

# Falls Across the Lifespan

Evidence-Based Practice  
Synthesis Document

November 2008



Ontario Injury Prevention  
Resource Centre

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# Introduction

## Purpose

The purpose of this document is to inform Ontario public health professionals and their community partners of evidence-informed practice in Falls Across the Lifespan in preparation for the implementation of the *Prevention of Injury and Substance Misuse* standard of the new Ontario Public Health Standards and Protocols, released October 31, 2008.

This document is based upon earlier systematic literature reviews conducted by the Ontario Injury Prevention Resource Centre staff in 2007-2008. These reviews are available by request from the Resource Centre.

The model upon which this synthesis document is based is contained in Safe Kids Canada's (2006) *Safer Homes for Children: A Guide for Communities* report.

## Structure

The document follows the general public health program planning stages as outlined in the Canadian Injury Prevention Curriculum and is thus divided into several sections. The first gives a brief overview of the magnitude of the issue of in-

juries resulting from falls at various stages in the lifespan, based upon analysis of recent hospitalization and emergency department visits in the province of Ontario. The second section briefly reviews what is known about risk factors for falls in each of these life stages. The third section provides the synthesis of best available evidence for effective practices to reduce falls and injuries within each life stage. In keeping with the purpose of this document, this information is provided in bulleted recommendations.

# Magnitude of the Problem

Falls are a significant issue across the life-span. Infants, toddlers, preschoolers,

children, youth, adults, and older adults all experience fall related injuries (Figure 1); however, the risk of serious fall injury is nine times greater for those over 65 years of age than for those younger (Figure 2).

Accordingly, much greater attention has been paid in the literature to the issue of falls among older adults. The second largest group at risk are the very young.

During the 2005/06 fiscal year, there were a total of

366,495 emergency department visits and 37,776 hospitalizations due to injuries from falls for all ages. These numbers

translate into provincial rates of 2,904.4 per 100,000 population for emergency department visits and 263.0 per 100,000 for hospitalizations.

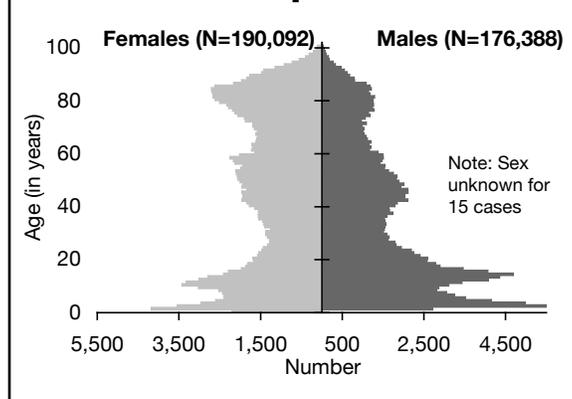
## Gender Rates

Males accounted for just under half of emergency department visits and 60% of hospitalizations. Males and females under 5 years of age had the highest numbers and rates of emergency department visits for a fall related injury. Males and females 80 to 84 years of age had the highest numbers and rates of hospitalizations.

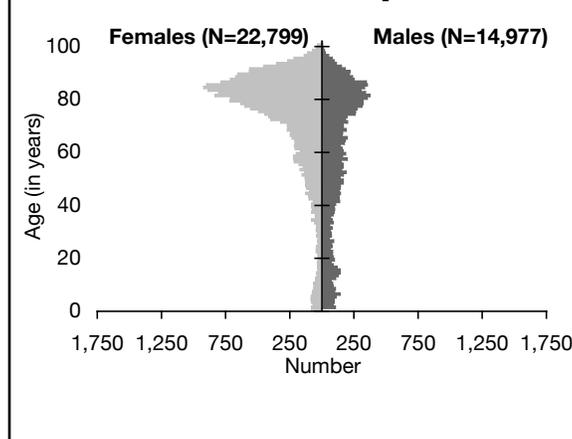
**Types of Injury in Emergency**  
The most commonly presented fall related injuries in emer-

gency departments across Ontario for all age groups were those to the head, accounting for 21% of all injuries. However,

**Figure 1 Emergency Department Visits for Injuries from Falls Across the Lifespan**



**Figure 2 Hospitalized Injuries for Falls Across the Lifespan**



when all types of injuries to the upper limb are combined, it has been demonstrated that injuries to the upper limb are the more common cause for emergency department visits. Upper limb includes the hand, wrist, elbow, forearm, shoulder, and upper arm.

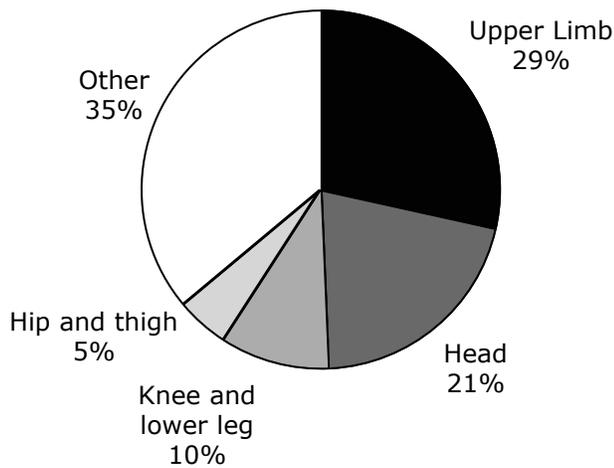
#### Types of Injury for Hospitalization

The most common type of fall related in-

emergency department visits, those under five years of age and older adults over 75 years of age were most often seen for a fracture of the femur. For children and pre-teens/teens 5 to 14 years of age, fracture of the elbow was the most common. Adults and older adults 20 to 74 years of age were most frequently seen for a fracture of the lower leg (including

Figure 3- **Nature of Fall Related Injuries**  
(Most responsible diagnosis, Ontario, 2005/06)

#### Emergency Department Visits



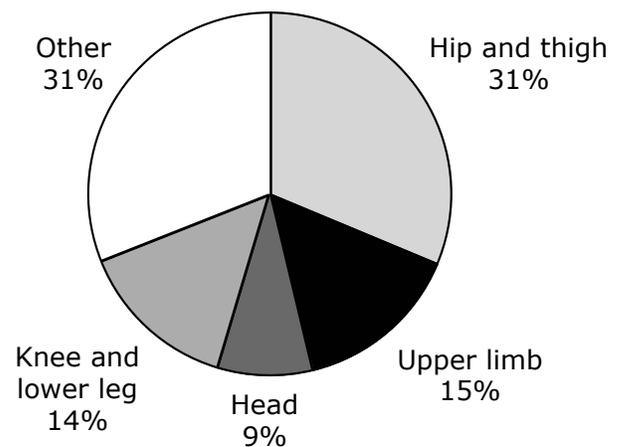
juries for which hospitalization was required were those to the hip and thigh, accounting for approximately 31% of all injuries. (See Figures 3 and 4).

#### Age Group Variance in Emergency

The most common type of injury resulting from a fall, varied by age group. For

Figure 4- **Nature of Fall Related Injuries**  
(Most responsible diagnosis, Ontario, 2005/06)

#### Hospitalizations



the ankle).

