

# ***Agricultural Fatalities and Hospitalizations in Ontario 1990-2008***

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### ***Agricultural Fatalities and Hospitalizations in Ontario 1990-2008***

This report from Agricultural Fatalities and Hospitalizations in Ontario 1990-2008 describes the occurrence of fatal and hospitalized agricultural injuries in Ontario from 1990 to 2008.

Workplace Safety and Prevention Services wishes to thank the Ontario Ministry of Agriculture, Food and Rural Affairs for their support and assistance in promoting health and safety to the Ontario Agricultural Community.

# *Agricultural Fatalities and Hospitalizations in Ontario 1990-2008*

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# Executive Summary

Injury has been identified as a major public health problem in Canada and a significant threat to the economy, health care system and overall quality of life. In other industries, victims of occupational injuries are usually workers aged 18 to 65. Agriculture is unique in that children and the elderly sustain significant numbers of severe work-related injuries. This is partly because farms and ranches are not just work sites, but also places where people of all ages live, play and participate in recreational activities. Also, unlike other industries, it is common for farmers and ranchers to work full time and to operate tractors and other heavy machinery well into their 70s and 80s.

Although the greatest cost of an agriculture-related injury is human suffering and loss to individuals and families, the financial costs are far from trivial. In 2004, agriculture-related injuries in Canada cost \$465 million dollars.<sup>1</sup>

There are three categories of injury by intent:

- unintentional injuries which are very responsive to injury prevention programming and include: motor vehicle collisions, machinery-related mishaps, injuries working with large animals, falls, poisoning, drowning and suffocation from grain,
- intentional injuries including acts of suicide (self-harm), violence
- undetermined injuries; those in which intent could not be determined.

This report focuses on unintentional injuries. Unintentional injuries accounted for the majority of costs; 80% of all agriculture-related injury costs (\$374 million).<sup>2</sup>

***Agricultural Fatalities and Hospitalizations in Ontario, 1990-2008*** includes an analysis of eighteen years of Canadian Agricultural Injury Reporting (CAIR) fatal and hospitalized agricultural injury data in the province of Ontario. The purpose of this report is to describe the magnitude of the agricultural injury problem in Ontario and to examine age-related patterns of injury. A main objective of CAIR is to identify agricultural injury patterns in order to facilitate the design and targeting of specific prevention initiatives. Also, by collecting agricultural injury data on an ongoing basis, CAIR is able to monitor the effectiveness of prevention programs and to quickly identify patterns of injury arising from new equipment and new farming techniques.

CAIR data show that agricultural injuries are not random or isolated “accidents”. There are many recurrent patterns of injury. From 1990-2008 in Ontario:

## ***Fatal Agricultural Injuries***

- 542 people were killed in agricultural injury events.
- 93% of those fatally injured were male.
- The percentage of males killed was highest for adults aged 60 and over (90%) and lowest for children under age five (76%).
- The agricultural fatality rate was 12.9 per 100,000 agricultural population (including non-workers). This is same as the national agriculture fatality rate.
- 94% of the fatalities were work-related.
- Machines were involved in 71% of all fatal agricultural injury events.
- Over half (53%) of all fatalities were due to three machine-related causes: machine rollovers, machine runovers and machine entanglements.
  - Of the machine rollover deaths, 65% were sideways.
  - Of the machine runover deaths, 34% were unmanned machine (machines had been bypass started, left running or left unblocked on a slope).
  - Of the entanglements deaths, 30% involved a power take off (PTO).
- The top five causes of agricultural fatalities in Ontario were machine rollovers (23%), machine runovers (21%), machine entanglements (8%), animal-related incidents, and being struck by a non-machine object (both 6%).

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<sup>2</sup> SMARTRISK, (2010). The Economic Burden of Injury within the Agricultural Population in Canada. SMARTRISK: Toronto, ON (unpublished).

- Of the animal-related deaths, 65% involved cows/bulls/calves.
- 50% of fatalities due to toxic substance exposure were attributed to hydrogen sulfide (manure gas) poisoning.
- 44% of all agriculture fatalities involved a tractor (runover, rollover, or being pinned by a tractor).
- 51% of the fatalities were operators of their farm.

