario and Waterloo Region, killing 2,137 persons in Ontario and 60 persons in Waterloo Region during that year.¹⁰ Data from 2014 shows that falls continue to be the leading cause of hospitalizations in Ontario and Waterloo Region, hospitalizing over 114 people in Ontario and three in Waterloo Region each day.¹¹

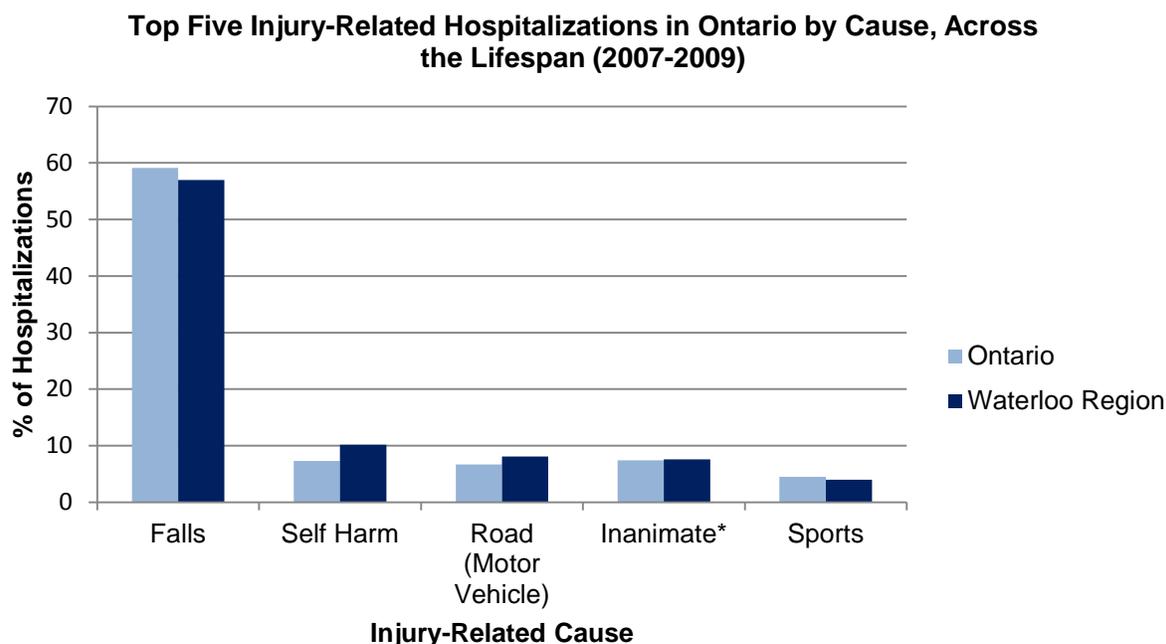
Falls affect our families, workplaces, and communities.^{1, 4, 5, 13} In Waterloo Region, falls claimed 60 lives in 2011 and hospitalized over three people each day in 2014.^{10, 11}

Figure 1: Top Five Injury-Related Emergency Department Visits in Ontario by Cause, Across the Lifespan (2007-2009)



Source: Ontario Injury Prevention Resource Centre. Ontario Injury Data Report. Toronto, ON: SMARTRISK; 2012.

Figure 2: Top Five Injury-Related Hospitalizations in Ontario by Cause, Across the Lifespan (2007-2009)



Source: Ontario Injury Prevention Resource Centre. Ontario Injury Data Report. Toronto, ON: SMARTRISK; 2012.

Aside from incidents that are not specified, most fall-related emergency department visits and hospitalizations in Ontario and Waterloo region are due to slips/trips on the same level.^{8, 9} In addition, the top fall-related injuries seen in emergency department are injuries of the head, whereas the top fall-related injuries causing hospitalization are injuries of the hip and thigh.^{8, 9}

2.2 Implications

The annual economic burden of falls in Ontario is approximately equivalent to the cost of building the CN Tower a staggering 11 times in just one year.^{12, 18}

The health consequences of falls may be seen as mostly physical, but falls and fall-related injuries also affect mental and social wellbeing. Falls can affect a person's ability to participate in activities they enjoy, such as playing sports, travelling, socializing with friends, and other hobbies.^{1, 4} They can also result in a loss of independence, impacting an individual's ability to perform necessary duties in the workplace, and even activities of daily living (e.g., eating, bathing, toileting, etc.).^{1, 13-16} These limitations can lead to social isolation, fear of falling, and reduced quality of life.^{1, 5,}

^{13, 15-17} This not only affects those injured, but also impacts the roles and relationships of families, friends, workplaces, and communities, causing emotional pain and mental distress for many.^{1, 4, 5, 13}