#### Age Group Variance for Hospitalization

For hospitalized cases, those under 10 years of age and older adults over 69 years of age were most commonly admitted for an open wound of the head. Pre-teens/teens 10 to 14 years of age and adults 50 to 54 years of age were admit-

**Table 1 - External Cause of Fall Resulting in Hospitalized Injury by Age**

Age Group	Cause of Fall
<b>Infants, Toddlers, Preschoolers 0-4</b>	Fall from one level to another; into hole, pit, or well / Fall involving bed or other furniture
<b>Children 5-9</b>	Fall involving playground equipment
<b>Pre-teens &amp; Teenagers 10-19</b>	Fall involving skates, skis, sport boards & roller-blades
<b>Adults 20-29</b>	Fall on same level; slipping, tripping & stumbling
<b>Adults 30-54</b>	Fall on/ from stairs and steps (escalator, ramps)
<b>Adults 55-64</b>	Fall on same level; from bumping into object/ getting on/off toilet

ted for a fracture of the forearm most often. And finally, the remaining ages were most often admitted for a fall causing foot and ankle dislocation, sprain and/or strain.

### **Causes of Falls**

The cause of the fall leading to the injury also varied by age group (Table 1). For example, the majority of pre-teens/teens aged 10 to 19 years of age seen at an emergency department for a fall related injury had been using skates, skis, sport boards, and roller-blades at the time of the incident. For all other age groups, falls occurring on the same level from slipping, tripping, or stumbling were the most common (unspecified). For hospitalized cases, those under 5 years of age were most often admitted for a fall from

one level to another. For example, they had fallen into a hole, pit, or well. Falls involving a bed or other type of furniture were also common for those under five. For children 5 to 9 years of age, the most common cause for a fall requiring hospitalization involved playground equipment. The majority of 10 to 19 year olds were hospitalized for a fall on the same level from slipping, tripping, and stumbling. Adults aged 30 to 54 years were most commonly admitted into a hospital for falls on and from stairs and steps (escalators, ramps, for example). And finally, the most common cause of a fall for those 55 years of age and older who were admitted to hospital were those other falls on the same level from bumping into an

object or from getting on or off a toilet, for example.

## Discharge Information

Over 85% of individuals who visited an emergency department for a fall related injury were discharged to their place of residence. For hospitalized cases, over 40% of patients were discharged home and close to 20% were transferred to a long-term care facility (nursing homes, senior's homes, personal care homes, etc). Finally, approximately 18% were transferred to another facility where they were provided inpatient hospital care, for example, acute care and rehabilitation centres. Fewer than 1% of individuals died after arrival in the emergency department and approximately 5% died after hospital admission. The 37,776 hospitalized cases

accounted for more than 300,7 days in acute care hospitals with an average length of stay of close to 10 days.

## Regional Differences

The highest rates of fall injuries requiring emergency department visits and hospitalization were seen in the North. The greatest number of emergency department visits for fall injuries were seen in the Central East Region, while the greatest number of hospitalized fall injuries were seen in Toronto (Table 2).

According to the 2006 *Economic Burden of Injury in Ontario* document, falls were the leading causes of unintentional injury in

**TABLE 2. Regional comparison of fall related injuries (Ontario, 2005/06)**

	South West	Central South	Central West	Central East	Toronto	East	North	Ontario
<b>Emergency Department Visits</b>								
Number	53,871	40,300	52,212	64,497	59,452	54,422	35,806	366,495
Rate per 100,000 <sup>a</sup>	3,329.1	3,259.1	2,274.1	2,958.1	2,227.8	3,209.9	4,080.7	2,904.4
<b>Hospitalizations</b>								
Number	5,865	4,502	5,327	5,968	6,230	5,567	3,876	37,776
Rate per 100,000 <sup>a</sup>	294.3	292.6	237.3	256.6	198.4	277.8	368.1	263.0

a. Age-standardized rate per 100,000 population. Note: Region of residence unknown/outside of Ontario for 5,935 emergency department visits and 441 hospitalizations.

Table 3 **Summary of the Number of Unintentional Injuries by Cause**  
Ontario, 1999

Cause of injury	Injury Deaths	Hospitalized Injuries	Non-Hospitalized Injuries
<b>Unintentional falls</b>	<b>1,198</b>	<b>37,313</b>	<b>189,137</b>
<b>Motor vehicle collisions</b>	<b>870</b>	<b>8,453</b>	<b>80,793</b>
<b>Other</b>	<b>664</b>	<b>16,137</b>	<b>129,441</b>
Striking against/struck by object or person	15	2,872	13,296
Poisonings	245	2,252	16,237
Other/unspecified transport incidents	50	1,843	7,263
Overexertion/strenuous movement	0	1,891	24,212
Cutting/piercing	<5	1,302	10,730
Machinery	28	873	2,052
Fire and flames	93	445	6,592
Drowning/submersion	131	97	993
Other/unspecified	98	4,562	48,066
<b>All unintentional injuries</b>	<b>2,732</b>	<b>61,903</b>	<b>399,371</b>

**Data Sources: All information and Tables 1 and 2 were created using the sources listed below.**

Emergency department data were obtained from the National Ambulatory Care Reporting System and acute care hospitalization data were obtained from the Discharge Abstract Database at the *Canadian Institute for Health Information* for the 2005/06 fiscal year. ICD-10 coding (W00-W19) was used to isolate all injuries from falls resulting in emergency department visits or hospitalizations. Note that some persons were seen in an emergency department and then admitted to hospital; however, persons can be admitted to hospital without visiting an emergency department. It is also important to note that emergency department visits and hospitalizations represent only one dimension of the issue. There are numerous additional cases of falls that are not represented in this analysis, as many incidents go unreported or do not require medical attention in the hospital setting. Regions were defined according to place of residence using the Ontario Ministry of Health Region Codes. Deaths occurring outside of the hospital setting were not included in this analysis.

terms of deaths, hospitalizations, non-hospitalizations, and disabilities. Fatal falls predominated among older adults.

## Risk Factors

Risk factors are those variables which increase the chance of a particular event of occurring. For example, a well established risk factor for falling (event) is postural instability (risk factor). Modifiable risk factors are those which one has control over. For example, one can change or modify one's risk by changing one's lifestyle, modifying one's environment, or taking medications. Non-modifiable risk factors are those which one cannot change and include age, gender, and family history, among others.

In relation to falls, risk factors vary by age group and consist of both modifiable and non-modifiable portions. Seniors, who are already at a higher risk of falling than other age groups, cannot do anything to change their aging status, but they can work to modify their environment and alter their lifestyle (install sturdy hand-rails on their stairs and participate in a regular exercise program

which incorporates balancing exercises and resistance training).

By focusing on the various, often differing, risk factors for each age group, interventions can be established to reduce the risk of falling among children, youth, and adults of all ages.