#### **Children and Youth (< 15 years of age), Ontario, 1990-2008**

- There were 68 children and youth who died as a result of an agriculture-related injury.
- 82% of the deaths were boys.
- 79% of the fatalities were work-related, 21% were not work-related deaths but due to hazards of the farm environment such as large animals, drownings in dugouts and troughs.
- 66% were machine-related.
- The leading causes of fatal injuries were machine runovers (46%), drowning (19%) and machine rollovers (7%). These three causes accounted for 72% of the agriculture deaths.
  - Of the machine runover deaths, 48% occurred to a child bystander,
  - Of the 13 drowning deaths, 69% were children less than 5 years of age and 38% of the deaths occurred in dugout/pond/lake.
- 51% of the deaths involved a tractor (runovers, rollover, or being pinned by a tractor).
- 81% of the children who died were a child of the operator.

#### **Adults (15-59 years), Ontario, 1990-2008**

- There were 277 adults who died as a result of an agriculture-related injury.
- 94% of the deaths were males.
- 96% of the fatalities were work-related.
- 69% were machine-related.
- The leading causes of fatal injuries were machine rollover (23%), machine runover (10%), and machine entanglements (10%). These three causes accounted for 44% of the agriculture deaths.
  - Of the machine rollover deaths, 68% were sideways rollovers.
  - Of the machine runover deaths, 38% involved unmanned machines (machines had been bypass started, left running or left unblocked on a slope).
  - Of the machine entanglements deaths, 41% involved an activity.
- 55% of the deaths involved a tractor (runovers, rollover, or being pinned by a tractor).
- 47% were farm operators.

#### **Adults (60 + years), Ontario, 1990-2008**

- There were 197 adults who died as a result of an agriculture-related injury.
- 96% of the deaths were males.
- 97% of the fatalities were work-related.
- 76% were machine-related.
- The leading causes of fatal injuries were machine rollover (28%), machine runover (27%), and animal-related (9%). The three causes accounted for 64% of the agriculture deaths. The top two causes accounted for 55% of the agriculture deaths.
  - Of the machine rollover deaths, 63% were sideways rollovers.
  - Of the machine runover deaths, 52% involved an unmanned machine (machines had been bypass started, left running or left unblocked on a slope).
  - Of the animal-related deaths, 76% involved cows/bulls/calves.
- 56% of all deaths involved a tractor (runovers, rollover, or being pinned by a tractor).
- 74% were farm operators.

## **Hospitalized Agricultural Injuries**

- 4,756 agriculture-related hospitalizations. This is an average of 264 admissions each year.
- 83% of those injured were male.
- The percentage of males hospitalized was highest for adults aged 60 and over (88%) and lowest for children under age five (76%).
- The agricultural injury hospitalization rate was 112.8 per 100,000 agricultural population (including non-workers).
- Machines were involved in 51% of all agricultural injury hospitalizations.
- The top causes of agricultural injury hospitalizations in Ontario were animal-related and entanglement/caught in machinery (each with 16%), falls from height (14%), machine runaway (10%).
  - Of the animal-related hospitalizations, 47% were cows/bulls/calves.
  - Of the entanglement hospitalizations, 20% involved an auger.
  - Of the fall from height hospitalizations, 41% fell from the barn loft/rafters.
  - Of the machine runaway hospitalizations, 30% were unmanned machines (machines had been bypass started, left running or left unblocked on a slope).
- 35% of machine-related hospitalizations involved a tractor.
- 18% of all agriculture injury hospitalizations involved a tractor.

## **Children and Youth (< 15 years of age), Ontario, 1990-2008**

- There were 609 children and youth who were hospitalized as a result of an agriculture-related injury.
- 73% of the hospitalizations were boys.
- 50% were machine-related.
- The leading causes of hospitalized injuries were fall from height (22%), machine entanglements (18%), machine runovers (16%) and animal-related injuries (14%).
  - Of the fall from height hospitalizations, 66% of the falls were from barn loft/rafters.
  - Of the machine entanglement hospitalizations, 19% involved augers.
  - Of the machine runovers hospitalizations, 49% were passengers, and another 39% were bystanders.
  - Of the animal-related hospitalizations, 70% were caused by horses/stallions/colts.

## **Adults (15-59 years), Ontario, 1990-2008**

- There were 2,805 adults hospitalized as a result of an agriculture-related injury.
- 83% of the hospitalizations were to males.
- 52% of the hospitalizations were machine-related.
- The leading causes of hospitalizations were entanglements/caught in machinery (18%), animal-related events (16%), falls from height (13%), machine runovers (8%) and being pinned or struck by a machine (7%).
  - Of the entanglement hospitalizations, 21% involved an auger.
  - Of the animal-related hospitalizations, 50% involved cows/steers/calves.
  - Of the falls from height hospitalizations, 35% were from barn loft/rafters.
  - Of the machine runovers hospitalizations, 33% were on unmanned machines (machines had been bypass started, left running or left unblocked on a slope).
- 30% of the machine-related hospitalizations involved a tractor.
- 16% of all agriculture injury hospitalization involved a tractor.