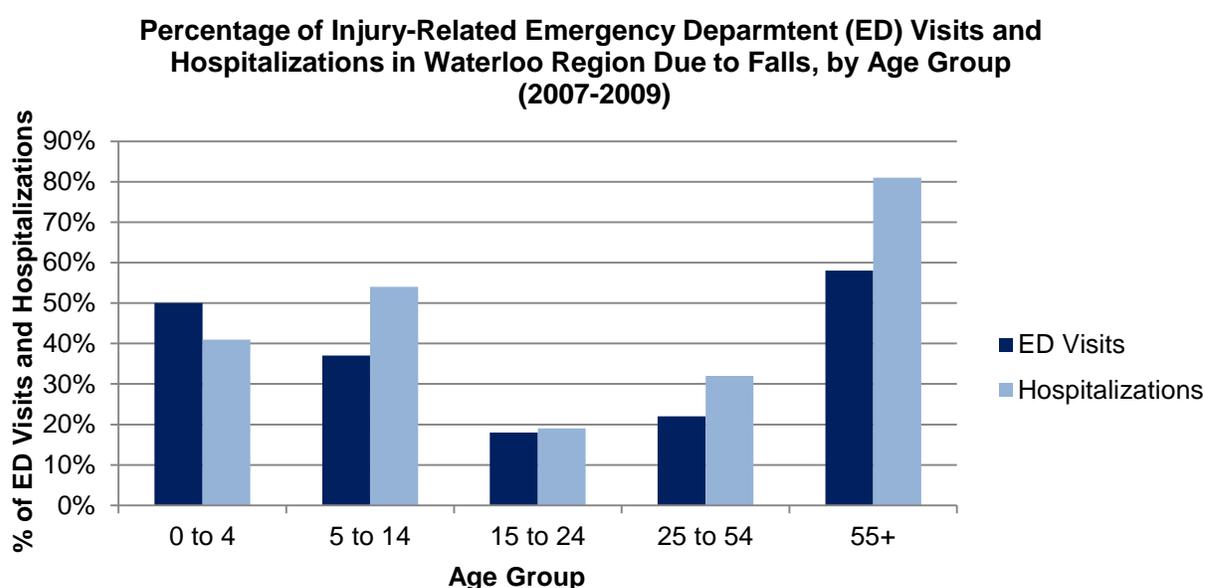
* Injuries due to contact with non-living objects, such as being stuck by sports equipment, being cut by glass, or being exposed to an electric current, et cetera.¹²

** Injuries due to contact with living objects, such as being bitten or stung by an animal, being struck by a person, or being scratched by plants with thorns, et cetera.¹²

The prevalence of falls can also translate into large costs to Ontario's healthcare system and economy.^{1, 4, 13} The injury pyramid in *Appendix B* depicts the burden that fall-related injuries have on different sectors of the healthcare system.¹³ Falls can utilize resources in the home, community care, primary care, and hospital care environments.¹³ In 2010, approximately one-third (32 per cent) of the total \$8.8 billion in costs associated with injuries in Ontario was due to falls.¹³ Moreover, it was estimated that fall-related injuries cost Ontario's economy a staggering \$2.8 billion in direct and indirect costs—an amount approximately equivalent to building the CN Tower 11 times in one year (constant dollar adjusted from \$63 million in 1974 dollars to \$260 million in 2016 dollars).^{12, 18}

Although falls substantially impact people of all ages, literature suggests that young and older populations are particularly at risk for falls and fall-related injuries.^{1, 4, 5, 8, 9, 19, 20} This is evident in *Figure 3*, which illustrates the percentage of all injury-related emergency department visits and hospitalizations across the lifespan that are due to falls.⁹ As can be noted, those most at-risk for falls in Waterloo Region are children under the age of 15 and older adults aged 55 years old and older.⁹ From a public health and health care perspective, this is significant. Ontario's rapidly aging population signifies a demographic shift in which it is estimated that the number of older adults aged 65 and older will more than double from 2.2 million in 2015, to over 4.5 million by 2041.²⁰ Further, population projections for 2021 suggest that almost one-third of both Ontario's population (29 per cent) and Waterloo Region's population (27 per cent) will represent young children (under ten years of age) and older adults (over 64 years of age).¹⁹ As falls continue to impact these large populations, targeted and coordinated efforts to address falls across the lifespan become more significant and timely.

Figure 3: Fall-Related Emergency Department Visits and Hospitalizations in Waterloo Region by Age Group (2007-2009)



Source: Ontario Injury Prevention Resource Centre. Ontario Injury Data Report. Toronto, ON: SMARTRISK; 2012.

3.0 Public Health Approach to Preventing Falls Across the Lifespan

Despite the concerning statistics regarding falls and fall-related injuries across the lifespan, falls are not normal and, in fact, most falls are predictable and preventable.^{1, 4} To protect our families and communities, various stakeholders in Waterloo Region—and particularly public health—can play an integral role in preventing falls for all.^{1, 4} The Public Health Approach to fall prevention, illustrated in *Appendix C*, includes critically appraising and synthesizing fall prevention evidence, defining the issue, identifying fall risk factors, examining evidence-informed fall prevention interventions that address the risk factors, and implementing and evaluating the fall prevention interventions.^{1, 4, 6, 7, 14, 21} For the purpose of the Development Framework (summarized in *Appendix A*), preliminary fall prevention evidence was gathered and critically appraised to identify fall risk factors and evidence-informed prevention interventions, however, more in-depth research and evaluation may be necessary to guide future fall prevention planning.