### Risk Factors for Infant, Toddler, Preschooler Falls 0 to 4 years

- ❖ Infants have a higher head to body ratio compared with adults, and this makes landing on their heads more likely. (Bulut M. et al., 2006)
- ❖ Falls are strongly related to infant and toddler developmental characteristics, such as curiosity and exploration of the environment. As their mobility increases, their exploration efforts exceed their ability to assess risks. (Munro S., Niekerk, A., & Seedat, M., 2006)
- ❖ Physical and motor development is developing faster than the cognitive ability to understand risks. For example, toddlers may climb to heights that do not match their balancing and reasoning abilities. (Safe Kids Canada, 2006, B)

- ❖ Home household hazards and products present risks for this age group because they are not built with child safety in mind. Even nursery products may not be designed to prevent falls. (Safe Kids Canada, 2006, B)
- ❖ Parents' / caregivers' attitudes, beliefs and knowledge may be a risk factor. They may not believe that falls can cause serious injuries and may not have the knowledge of child development. (Safe Kids Canada, 2006, B)
- ❖ Economically disadvantaged families have fewer resources for safety measures in the home, which may lead to a greater risk of injury, according to the 2002 Chief Medical Officer of Health Report, *Injury: Predictable and Preventable*. (Ministry of Health and Long-Term Care, 2006)
- ❖ Surveys have shown that parents believe that boys are more likely to be injured than girls. Parents tolerate more risk taking with boys, while parents teach girls to avoid risks. (Morrongiello, B. & Rennie, H., 1998)

## Risk Factors for Childhood Falls 5 to 9 years

- ❖ Many children still lack a sense of danger, they are unable to assess how risky their actions are and to foresee the consequences. (Bulut M. et al., 2006)
- ❖ Falling off playground equipment is the most frequent reason for injury and can be attributed to **four factors**:
  - Equipment that is too tall.
  - Inadequate cushioning surface underneath equipment.
  - Specific hazards (e.g., broken equipment).
  - Lack of supervision during playground activity. (Hendricks, C.M. , 1993)
- ❖ Impoverished neighbourhoods often have play structures below the standards of the *Canadian Standards Association* and have fewer safe play areas. (Ministry of Health and Long-Term Care, 2006)

## Risk Factors for Pre-teen & Teenager Falls 10 to 19 years

- ❖ Risk-taking disposition, risky behaviours, and novelty seeking are charac-

teristics of this developmental age. (Ryb G.E., et al., 2006)

- ❖ Developmental characteristics of teens place them at an increased risk (e.g., underestimating personal vulnerability, searching for independence, being easily influenced by peer groups, experimentation, impulsivity and curiosity). (Ryb G.E., et al., 2006)
- ❖ Workplace environments pose risks in regards to tripping, slipping and increasing heights. Four out of 10 falls happen when a worker moves to a different physical height. (Canadian Centre for Occupational Health and Safety, 2008)
- ❖ Substance use, particularly alcohol, is a risk factor for various falls. (Ryb G.E., et al., 2006)

### **Risk Factors for Falls in Adults 20-54 years**

- ❖ Individual differences such as risk-taking disposition, risky behaviours and previous experiences may be pre-determinants of increased injury risk. (Canadian Foundation for Drug Policy, 1993)

- ❖ Alcohol use remains a risk factor for falls in this age group. (Canadian Foundation for Drug Policy, 1993)
- ❖ Physical aspects of work environments may also pose risks.
- ❖ Environmental hazards can contribute to falls in this age group. Examples of outdoor risks can include sidewalk cracks, uneven surfaces, snow or ice, unsafe stairs and poor building designs. Indoor hazards include throw rugs, loose carpets, pets, clutter, cords, and stairs.

### **Risk Factors for Falls in Adults 55-64 years & Older Adults (65+ years)**

#### **Environmental Hazards**

- ❖ Environmental risk factors contribute to falls, both in the home and in public spaces and are more encompassing for this age group. Examples of hazards are listed next.
- ❖ Outdoor hazards relate to sidewalk cracks, uneven or cluttered surfaces, tree roots, snow or ice, unsafe stair design, poorly lit areas, lack of handrails, poor building designs, and lack of maintenance. (Public Health Agency of Canada, 2005)

- ❖ Indoor hazards relate to throw rugs and loose carpets, electrical cords, pets, clutter, poor lighting, low toilet seat, high beds, slippery floors, stairs (uneven, unmarked edges), poorly fitted handrails, lack of grab bars, curb ramps, rest areas, absence of accessible light switches at room doorways, and items stored in high cupboards. (Public Health Agency of Canada, 2005)

### **Biological / Medical Factors**

- ❖ Middle aged-adults progressively start to show higher incidences of diseases and their sequelae (e.g., cardiovascular, bowel and bladder, acute illness, arthritis, diabetes) and greater medication use, lower levels of physical activity, and physiological changes, such as reduced vision, depth perception, decreased bone density, and hearing. In combination, these factors may begin to alter postural stability and increase the risk of falls for adults. (Talbot, L.A., et al., 2005)
- ❖ At 65+ years, neurodegenerative disorders (e.g., dementia, stroke, Parkinson's), chronic diseases such as osteoporosis and arthritis, as well as short-

term illness, can cause increased frailty and physical impairment and lead to an increased risk of falling. (Talbot, L.A., et al., 2005)

- ❖ For many in the 65+ age group, changes in perceptual systems, muscle strength, balance, gait, flexibility, and coordination increase their risk of falling. (Talbot, L.A., et al., 2005)

### **Behavioural Factors**

- ❖ Behavioural risks include lifestyle factors such as poor nutrition choices/hydration, excessive alcohol use, choice of footwear/clothing, advanced age, female gender, engaging in risky behaviours (e.g., attempts to shovel off a roof, rushing from place to place), addictions, multiple medications or the use of high-risk medications that predispose some older adults to falling. (Public Health Agency of Canada, 2005)
- ❖ As aging occurs, it can be difficult to realize that ordinary choices that were made when younger may now greatly increase the chance of falling. This in itself can pose a risk. (Public Health Agency of Canada, 2005)

- ❖ Medications are associated with an increased risk of falls and fall-related injuries, and the risk of falling increases with the number of medications used. In general, four or more medications taken concurrently, or any use of psychotropic (e.g., Paxil, Zoloft) and benzodiazepine (e.g., Xanax, Valium) medications increases the risk of falling. (Akyol, A.D., 2007)
- ❖ History of falling or fear of falling is one of the best predictors of future falls. Fear of falling may lead some older adults to avoid physical and social activities, potentially leading to loss of confidence, dependency, social isolation, and an overall decrease in their quality of life, and an increase in their risk of falling. (Reinsch, S., et al., 1992)
- ❖ Attitudes and beliefs of older adults can influence fall prevention behaviours and this needs to be taken into consideration as a factor (e.g., many may not want to participate in strength and balance training even though it may help them). (Yardley L., Donovan-Hall, M., Francis, K. & Todd, C., 2007)

## Social / Economic Factors

- ❖ Living alone, social isolation, poor family support, lack of transportation, language barriers, lack of education, financial strain, poor living conditions, and illiteracy are examples of social factors that can lead to increased risk of falling with older adults. (Public Health Agency of Canada, 2005)

There is a complex interaction between risk factors and as the number increases so does the risk of falling and being injured. Normal aging brings changes which may contribute to falls, and advanced aging brings higher rates of falls and injuries. This speaks to the importance of using a multi-risk factor strategy in the community and suggests that risk factor modification may help reduce the risk of falling. (Tinetti, M.E., ET AL., 1994)

# Evidence-Informed Practice Recommendations

Evidence-informed practices are interventions that have been cited by researchers or organizations who conducted a systematic review of relevant literature.