## **Adults (60 + years), Ontario, 1990-2008**

- There were 1,342 adults who were hospitalized as a result of an agriculture injury.
- 88% of the hospitalizations were to males.
- 49% were machine-related.
- The leading causes of hospitalizations were animal-related (17%), fall on same level (13%), fall from height (12%), machine runaway (12%) and entanglement/caught in machinery (10%).
  - Of the animal-related, 68% involved cows/steers/calves.
  - Of the fall from height, 38% involved a fall from barn loft/rafters.
  - Of the machine runaway hospitalizations, 46% were unmanned machines (machines had been bypass started, left running or left unblocked on a slope).
  - Of the entanglement hospitalizations, 22% involved an auger.
- 49% of the machine-related hospitalizations involved a tractor.
- 24% of all agriculture injury hospitalization involved a tractor.

## Highlights: all age groups combined

	<i>Fatalities</i>	<i>Hospitalizations</i>
<i>Surveillance period</i>	1990-2008	April 1, 1990-March 31, 2008
<i>Age range</i>	1-93	<1-95
<i>Average age</i>	47.6	44
<i>Number injured</i>	542	4,756
<i>Percentage of machine injuries</i>	71%	51%
<i>Percentage of non-machine injuries</i>	39%	49%
<i>Number/percentage of male victims</i>	505 (93%)	3,967 (83%)
<i>Number/percentage of female victims</i>	37 (7%)	788 (17%)
<i>Average length of hospital stay*</i>	-	6.8 days
<i>Length of stay range*</i>	-	1 to 366 days
<i>Top five causes of injury:</i>		
	1. Machine rollover (23%)	1. Animal-related event (16%)
	2. Machine runover (21%)	2. Machine entanglement (16%)
	3. Machine entanglement (8%)	3. Fall from height (14%)
	4. Animal-related event (6%)	4. Machine runover (10%)
	5. Struck by a non-machine object (6%)	5. Fall from machine-not runover (7%)
* length of stay was calculated for records with admission and discharge dates completed.		



# 1 INTRODUCTION

## 1.1 GENERAL INTRODUCTION

The Canadian Agricultural Injury Reporting (CAIR), formerly known as the Canadian Agriculture Injury Surveillance Program (CAISP) was established in 1995 in response to the need for better information about fatal and hospitalized agricultural injuries in Canada. CAIR is a national program with collaborators in each of the ten provinces of Canada. *Agricultural Fatalities in Canada 1990-2008* examines Canadian agricultural fatality data for the nineteen calendar years from 1990-2008. This report includes reported agricultural fatality data for persons who were part of the Canadian farm population, those in the temporary foreign workers under the seasonal agriculture works program from Citizenship & Immigration Canada or who were at risk to agricultural injuries in Canada from 1990-2008. There were 1,975 agricultural fatalities in Canada from 1990 to 2008, an average of 104 per year. Over the 19-year surveillance period, the average fatality rate per 100,000 farm population, per year was 12.9 deaths.

Following this introduction, there is a description of the methods used in CAIR. Agricultural fatalities in Canada are then reviewed comprehensively in an overview chapter. After the overview, important trends and patterns in agricultural fatalities are presented for children under fifteen, adults aged 15 to 59 and adults aged 60 and over.

## 1.2 HISTORY OF AGRICULTURAL INJURY SURVEILLANCE IN CANADA

Agricultural injuries have been viewed as an important rural health issue since the 1960s, when the problem was first recognized in the medical literature. At that time, some provincial groups began to monitor agricultural injuries, but only recently have substantial national resources been committed to the study of agricultural injuries.