The subsections below discuss the risk factors for falls and fall-related injuries that affect individuals across all stages of the lifespan, as well as, the fall prevention interventions that aim to address these risk factors. In addition, a [compendium](#) has been created to explore some of the unique issues, risk factors, and implications of falls that are characteristic of the different stages of the lifespan. It also shares some fall prevention interventions and resources relevant to the life stages. In alignment with the changes to the structure of HLV, these life stages have been categorized into the following groups: “Fall Prevention for Ages 0-5”, “Fall Prevention for Ages 6-12”, “Fall Prevention for Ages 13-24”, “Fall Prevention for Ages 25 to 54”, and “Fall Prevention for Ages 55+”.

Most falls are predictable and preventable and public health can play a vital role in preventing falls of all.^{1, 4}

3.1 Lifespan Theory and Fall Risk Factors Across the Lifespan

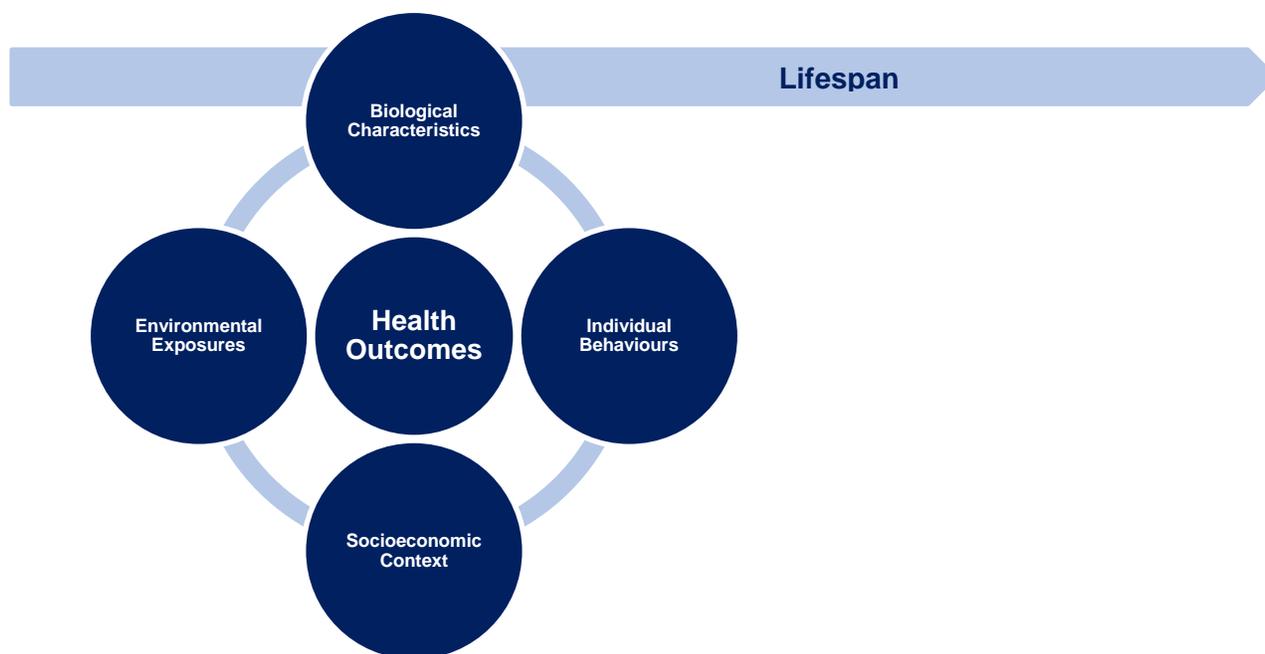
Risk factors related to falls accumulate across the lifespan, shaping an individual’s health outcomes and, thus, likelihood of experiencing falls and fall-related injuries.^{1, 4, 6, 7} Fall prevention efforts should focus on reducing those risk factors that are modifiable.^{1, 4, 6, 7, 14, 17, 21}

While infants, children, youth, adults, and older adults all experience falls, the factors that put these individuals at risk for falling can vary across the different stages of the lifespan.^{1, 4-7, 14, 16, 17, 22} These differences can be explained by the lifespan theory (illustrated in *Figure 4*), which suggests that innate biological characteristics, individual behaviours, socioeconomic contexts, and environmental exposures are all factors that shape a person’s physical, mental, and social health outcomes.^{1, 6}

As a person progresses through the stages of the lifespan, biological characteristics inevitably change, influencing an individual’s health outcomes.^{1, 6} Factors related to individual behaviours, socioeconomic contexts, and environmental exposures can also accumulate throughout the lifespan, further shaping a person’s health outcomes in the later stages of life.^{1, 6} The literature suggests that these factors interact with an individual across the life course and can either contribute to, or prevent falls and fall-related injuries.^{1, 4-7, 14, 16, 17, 22} Most falls are not the result

of a single factor, but rather a network of factors that accumulate across the lifespan.^{1, 4, 6, 7} When two or more risk factors are present concurrently, an individual's risk for falling increases, along with their risk for suffering injury.^{1, 4}

Figure 4: Lifespan Theory



Adapted from: Hosking J, Ameratunga S, Morton S, Blank D. A life course approach to injury prevention: a "lens and telescope" conceptual model. *BMC Public Health* [Internet]. 2011; 11(695): 1-8.