For the purposes of this document, a systematic review was done using key descriptors. These included:

- ❖ Infant/childhood
- ❖ Adolescent/teenage
- ❖ Adult/senior/elderly
- ❖ Injury and risk of falls/falling
- ❖ Falls prevention
- ❖ Best practices and falls/falling

Using the above descriptors, a computerized search of the English-language literature on PsycINFO, Cochrane Database, Web of Science, and Medline, was carried out to identify practices and systematic reviews on the topic of fall injuries across the lifespan. A search of bibliographic references of recent and relevant journal articles, literature reviews,

and reports, was also conducted to ensure inclusion of all potentially suitable studies. All articles identified were reviewed and included only if they contained data that was relevant to the Canadian population and discussed injury as a result of falling or being dropped.

Articles were sought to include research conducted on all ages; however, the initial finding of the review was that based upon the magnitude of the burden experienced, existence of well-established risk factors, and availability of evidence for interventions, the priority populations which could be addressed are falls among:

- ❖ Infants / Toddlers
- ❖ Children
- ❖ Older Adults

## Evidence Informed Practice Recommendations for Infants and Toddlers 0 to 4 years

Since infants and toddlers do not have the control to change their physical environments, it is up to their parent/caregivers to ensure they are in low-risk surroundings. Public Health professionals have the opportunity to discuss this

information with caregivers in the *Healthy Babies, Healthy Children* program. Opportunities for sharing this information arise within prenatal classes, postpartum home visits (by Public Health Nurses and Parent Support Workers), baby groups (e.g. Healthy Baby Groups), mailed publications, and during meetings with other community partners (e.g., Early Years Centres, CAS, Social Services).

The most effective falls prevention interventions are those that use a population health multi-factorial approach. The *World Health Organization* (WHO) Safe Communities model has also shown positive results in reducing injuries to young children. (Safe Kids Canada, 2006, A)

When Public Health is developing programs, research indicates that the following issues are examples of what could be considered:

- ❖ Target groups at high risk:
  - Parents of infants
  - Parents of toddlers
  - Parents of boys

- Families from low socioeconomic and low-income neighbourhoods with poor-quality housing

- ❖ Focus on a single cause of injury.
- ❖ Develop intervention strategies for different causes of injuries. (Safe Kids Canada, 2006, A)

*Public Health could develop interventions that are targeted for use after an injury has occurred, or for use in a health care setting. This may increase parents' receptiveness to the intervention and the program's credibility and may increase its effectiveness.*

- ❖ One study found that performing a home visit after a child was injured led to a reduction in the number of subsequent visits to the doctor. (Safe Kids Canada, 2006, A)
- ❖ Another study found that families were more likely to use safety devices if they came from a hospital-based resource centre. (Safe Kids Canada, 2006, A)

*Public Health may want to develop home assessments that capture parent-child and environmental factors that put the child at risk for injury. (Safe Kids Canada, 2006, A)*

- ❖ Research indicates that parent attributes and behaviours towards injury prevention can be measured via self report questionnaires, including the new PSAPQ. (Morrongiello B.A. & House K., 2004)
- ❖ Another study indicates that mothers use varying measures of home-safety practices depending on the type of injury. This suggests the need for developing strategies for different causes of injuries. (Morrongiello, B.A. & Kiriakou, S., 2004)
- ❖ Another study indicates that one must consider the risk-taking tendencies of the individual child within the context of the parents' protectiveness beliefs and practices. (Morrongiello, B.A., Ondejko, L., & Littlejohn, A., 2004, A)
- ❖ Research also shows that when children are between two and three years of age, it is common for parents to transition from environmental and supervision strategies to teaching and rule-based strategies for managing injury risk. However, doing so clearly elevates children's risk of injury in the home. (Morrongiello, B.A., Ondejko, L., & Littlejohn, A. , 2004, B)

*Plan interventions that increase parents'/ caregivers' beliefs that their own child is vulnerable to injuries and that those injuries can be serious.*

- ❖ Teach caregivers that falls are the leading cause of hospitalization in one to four year olds and that it is not a normal part of growing up. (Pressley J.C., et al., 2005) (Calgary Injury Prevention Coalition, 2006) Most injuries happen in the home and can be prevented. (Pickett, W., et al., et al., 2003)

*Public Health could provide injury prevention information to parents based on the age and stage of the child's development.*

- ❖ Parents/caregivers need to know and understand their child's developmental stages and make adjustments accordingly in and around the home. Convey that each stage of development puts the child at particular risks. Teach caregivers how to anticipate and manage potentially high-risk situations. It is important to convey to parents/caregivers their role in fall prevention. (Safe Kids Canada, 2006, B)

*Public Health could plan interventions that focus on a single cause of injury:*

- ❖ Research shows that being dropped is the most common type of fall for infants birth to 2 months. Falls from furniture is most common for three month to 11 month olds. (Pickett, W., et al., et al., 2003)
- ❖ Research also shows that falls from balconies, stairs, windows, and furniture are the most common type for toddlers. (Bulut M., 2006)
- ❖ Hospitalizations due to falls from beds or chairs are most common among those under five years of age. (Safe Kids Canada, 2007, A)
- ❖ Research shows that one to four year olds are more likely to get hurt than other age groups in home play-grounds, with swings being involved in approximately half of all injuries. (Safe Kids Canada, 2007, B) (KIDSAFE, 2004)
- ❖ Programs that focus on a single cause of injury seem to have better outcome results. (e.g., Children Can't Fly Program in New York City reduced window falls and deaths by 50 % and 35%

respectively). (Safe Kids Canada, 2006, A)

*Public Health could try to work with community partners to advocate for safer products or banning of unsafe products.*

- ❖ Banning baby walkers in Canada in April 2004 is an example of this strategy. (Safe Kids Canada, 2006, A)

*Public Health could work with caregivers to use home safety products to modify the home environment.*

- ❖ When planning new home safety programs, assessment of caregivers' beliefs and attitudes to home safety practices, and their perception of their own child's risk of injury, may provide insights into how to use the devices to best prevent injuries. (Safe Kids Canada, 2006, B)

## **Evidence Informed Practice Recommendations for Children 5 to 9 years**

Falls are the number one cause of all childhood injuries, with the rate of injuries decreasing as children get older. (Safe Kids Canada, 2007, A) However, one injury appears again and again in the data. Children between 5 to 9 years of age tend

to fall from playground equipment. Thus, the following section will focus on specific interventions related to this topic in the community setting.