When compared with other Canadian industrial sectors, agriculture is a dangerous occupation. Agriculture ranks as the fourth most hazardous industry in Canada with respect to rates of fatal injury. In terms of absolute numbers of fatalities, there is no more dangerous occupation.<sup>3</sup> Economic costs associated with agricultural injuries are also substantial. In 2004, agriculture-related injuries in Canada cost \$465 million dollars. Unintentional injuries accounted for the majority of costs, 80% of all agriculture related injury costs (\$374 million).<sup>4</sup>

Until the establishment of CAIR, Canadian data on agricultural injuries were historically limited. This surveillance program has filled an important void in providing national evidence of agricultural injury occurrence that can be used in developing and targeting effective injury prevention strategies. CAIR data has been used by various groups internationally, including Australia, Brazil, Hong Kong, India, Ireland, Netherlands, New Zealand, the United Kingdom and the United States. CAIR has been referenced in a variety of inventories and compendiums including guides to occupational and environmental health and safety, casebooks and inventories published by the Public Health Agency of Canada. In terms of policy, the use of CAIR was demonstrated as a reference source for agricultural injury at international, national, provincial, and regional levels. Information gathered indicated that the program's data has contributed to informing, influencing and enacting policy development at both federal and provincial levels. Evidence of strategic planning influences at provincial and organizational levels was apparent, and other contributions can be linked to: child safety guidelines<sup>5</sup>, child labour laws<sup>6</sup>, occupational health and safety guidelines<sup>7</sup> engineering standards<sup>8</sup> and injury reduction and health promotion strategies. At an international level, the Government of Canada cited CAIR and two CAIR reports in its 2003 submission to the United Nations, on the Convention on the Rights of the Child and identified CAIR as having

<sup>3</sup> Pickett W, Hartling L, Brison RJ, Guernsey J (1999). *Fatal farm injuries in Canada*. *Can. Med Assoc. J.* 160:1843-1848.

<sup>4</sup> SMARTRISK, (2010). The Economic Burden of Injury within the Agricultural Population in Canada. SMARTRISK: Toronto, ON (unpublished).

<sup>5</sup> National Children's Centre for Rural and Agricultural Health and Safety, Marshfield Clinic Research Foundation, 2006. Available at: [http://www.marshfieldclinic.org/nccrahs/?page=nccrahs\\_aboutus\\_center\\_highlights](http://www.marshfieldclinic.org/nccrahs/?page=nccrahs_aboutus_center_highlights).

<sup>6</sup> Irwin, John, Stephen McBride and Tanya Strubin. 2005. "Child and Youth Employment Standards: The Experience of Young Workers Under British Columbia's New Policy Regime." Canadian Centre for Policy Alternatives, September 2005. 40 pp.

<sup>7</sup> Ontario Ministry of Labour, 2006; Workers Compensation Board of Prince Edward Island, 2006.

<sup>8</sup> Canadian Standards Association. Available at: <http://www.csa.com/>

played an important role in influencing children's rights in Canada<sup>9</sup>. CAIR was also identified as used for awareness raising, skill building and knowledge development through conference presentations, teleconferences, lectures, course materials, social marketing campaigns, and resource materials. From a research perspective, 132 articles were identified as CAIR related and or citing CAIR articles and were linked to 56 journals reaching a very wide range of disciplines.

### 1.3 THE CANADIAN AGRICULTURAL INJURY SURVEILLANCE PROGRAM

The Canadian Agricultural Injury Reporting (CAIR) is a national program that is funded by the Canadian Agricultural Safety Association (CASA). CAIR is a collaborative program involving various organizations from across Canada. It is coordinated from a national office at the Alberta Centre for Injury Control & Research, University of Alberta, in Edmonton, Alberta. The people and organizations that contribute to CAIR include researchers, government agencies and the agricultural industry.

The main purpose of CAIR is to collect and interpret information on agricultural injuries from across Canada. CAIR established national standards for the collection of agricultural fatalities and hospitalizations. Although a very rich data source, in 2002, CAIR ceased the collection of hospital admission data on a national basis due to budget cuts. The collection of hospital admissions data requires the review of hospital records in order to extract the circumstances around the injury producing event. Due to the sheer number of hospital admissions annually, 1,354, the costs proved to be prohibitive.

### 1.4 OBJECTIVES OF CAIR

The objectives of CAIR are:

1. To develop a coordinated system for the assembly of national agricultural injury surveillance data. CAIR's fatality and hospitalized injury data are collected, compiled, and analyzed in a standard manner by all provinces.
2. To ensure that the collected information is interpreted and communicated in forms that are useful to potential data users in the agricultural industry. The CAIR collaborators are committed to ensuring that the data are disseminated in an appropriate and useful manner. Our primary audience is individuals within the agricultural industry who need to make informed decisions about safety programs and policy. Our reports represent one approach to making these data accessible to this audience. Other dissemination formats include articles in scientific journals, presentations at national conferences, our website at [www.cair-sbac.ca](http://www.cair-sbac.ca) and press releases.