There are a number of risk factors for falls and fall-related injuries that can affect individuals across the lifespan. These risk factors, outlined in *Table 1* and summarized in the Development Framework summary in *Appendix A*, can be both non-modifiable (i.e., risk factors that cannot be changed) and modifiable (i.e., risk factors that can be changed).^{1, 4, 6, 7} Non-modifiable risk factors are usually those related to biological characteristics, such as age, gender, and genetics, whereas modifiable risk factors can include the environment, social determinants of health, physical activity levels, and nutrition.^{1, 4-7, 14, 22, 25, 26, 29} A body of literature suggests that minimizing modifiable fall risk factors is a key component to preventing falls across the lifespan and, ultimately, improving the health outcomes among our populations.^{1, 4, 6, 16, 29, 31, 32}

Table 1: Fall Risk Factors Affecting Individuals Across the Lifespan

Biological/Medical	Behavioural
<ul style="list-style-type: none"> • Developmental characteristics^{1, 4, 7} • Gender^{1, 4, 22} • Age (males in younger and females in older age groups)^{1, 4-7, 14, 32} • Health conditions, such as cognitive disabilities, diabetes, hypotension, or heart disease^{1, 4} 	<ul style="list-style-type: none"> • Lack of understanding, or negative attitudes and perceptions about the dangers of falling^{1, 4, 6, 7, 14} • Maladaptive risk-taking behaviours^{1, 4, 5, 14, 22, 26, 30} • Low physical activity levels^{1, 4, 7, 14, 15, 35, 39, 40} • Poor nutrition^{1, 4, 6, 7, 14}

Social/Economic	Environmental
<ul style="list-style-type: none"> • Socioeconomic factors, such as: <ul style="list-style-type: none"> ○ Overcrowded housing; ○ Hazardous environments; ○ Single-parent upbringing; ○ Unemployment; ○ Low income levels; ○ Low education levels; and ○ Lack of access to health care^{1, 4-7, 14, 22, 24, 25} • Stress and mental health issues^{1, 24} • Social isolation^{1, 4, 6, 7} • Poor social support networks^{1, 4, 6, 7} • Ethnicity^{1, 24} • Aboriginal status¹ 	<ul style="list-style-type: none"> • Fall hazards in the home, including: <ul style="list-style-type: none"> ○ Stairs and windows; ○ Furniture; ○ Clutter; ○ Loose cords, carpets, and rugs; ○ Poor lighting; ○ Slippery or uneven surfaces; and ○ Improperly used or fitted safety products, or lack thereof (e.g., ladders, grab bars, stair gates, and window guards).^{1, 4-7, 14, 22, 25, 26, 29} • Fall hazards in the outdoor environment, including: <ul style="list-style-type: none"> ○ Poorly maintained infrastructure; ○ Slippery or uneven surfaces; ○ Poor lighting; ○ Weather (e.g., snow and ice); ○ Improperly used or fitted safety products, or lack thereof (e.g., stair handrails).^{1, 4-7, 14, 35} • Living in high-rise buildings^{1, 14} • Living in rural areas^{1, 4, 14}

3.2 Interventions for Preventing Falls Across the Lifespan

To address the modifiable risk factors, multi-factorial, ecological interventions are necessary.^{1, 4-7, 14, 21} Such interventions consider the various levels of influences on health outcomes, including the social determinants of health and injury, personal characteristics and lifestyles, social policy, physical environments, and more.^{1, 6, 21} The Three E's of Injury Prevention is, thus, an appropriate model for preventing falls across the lifespan.^{1, 6} The model, summarized in the Development Framework summary in *Appendix A*, concurrently and comprehensively seeks to facilitate the uptake and success of primary fall prevention activities through:

- **E**ducation;
- **E**ngineering (or, in public health, safe and supportive environments); and
- **E**nforcement (or, in public health, healthy public policy).^{1, 6}

Multifactorial, ecological interventions which integrate education, safe and supportive environments, and healthy public policy, are necessary to prevent falls across the lifespan.^{1, 4-7, 14, 21}

3.2.1 Education

Education includes increasing public awareness of falls and fall-related injuries, as well as, of evidence-informed measures to encourage voluntary adoption of positive health behaviours which aim to prevent such injuries.^{1, 6} Education can involve the delivery of health promotion

campaigns, evidence-based information materials and tools, and skill-building group facilitation classes.¹ Broadly, the literature suggests that efforts should be made to raise awareness about the prevalence of falls experienced by the target population; common causes of falls; common types of fall-related injuries; risk factors associated with falls and fall-related injuries; and evidence-informed fall prevention interventions, or steps that can be taken to prevent falls and fall-related injuries.^{1, 4-7, 14, 30, 32} These efforts should also emphasize the fact that falling is not an inevitable as people age, but rather that most falls are predictable and preventable.^{1, 4-7, 14, 30, 33, 39-41}