*Public Health may want to plan interventions that improve safety standards/policies for fall prevention:*

- ❖ Research shows that *Canadian Standards Association (CSA)* standards are an effective tool in identifying hazardous playground equipment and that removing and replacing unsafe equipment is an effective strategy for preventing playground injuries. Public Health can align with community members, parents, and health care providers to advocate for compliance with CSA playground standards. (Howard, A.W., et al., 2005) Consider starting with low socioeconomic areas. (Ministry of Health and Long-Term Care, 2006)
- ❖ Advocate also for compliance with the CSA playground standards at schools and municipal playgrounds. CSA has established guidelines to reduce injury called “Children’s Playspaces and Equipment”. (Canadian Paediatrics Society, 2007)

- ❖ Engage key stakeholders (community members, parents, schools, municipality) in next steps of achieving compliance of CSA standards in their community. Next steps policy development can include. (Hendricks C.M. , 1993)

- Inspection by certified experts to assess and document hazards.
- Prioritizing hazards for modification or correction.
- Maintenance of playground equipment, surfacing, and grounds.
- Injury reporting and follow-up to correct hazards.
- Planning of future play areas that comply with CSA standards.

- ❖ Investigate alternative outdoor play environments (e.g., [www.evergreen.ca](http://www.evergreen.ca)).

*Public health could try to plan interventions that educate stakeholders about CSA standards:*

- ❖ Educate playground operators (municipalities, school boards) about

playground injuries and their prevention.

- ❖ Educate emergency health care providers about the importance of reporting injuries in their documentation.
- ❖ Educate community members, parents about the CSA standards.
- ❖ Educate caregivers about playground basics for home and community.

## Evidence Informed Practice Recommendations for Pre-teens & Teens 10 to 19 years

Teenagers most often acquire a fall related injury while engaging in a recreational activity. Interventions could focus on education, training, use of equipment and policy / regulations. Much of this detailed information is located in the *Sports and Recreation Injuries; Evidence-Based Practice Synthesis Document* at the Ontario Injury Prevention Resource Centre.

Please refer to this review for more details about the 10-19 year-olds.

In addition to recreational injuries, it would be beneficial to address risk taking behaviours with this age group.

Evidence-based research from the Search Institute has shown the power of devel-

opmental assets. Assets protect youth from high-risk behaviours and promote positive attitudes and behaviours. (Search Institute) Public Health can work with community partners to promote the “40 Developmental Assets” within communities. This framework addresses substance prevention issues, as does the OIPRC document, *Alcohol Related Injury; Evidence-Based Practice Synthesis Document*.

A recommendation would be to keep up to date on falls prevention innovations and find opportunities to work with community partners in new areas of innovation. For example, in the workplace, research has shown that improving proprioception may also reduce injury by helping young people deal with height demands and other balance control situations in industrial settings. (Maki, B.E., et al., 2008) It was also established by one study in comparing falls across the lifespan, that adolescents fall more outdoors than their older counterparts. (Talbot L.A, et al., 2005) This emphasizes that when work is done to modify outdoor environmental hazards, (discussed later under adults and older adults) it is beneficial to more than one age group.

## Evidence Informed Practice Recommendations for Adults 20-29 years

N.B. As compared to the previous section entitled “Risk Factors for Adults 20-54 years”; the “Evidence Informed Practice Recommendations” for the age group has been further divided into two sections based on the differing socioeconomic environments that exist for the age ranges in this category. These vastly different environments affect and alter the recommendations that need to be made.

Alcohol misuse is known to be a factor in leading to increased risk of slipping, tripping, and stumbling. (Spirito, A., et al., 1997) This type of injury was the most common reason adults aged 20-29 years visited the emergency department or were hospitalized in Ontario in 2005/06. (Canadian Institute for Health Information, 2006) It is recommended that interventions focus on policy and low risk drinking guidelines. It is also important to note that in 2000/2001, 27% of all people hospitalized for injuries due to a fall had blood alcohol concentrations over 0.08%, the legal limit. (MADD Canada & CAMH, 2006) This data supports the need for alcohol policy priorities for Ontario. Infor-

mation relating to this topic is discussed in further detail in the *Alcohol Related Injury; Evidence-Based Practice Synthesis Document* at the Ontario Injury Prevention Resource Centre.

Research suggests that interventions may be effective in improving the balance of young adults. (Maki, B.E., et al., 2008) Strong evidence also exists that the use of hand rails can significantly decrease the risk of falls. (Coutts, J., Lockett, D. & Edwards, N.) Research also shows that younger adults need to be encouraged to keep strong and able-bodied for prevention of falls. Integrated injury prevention efforts between injury prevention and chronic disease prevention teams can collaborate to support the physical activity messaging given to adults.

## Evidence Informed Practice Recommendations for Adults 30-54 years

A multi factorial approach used for older adults, will also help reduce falls in adults aged 30-54 years. The main causes of falls in this age group are stairs and steps. Interventions can ideally focus on modification of the environment, education, and engineering with regards to policy. A good resource to use is *Steps to*

*Safer Stairs, A Kit for Improving Stair Safety* by the Community Health Research Unit, University of Ottawa. (Coutts, J., Lockett, D. & Edwards, N.)

### **Recommendations:**

*Public Health could provide education to the community at large about home stairs and outdoor safety measures.*

- ❖ Review of the literature identified a stairway safety checklist to determine if sets of stairs are safe. Quick Tips modification and prevention messages are also available (Steps to Safer Stairs, Community Health Research Unit, University of Ottawa). (Coutts, J., Lockett, D. & Edwards, N.)

*There could planning of interventions that improve engineering standards for fall prevention.*

- ❖ Advocate for standardization of stair modification for residential, community and home dwellings.
- ❖ Engage key stakeholders (e.g., municipal governments, local businesses or landlords) to tackle the issue.
- ❖ Collaborate with members in the community with a vested interest (e.g., parents with children, women's

groups, seniors' groups). (Coutts, J., Lockett, D. & Edwards, N.)

- ❖ Collaborate with other groups (e.g., Accessibility Groups, Home and Community Support Services, VON) to set up home maintenance programs for repairs and installation of safety equipment, and promote to community at large.
- ❖ Engage municipal officials/public works in setting up a hotline to report hazards in public places and promote to community at large. The major change to comprehensive programming was to add winter safety to spotting hazards. (Ontario Neurotrauma Foundation, 2005)

*A focus could be placed on educating and improving skill development of adults in relation to physical activity.*

- ❖ Middle age is an excellent time to encourage fitness in order to reduce the risk of falls in the long run.

## Evidence Informed Practice Recommendations for Adults 55-64 years and Older Adults 65+ years

Causes of falling for both these age groups are the same, so what is good for a 58 year old is also good for a 65 year old. There are many possible causes of falling. Some are related to health and physical conditions, such as poor balance or muscle strength. Others are risks in the home or public places or use of multiple medications. When several are combined, the risk of falling increases. That is why the most effective falls prevention interventions are those that use a multi-factorial population health community based program. (Tinetti, M.E, et al., 1994)

There are two models that address this approach: the BEEACH Prevention Model, (Scott V.I., 2007) which is outlined by Dr. Vicki Scott in the Canadian Falls Prevention Curriculum (CFPC) and the Stay on Your Feet (Barnett, L.M., et al., 2004) program used by the Ontario Neurotrauma Foundation. The BEEACH Model uses a comprehensive approach that addresses behaviour change while Stay on Your Feet ensures comprehensive and integrated programming in relation

to older adults and fall prevention. Both will be outlined as they are evidence-based falls practices.