### 1.5 USES OF CAIR DATA

CAIR has developed a surveillance system for Canada that describes the occurrence and patterns of agricultural injuries at a higher level of detail than was available previously. At both national and provincial levels, CAIR has provided evidence that has assisted in the development of priorities for health and safety programs as well as strategies for the targeting of these initiatives. CAIR data have also facilitated the post-implementation assessment of injury prevention programs.

Agricultural safety specialists and others require objective evidence so that they can promote awareness of agricultural injury issues and advocate the allocation of additional resources to injury prevention and research programs. CAIR information has been used repeatedly to assist in advocacy efforts. This has contributed to the development of informed safety policy in the agricultural industry and to the funding of safety programs at international, national and provincial levels.

CAIR has provided baseline evidence to support several applied research projects. These projects include focused investigations aimed at the prevention of agricultural injuries in children and the elderly, studies of agricultural machinery injuries and their causes, and two studies examining the economic burden of agricultural injuries.

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<sup>9</sup> Government of Canada, 2003. Available at: [http://www.canadiancrc.com/UN\\_CRC/UN\\_Committee\\_Rights\\_Child\\_Canada\\_2nd\\_Report-Overview\\_SEP\\_2003\\_34th\\_Session.aspx](http://www.canadiancrc.com/UN_CRC/UN_Committee_Rights_Child_Canada_2nd_Report-Overview_SEP_2003_34th_Session.aspx)

## 1.6 THE CHALLENGES OF INJURY CONTROL IN AGRICULTURE

In other industries, victims of occupational injuries are usually workers aged 18 to 65. Agriculture is unique in that children and the elderly sustain significant numbers of severe work-related injuries. This is partly because farms and ranches are not just work sites, but also places where people of all ages live, play and participate in recreational activities. Also, unlike other industries, it is common for farmers and ranchers to work full time and to operate tractors and other heavy machinery well into their 70s and 80s.

The prevention of injuries in agricultural work settings is challenging because of the unique nature of the agricultural work environment. Also, in most jurisdictions, agriculture is not a heavily regulated industry in terms of occupational health and safety standards. Unlike other industrial workplaces, many Canadian agricultural workplaces have not benefited from modern industrial hygiene and safety practices. The composition of the agricultural workforce, farming practices and safety practices is geographically diverse. This diversity adds to the difficulty of establishment and enforcement of safety standards. There has traditionally been reliance on voluntary rather than regulatory safety standards, but the effectiveness of voluntary safety standards has not been well evaluated.

## 2 METHODS

### 2.1 Agricultural Fatalities

#### 2.1.1 Identification of Agricultural Fatalities

A detailed review of CAIR's data collection and analysis methods is available in CAIR's national report *Agricultural Injuries in Canada for 1990-2008*. The process used in the identification of agricultural fatalities varies by province. This is a general description of the process:

1. Potential sources of agricultural fatality data are identified. These are kept by a variety of agencies that vary by province. Examples of these agencies include: offices of the provincial coroner or chief medical examiner, occupational health agencies, departments of vital statistics, ministries of transportation and health, and provincial agricultural safety associations.
2. A comprehensive list of all potential agriculture-related fatalities is assembled within each province. These lists draw upon each available source of fatality data. In Ontario, the main sources of CAIR's fatality data have been the Chief Coroner's Office and the Farm Safety Association.
3. Once cases are identified, detailed case reports are sought for review and data abstraction. The main sources of information are coroners' investigation reports, occupational safety and health agency investigation reports, and provincial police (OPP in Ontario) reports.
4. Data abstraction and entry are completed on each eligible fatality. This is done in a consistent manner using standard data abstraction forms (Appendix C). Data abstraction is completed on-site at the Provincial Chief Coroners' office by obtaining the relevant information from coroners' files. Data are then sent to the national site for verification, coding and analysis.

## 2.1.2 Definition of Agricultural Fatalities in Ontario

**Agricultural Fatalities:** CAIR defines an agricultural fatality as 1) Any unintentional injury resulting in death that occurs during activities related to the operation of a farm or ranch in Canada and/or 2) Any unintentional injury resulting in death that involves any hazard of a farm or ranch environment in Canada (excluding fatal non-work-related injuries that take place in the farm residence). This includes deaths that occur away from agricultural work locations if agricultural work is being done, e.g., transporting workers, livestock, supplies or harvested crops on public highways; farm animals roaming on public highways. Deaths where victims are killed because a third party is engaged in agricultural work are also included.

**Population of Fatalities:** All persons who live, work on, or visit a Canadian farm or ranch (as defined below), as well as all persons who are fatally injured in other locations (such as public highways) as a result of agricultural activity and all temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada.