General fall prevention key messaging relevant to individuals across the lifespan can include promoting:

- Skill-building surrounding identifying and modifying fall dangers in the indoor (including homes, workplaces, and care environments) and outdoor environments (including parks, walkways, and other public spaces);^{1, 4-7, 14, 22, 25, 26, 29, 30, 33, 39-41}
- Proper nutrition, which includes regularly eating a variety of nutritious meals to maximize energy, strength, and endurance;^{1, 4, 6, 7, 14}
- The benefits of vitamin D supplements for improving and maintaining bone health;²⁸ and
- Regular physical activity, which incorporates a range of moderate- to vigorous-intensity aerobic and weight-bearing activities, to strengthen bones and muscles, as well as, improve posture and balance;^{1, 4-6, 15, 17, 24, 27, 26, 30, 33-36, 39, 40}

Fall prevention messaging should be shared through multiple and targeted mediums and incorporate behaviour change theory^{1, 4, 14}

While some fall prevention key messages can be generalized to individuals across the lifespan, it is suggested that education and key messages should be tailored to the unique characteristics that influence and impact the age and stage of the target or priority population, such as the target audience's beliefs and attitudes, as well as, unique barriers and enablers to change (also known as demographic segmentation).^{1, 4, 14} Target or priority populations can include children, older adults, low income or ethnic communities, and possibly even rural and Aboriginal communities.^{1, 4, 8, 9, 14} To increase the likelihood that education will affect change, concepts from one or more behaviour change theories should also be learned and applied.^{1, 4} Finally, education should be culturally appropriate, and information should be available in relevant languages.^{1, 21} The [Communication Plan Template](#) can be used as a tool to gather information needed about the target population and develop appropriate educational strategies.

Finally, education can occur through multiple and existing channels in the community by collaborating with those who are intermediaries of the target or priority population, such as community-based organizations and committees, or in injury-related visits in primary and acute care settings.^{1, 4, 14} Public health should strive to include the promotion of community-wide programs, services, and events that provide fun and enticing opportunities to be engaged and active within the community (e.g., walking and cycling programs, community challenges) as part of an overall education strategy.¹⁵

3.2.2 Safe and Supportive Environments

Creating safe and supportive environments includes designing or modifying products and environments to minimize risk of injury, and facilitate opportunities that promote good health and protect against factors that threaten good health.¹ The environments in which we live, work and play can greatly impact our risk for falls.^{1, 4-7, 14, 22, 25, 26, 29, 30, 33, 39, 40} In fact, one-third of injuries across all ages occur in the home.^{1, 29}

Creating safe and supportive environments involves building capacity throughout the community and collaborating with stakeholders to address key characteristics that contribute to falls in the environments in which we live, work, and play.^{1, 4, 5, 14, 34, 38-40}

In striving to prevent falls across the lifespan, public health can work to build capacity throughout the community and collaborate with a variety of key stakeholders, such as municipalities, schools, child care facilities, long-term care, hospitals, workplaces, local businesses, and landlord associations, to advocate for safe built environments and minimize environmental hazards that contribute to falls.^{1, 4-6, 14, 17, 24, 27, 26, 34 38-40} This can include promoting safe and clean parks and recreational spaces, establishing clear snow/ice removal and regular road and sidewalk maintenance strategies, implementing environmental

hazard reporting mechanisms, and removing socioeconomic inequities in low income areas.^{1, 4, 5, 14, 30, 34} Public health could also advocate for built environments that are more supportive of physical activity, such as those that are pedestrian-centric versus car-centric.^{1, 4-6, 15, 17, 24, 27, 26, 30, 33-36, 40} This can involve planning networks of safe routes for active transport to schools and workplaces, re-allocating road space to support active transportation, and introducing traffic calming schemes.^{1, 14, 15, 35}

3.2.2 Healthy Public Policy

Healthy public policies can include legislation set by a level of government, but also guidelines, procedures, rules, and policies developed by organizations and institutions.¹ Healthy public policy related to fall prevention aims to stimulate the voluntary adoption of attitudes and behaviours that protect against falls, as well as, positively influence the social determinants of health.^{1, 6} To address falls across the lifespan, public health could provide support and consultation to key stakeholders, such as municipalities, schools, child care facilities, hospitals, long-term care, workplaces, and local businesses, with regards to developing and implementing fall prevention policies and procedures (or integrating fall prevention practices into existing policies and procedures).^{1, 4, 14, 22, 25-27, 39-41} Such policies could provide direction on the establishment of regular fall prevention education training for those intermediaries interacting with the target or priority population, the reduction of environmental hazards related to falls, and the use of safety products to prevent falls and fall-related injuries.^{1, 4, 6, 14, 39, 38, 40} For example, public health could work closely with municipal planning groups to ensure planning applications for new developments always prioritize pedestrian-centric traffic to encourage and support physical activity, as well as,