### Stay on Your Feet

Addresses each of the following areas in a coordinated and integrated approach:

- ❖ Public Information and Awareness
- ❖ Community Education and Skill Development
- ❖ Partnerships with Health Care Professionals
- ❖ Community Policy Development
- ❖ Home Safety/Home Hazard Reduction

Examples of implementation interventions that have been evaluated and used by Public Health in the Stay On Your Feet programming are outlined: (Ontario Neurotrauma Foundation, 2005)

#### **Public Information Dissemination and Awareness**

- ❖ Distribute falls prevention materials to community at large.
- ❖ Conduct workshops on the wise use of medications with a variety of community health professionals.

- ❖ Hold “pill-spills” district wide campaigns (drop off unused/expired medications).
- ❖ Develop a Home Safety Checklist and provide presentations to local hardware stores about stocking new falls safety products.

### **Community Education and Skill Development**

- ❖ Develop media campaigns about fall issues, workshops, campaigns.
- ❖ Training and employing older adults on part time basis as medication workshop leaders.
- ❖ Instruct older adults to lead gentle exercise classes.
- ❖ Train “Falls Prevention Advisors” (all of whom are 50 years of age or older) to discuss key issues.

### **Partnerships with Health Professionals**

- ❖ Involvement with other community partners in the development, implementation and distribution of a falls algorithm. The scope of this involvement may vary.
- ❖ Provide targeted research and educational campaign materials to Family

Medicine, Community Health Nurses and Nurse Practitioners.

- ❖ Development of educational tools (e.g., patient questionnaire to introduce falls prevention and patient falls-risk assessment to be used by family physicians).
- ❖ Development of referral pads for community health nurses to refer at-risk older adults to a range of services.
- ❖ Provide information sessions that are held in conjunction with professional credits (e.g., CME).

### **Community Policy Development**

- ❖ Develop falls prevention policy for public places.
- ❖ Develop a set of guidelines to assist local governments in taking falls prevention measures.
- ❖ Educate occupational therapists on falls prevention improvements for pensioner units.

### **Home Safety/Home Hazard Reduction**

- ❖ In partnership with community agencies/ hardware stores, conduct home inspections using a home safety checklist and ensure that the partner-

ship results in follow up with modification changes.

- ❖ Engage local municipal governments in the development of a public hazard hotline. Then distribute information advising residents to contact public works if they spot a hazard.

BEEACH MODEL (see diagram) illustrates the comprehensive approach for falls prevention, centered on behaviour change and will be elaborated on next.

*Public Health can plan interventions that increase **knowledge** about fall injuries:*

- ❖ Increase awareness of the issue and scope of the problem (e.g., if the rate of injury among seniors remains the same, the number of injuries would almost double by 2031). (Ontario Injury Prevention Resource Centre, 2007)
- ❖ Educate the public that falling is not inevitable as people age.
- ❖ Convey to the community their role in fall prevention.
- ❖ Distribute focus tested falls prevention resources to community at large.

*Public Health can work with health professionals, older adults, decision makers, around the issue of **equipment or assistive device** use.*

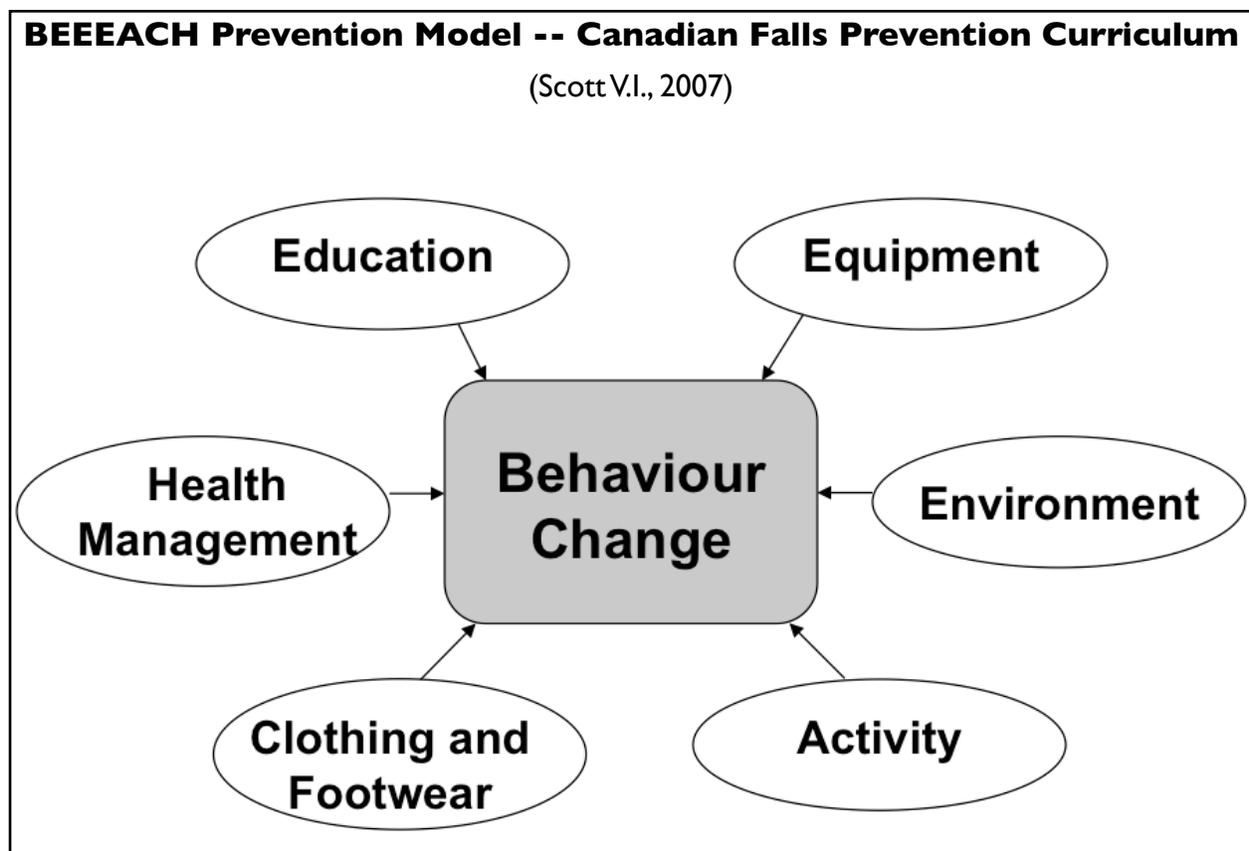
- ❖ An exploratory study used focus groups to explore seniors' views on the use of assistive devices in fall prevention. The findings have important implications for public health nursing with regards to counselling, social marketing and policy change to prevent falls among older adults. (Aminzadeh F. & Edwards N., 1998)

*Plan interventions for **environmental assessment and modifications** in and around the home:*

Home assessments aim at enhancing safety, accessibility and performance of daily activities. Evidence informed practices for environmental modifications could include. (Public Health Agency of Canada, 2005)

- ❖ Home modifications as part of a fall reduction program.
- ❖ Use the skills and training of occupational therapists for conducting home assessments as they can evaluate the environment and the older adults' functioning level.

- ❖ Combine programs with strategies such as education and counseling about reducing risks (e.g., what other risk factors are present that would interact with the environment to increase a fall).
- ❖ Offer some form of financial or manual assistance as it improves success rates.
- ❖ Target people who are ready to change and involve them in the process of making decisions around modifications (e.g., recent fall, increased understanding of falls).
- ❖ Modifications in and around the home can include: securing cords and loose carpets, installing grab bars and handrails, removing clutter, improving tub and shower safety, and improving lighting and switches at doorways.
- ❖ Ensure that the hazards that are identified are corrected. Part of the falls reduction program must include identifying who is responsible for fixing the hazards (e.g., handy man in local community, older adult's family). The most successful programs are those that do not leave the modifications to



the older adult. (Public Health Agency of Canada, 2005)

*Plan interventions that encourage **physical activity** in the community dwelling adults:*

Public Health can partner with the Centre for Activity and Aging (e.g., Train the Trainer programs), fitness instructors, kinesiologists, occupational therapists, physiotherapists, CCAC (Community Care Access Centres), and interested community members to raise awareness, increase knowledge and skills of older adults with regard to physical activity and its role in fall prevention . Steps to take include. (Scott, V.I., 2007)

- ❖ Determine your target group and tailor program appropriately.
- ❖ Focus on endurance, strength, balance, and flexibility (See Table 3 for examples). Other recommended physical activities include walking, dancing, water fitness or Tai Chi. Research findings show that home-based exercise, fall-related multi-factorial programs and community based tai chi in a group format have been effective in reducing fear of falling in community living older people. (Zijlstra, G.A., et al., 2008)

- ❖ Ensure affordability, accessibility, and enjoyability of intervention.
- ❖ Include motivation and integration. Research shows that the intention to do strength and balance training is closely related to beliefs around perceived benefits and appropriateness for them to undertake such activities. (Yardley L., et al., 2007)
- ❖ Reflect medical clearance for those with serious health problems.
- ❖ There could be attempts to work with community partners to ensure that communities are pedestrian friendly and support active aging. This may involve changing attitudes, engineering, increasing knowledge, and policy development.
- ❖ *Plan an intervention that focuses on educating older adults and their caregivers on the role of **footwear/clothing** for reduction of falls.*

- Public Health needs to keep up-to-date on falls prevention innovations. For example, research shows that proprioception plays a key role in balance and advancements in this area have the poten-

tial to significantly influence falls prevention. (Perry, S.D., et al., 2008) Public Health could use this information to advocate for the development and distribution of balance enhancing insoles and then create a population-based public health campaign.

- Home safety checklist should include information about pants and housecoats needing to be a safe length to prevent tripping.

❖ *Public Health can work with community health partners to ensure **health management** services are promoted.*

- Although Public Health is not involved directly with hands on care, there is still opportunity to educate and collaborate with partners directly involved in the care and general health management of individuals (e.g., medication review campaign with pharmacists).

- Engage in opportunities to collaborate with partners on campaigns and exchange up-to-date information on general health and well-being (e.g., Osteoporosis Society – Vitamin D and Calcium

bone health campaign for the general public, optometrists – information dissemination for people with new lenses on how to prevent falls while adjusting to new glasses, etc.).

- Attend Canadian Falls Prevention Curriculum, hosted by Ontario Injury Prevention Resource Centre, and encourage community partners/ coalitions to attend for orientation to older adults falls issues.

- By promoting exercise, Public Health is directly helping with health management. Exercise programs typically involve cardiovascular endurance, muscle strength, flexibility, balance, and can increase bone density, (Public Health Agency of Canada, 2005) thus, exercise goes a long way in maintaining health and diminishing the effects of chronic disease issues.

The more emphasis there is on fall prevention, the more opportunity there will be for families, adults, older adults, and workplaces to become a culture of safety.

**Table 3 -- Types of Exercise for Falls Prevention (SMARTRISK, 2004)**

TYPE OF EXERCISE	PURPOSE	HOW OFTEN
Endurance	Improves stamina of heart and lungs. Strengthens bones and reduces risk of fractures.	Accumulate 30 minutes, 4-7 days per week.
Strength	Makes muscles stronger and improves balance.	30 minutes, 3 times per week
Balance	Improves posture, stability and coordination.	30 minutes, 3 times per week
Flexibility	Improves flexibility and range of motion of joints.	10-20 minutes every day.

## Implementation and Evaluation

Resources, further research and attention is needed to determine the unique risk factors, numbers, and rates of injury associated with falls across the lifespan. This will help tailor multifaceted injury prevention strategies to be developed and implemented.

Implementation and ongoing evaluation at each stage is essential in order to maximize the effectiveness of reducing the risk of injury associated with falls. Because falls and the injuries associated with them affect the community as a whole, multiple levels of the local com-

munity need to be involved in order to gain maximum benefit from injury prevention programs.

### Evaluation of Prevention Initiatives

Determining the effectiveness and efficacy of an injury prevention program is an important step prior to its implementation. To do this, an evaluation framework needs to be put in place, which looks at not only the intended outcomes of the program and initiatives, but also evaluates each stage of the implementation process. As a first step, research support is needed to collect local baseline data.

Research indicates that evaluation is not a consistent, standard practice for local initiatives. Therefore, effective evaluation needs to become a routine and standardized practice when implementing injury prevention initiatives, particularly at a local level. This will require partnerships with researchers, as well as those with expertise in evaluation (e.g., OIPRC, THCU).

Any evidence-based population health approach to injury prevention requires resources within the community (Nova Scotia Injury Prevention Strategy, Nova Scotia Health Promotion, 2003). This type of approach to injury prevention incorporates the whole population and works on improving the health of the population over its life-course. It focuses not only on the physical health of the individual, but also the social, political, and economic conditions and how they affect health on a broader population base.

The effectiveness of a program is measured by the ability of the program to reduce or minimize the risk of injury in a given population. In addition to assessing the effectiveness of a program, it is also important to determine the efficiency of a program, or in other words, the ability of

the program to produce the greatest outcomes using the smallest amount of resources, as often resources are limited (The Injury Prevention and Evaluation Cycle, British Columbia Injury Research & Prevention Unit).

There are numerous factors to consider when evaluating a program. For example, questions to consider include:

- ❖ Does local data for a baseline exist? If not, how will it be collected?
- ❖ What was identified as the issue to be addressed? Which risk factors were targeted?
- ❖ Has anyone else addressed this issue successfully before? If so, what did they do, and how can it be translated to our local context?
- ❖ What goals do we hope to achieve, and how can they be translated into specific, measurable objectives? How can these be expressed as intended short-term and long-term outcomes?
- ❖ Who do we need to align or partner with to achieve our intended outcomes?
- ❖ Who are we targeting with our messages or other interventions?

- ❖ Is each step of the process that was decided upon complete?
- ❖ Are the appropriate age groups (target population) being reached?
- ❖ Are we having an impact on our intended short-term outcomes (e.g., Are the skills being taught? Are changes in attitude, knowledge, and behaviour around risk being realized?)
- ❖ Are we having an impact on our intended long-term outcomes (e.g., Is there a reduction in the number of falls and the injuries associated with them?)