Healthy public policy that is supportive of fall prevention across the lifespan aims to stimulate the adoption of positive behaviours and influence the social determinants of health.^{1, 6}

incorporate procedures for the regular maintenance of infrastructure to reduce fall-related hazards in the environment.^{1, 4, 15, 35, 40}

4.0 We All Have a Role to Play

Falls are a complex issue, impacting families, workplaces, and communities across all ages in Waterloo Region. Fall-related injuries hospitalize and send more people to the emergency department in Waterloo Region than any other form of injury.⁹ Most falls are a result of a network of biological/medical, behavioural, social/economic, and environmental risk factors that interact with individuals and accumulate across the lifespan.^{1, 6} Fortunately, falls for the most part, are predictable and preventable.^{1, 4}

Preventing falls across the lifespan is a shared responsibility and can only be achieved through multiple levels of collaboration.¹

To address the many risk factors associated with falls across the life span, a multi-factorial, ecological approach must be employed, integrating prevention measures related to education, safe and supportive environments, and healthy public policy.^{1, 4-7, 14, 21} Fundamentally, preventing falls is a shared responsibility and can only be achieved through continued cross-divisional, cross-departmental, and multisectoral collaboration.¹ As evident in this report, fall prevention interventions are linked to much of the health promotion work that public health already skillfully delivers, every day. Thus, public health can play an integral role in mobilizing key stakeholders in Waterloo Region towards collective impact in preventing falls across the lifespan.^{1, 4}

There is a readiness to address falls in Waterloo Region—58 per cent of HLV staff felt that falls are a significant public health issue and 79 per cent felt that they have a role to play in preventing falls for all.

One of the goals of the Development Framework is to promote a culture of fall prevention in Waterloo Region. A survey to HLV staff reveals that there is indeed a readiness to address falls through collaborative efforts—58 per cent of staff feel that it is a significant public health issue and 79 per cent feel that they have a role to play in preventing falls across the lifespan. While broad-level strategies can be planned and implemented to prevent falls across the lifespan, it is essential to consider the risk factors for falls, along with evidence-based fall prevention

interventions, that are unique to each stage of the lifespan (see [compendium](#) for information about these unique risk factors and fall prevention interventions).^{1, 4, 14} In keeping with the Public Health Approach to injury prevention (illustrated in *Appendix C*), it may be necessary that more in-depth research and evaluation be conducted to guide future fall prevention planning. Nonetheless, this Development Framework is intended to serve an introductory information source to initiate and guide fall prevention planning at ROWPHE. Together with the community, public health can play a role in preventing falls for all.

5.0 Limitations and Notes

For consistency purposes, data extracted from IntelliHealth Ontario, using relevant International Classification of Disease (ICD) codes, and outlined in the 2012 *Ontario Injury Data Report*, were used in this document when comparing the prevalence of fall-related injury both provincially and locally.^{8, 9, 12} Though the data presented in the report were extracted between 2001 and 2009, this is the most recent known and publicly available injury data aggregated according to injury type, injury cause, and age for both Ontario and Waterloo Region during the same time periods. As such, it is important to interpret this data with caution.

In addition, fall-related injuries may often be treated by primary care and community care providers, as well as, in the home by informal caregivers. Therefore, the data in this report likely only captures more of the most serious fall-related injuries, representing an unknown proportion of the true burden of falls and fall-related injury in Waterloo Region. The true incidence of falls and fall-related injuries in Waterloo Region is undoubtedly much higher than those incidents depicted in the emergency department visit and hospitalization data.

Finally, fall prevention research and literature is quite limited for certain stages of the lifespan, including those in the adolescent and mid-aged adult years. In light of this, it will be important to continually monitor new fall prevention research, and possibly consider initiating an Evidence and Practice-Based Planning Framework related to the topic of fall prevention across the life stages, in order to ensure public health key messages and programming are reflective of the most up-to-date evidence.