When looking at the efficiency of the program, the cost effectiveness of the initiative is an important aspect to consider. For instance, seniors, a population which has been established as one at risk for falls, and hip fractures that result from them, use health care resources for often lengthy periods of time. By reducing the occurrence of falls and hip fractures among this age group, one would not only improve their quality of life, but would also produce cost savings in health care resources.

## Implementation of evidence informed practice recommendations

Once the various factors associated with an injury prevention program have been considered, modified, and adapted to meet the needs of the at-risk population and the program itself has been established as one considered optimally effective in reducing the burden of injury, the planning and implementation process can effectively begin. A sample of such a process, using the five-step public health approach, is summarized in Figure 1. Note that the process begins with defining the problem, moving on to identifying risk and protective factors, selecting an intervention, implementing and evaluating the intervention. While the process is shown proceeding in a single direction, it is important to note that it may be necessary to revisit an earlier stage of the process at any time, as new information and a richer understanding of the injury issue, and the social and political context comes to light.

When implementing a plan, a specific system must be in place to guide the prevention initiatives. This includes specific goals, objectives, timelines, personnel re-

sponsible, costs, evaluation protocols, and room for potential modification. Such a system involves asking questions at each stage of the process, which in turn link to evaluation issues. For example, defining the problem amounts to asking, “Who is getting hurt and how?” In evaluation terms, answering this question corresponds to conducting a needs assessment. Defining the problem concludes when one has a clear goal, or statement of intended change in mind.

Once one has a goal or goals defined, one can translate these into objectives using the old anagram SMART, a mnemonic device to remind one that objectives are to be: specific, measurable, attainable, relevant, and time-bound. In short, they are specific statements of what one wants to see change as a result of the intervention, for whom, by how much, and over what timeframe. The link back to evaluation is again clear, as in evaluation terms objectives are really just intended outcomes.

Once one has intended outcomes, one can continue the plan by identifying: which activities will produce these outcomes; who needs to be targeted by these activities, and how these activities naturally

group into the components of your intervention. One can diagram the connections between components, activities, targets, short-term outcomes, and long-term outcomes to produce a program logic model that will help guide implementation, evaluation, and communication with program stakeholders, management, and staff.

Programs are most effective when an individual is assigned to manage the specific tasks in the plan. Without this, the goals of the program may not be reached. As an important first step of any plan which involves communication, it is essential to consider the target audience with respect to their attitudes and beliefs about injury risk. By doing this, the program can be carried out in a way which will increase the likelihood of change in knowledge and skills of that population, in particular (The Injury Prevention and Evaluation Cycle, British Columbia Injury Research & Prevention Unit).

It is also important to tailor the intervention to the local social and political context, as only then can the injury prevention strategies become maximally effective in modifying the knowledge and skills, and subsequently reducing the risk

and prevalence of injury. Figure 1 centers the program planning and implementation process on the social and policy context for this very reason.

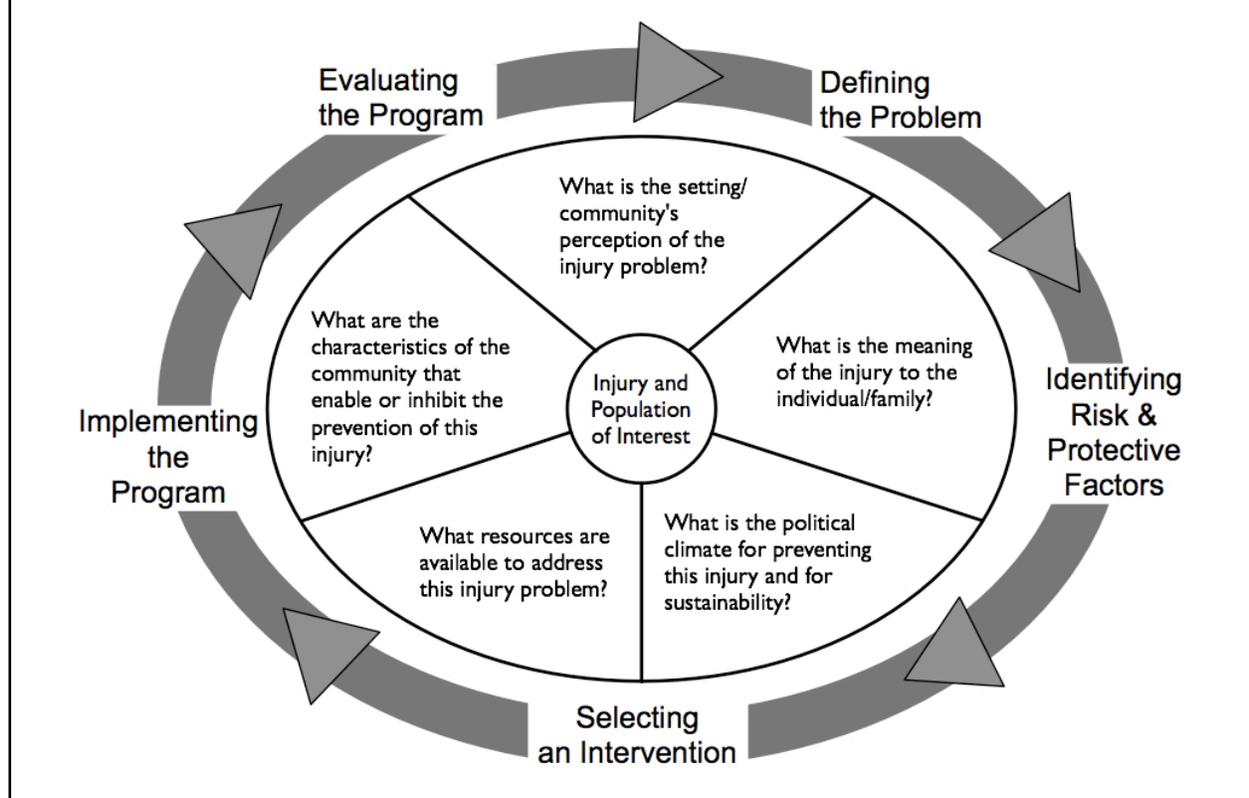
For example, the appropriate and necessary social and political support must be available in the local community in order to successfully implement the program. Without support at these levels, the implementation process can be slowed or hindered. Connect and collaborate with individuals in your community including city council, public health organizations, seniors' coalitions, public works, caregivers, school boards, health care professionals and other key stakeholders. Seek out community and business groups which will support programs of this type.

At this stage, potential limitations must also be considered. This includes issues related to the availability of resources in the community. This will differ in each community and must be adapted to accordingly.

And finally, as with any injury prevention plan, continuous refinement and modification will occur as the plan is further developed. As injury priority issues change, so will the programs put in place.

This further emphasizes the importance of continuous evaluation at all stages of implementation by way of surveillance, research, and consultation.

Figure 1 - **Planning and Implementing an Injury Prevention Intervention and its Relationship to the Social and Policy Context** (Canadian Collaborating Centres for Injury Prevention, 2008)



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