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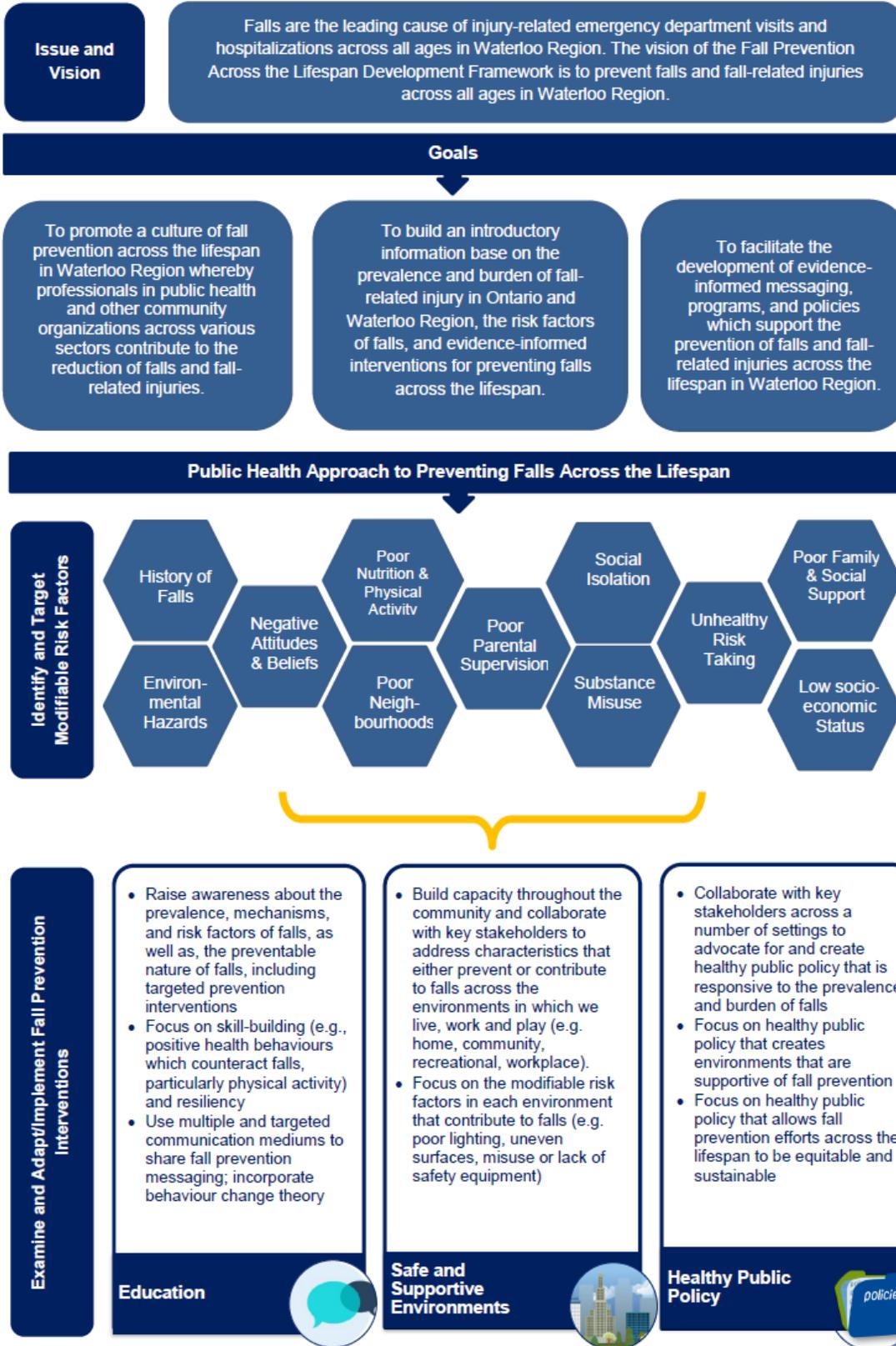
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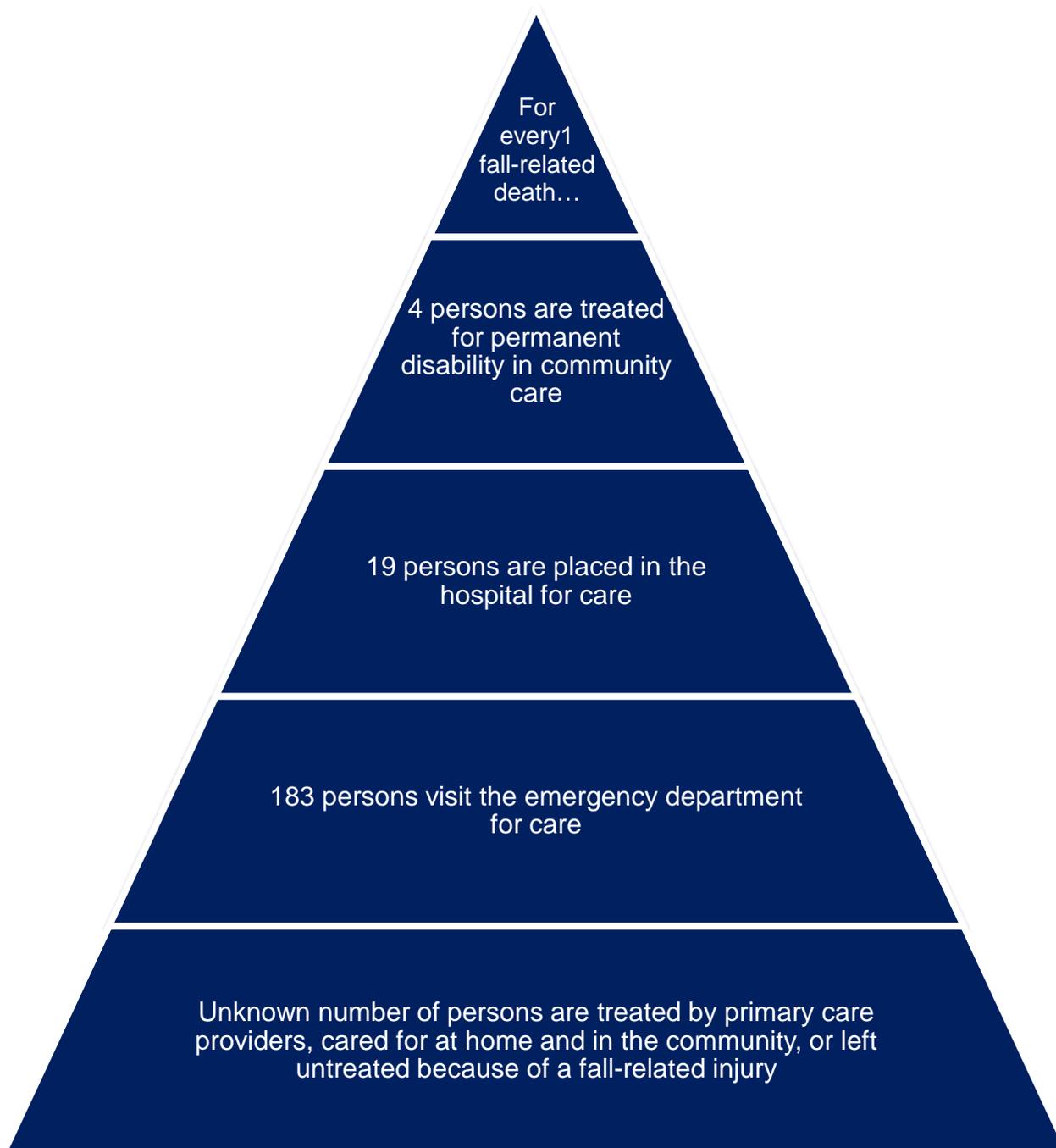
Appendix A

Fall Prevention Across the Lifespan Development Framework at a Glance



Appendix B

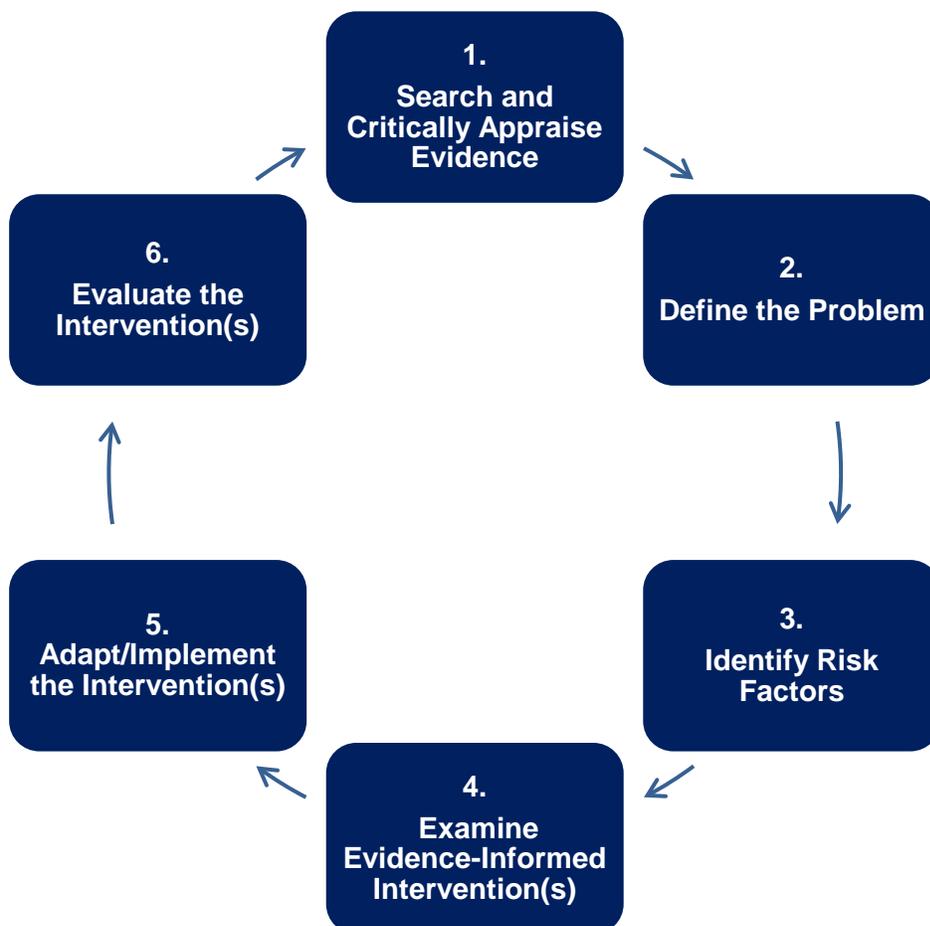
Fall-Related Injury Pyramid in Ontario (2010)



Adapted from: Parachute. The Cost of Injury in Canada [Internet]. Toronto: Parachute; 2015.

Appendix C

Public Health Approach to Injury Prevention



Adapted from: Scott V. Fall Prevention Programming. Designing, Implementing and Evaluating Fall Prevention Programs for Older Adults. Raleigh: Lulu Publishing; 2012. p. 1-232.