**Farm:** In the Census of Agriculture, Statistics Canada defined a farm as “any farm, ranch or other agricultural holding that produces at least one of the following agricultural products intended for sale: crops, livestock, poultry, animal products, greenhouse or nursery products, mushrooms, sod, honey, or maple syrup products.” Canada Census of Agriculture, 1996, Statistics Canada.

Other inclusion/exclusion criteria are provided in Appendix A.

## 2.2 Hospitalized Agricultural Injuries

### 2.2.1 CAIR’s Selection Criteria for Hospitalized Agricultural Injuries in Ontario

In reporting these data there were two classification systems used in Ontario. From April 1990 to March 1999 International Classification of Diseases and Related Health Problems, Ninth Revision was used. A new version of the International Classification of Diseases and Related Health Problems, Tenth Revision, Canada (ICD-10-CA), was implemented during fiscal year April 1999 to March 2000. ICD-10-CA included revised external cause of injury codes. Most hospitalized agricultural injury cases filed after March 1999 were identified using the ICD-10-CA criteria.

- Machine-related agricultural injury (ICD 9): *Agricultural machine-related injuries include cases admitted to an Ontario hospital, where the ICD 9 external cause of injury code on the hospital discharge record was E919.0, ‘Injuries caused by agricultural machinery’. Cases with the location of injury ‘farm’ (ICD 9 CM place of occurrence code = E849.1 or ICD 9 CA 5th digit sub-classification “place of occurrence” code =1) are also included if the incident involved a machine or a motorized vehicle.*
- Non-machine-related agricultural injury (ICD 9): *Non-machine-related agricultural injuries include cases admitted to Ontario hospitals, where the injury occurred on a farm (ICD 9 CM place of occurrence code = E849.1 or ICD 9 CA 5th digit sub-classification “place of occurrence” code =1), as long as the injury did not involve a machine or vehicle.*
- Machine-related agricultural injury (ICD 10): *Agricultural machine-related injuries include cases admitted to an Ontario hospital, where the ICD 10 CA external cause of injury on the hospital discharge record was W30 ‘Contact with agricultural machinery’ or V84X ‘Transport accident – special vehicle mainly used in agriculture’. Cases coded with the location of injury ‘farm’ (ICD 10 CA place of occurrence code U98.7) are also included if the incident involved a machine or a motorized vehicle.*
- Non-machine-related agricultural injury (ICD 10): *Non-machine-related agricultural injuries include cases admitted to Ontario hospitals, where the injury occurred on a farm (ICD 10 CA place of occurrence code = U98.7)..*

## 2.2.2 Improved Identification of Non-machine Hospitalized Injuries in ICD 10 CA

The ICD 9 coding system was very effective in identifying injuries involving farm machines, such as tractors and harvesters, but was less useful for identifying non-machine agricultural injuries and injuries involving motor vehicles and off-road vehicles (ORVs). In contrast, the new ICD 10 CA coding system provides a coding structure that identifies non-machine farm injuries more effectively. As Figure 1 shows, the implementation of the ICD 10 CA coding system has resulted in marked increases in the number of non-machine agricultural injuries identified in Ontario. During the two year ICD 10 CA coding period, the number of non-machine agricultural injuries was 209.4% higher than for the two year ICD 9 coding period. Implementation of the ICD 10 CA coding system resulted in increased identification of animal-related, fall-related, struck by object, caught under object, and overexertion injuries (Figure 2).

Figure 1. The number of non-machine-related agricultural injuries identified in Ontario under ICD 9 compared with ICD 10 CA.

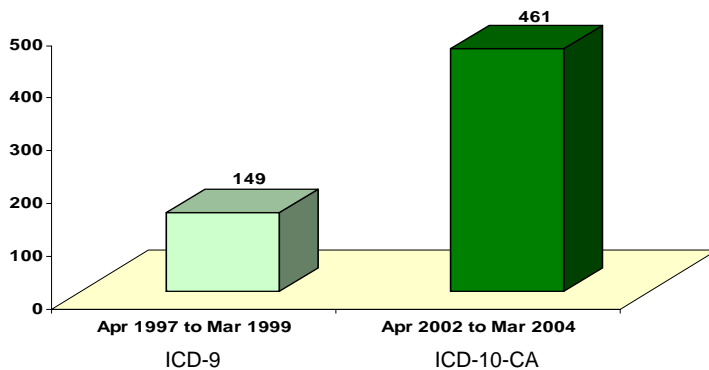
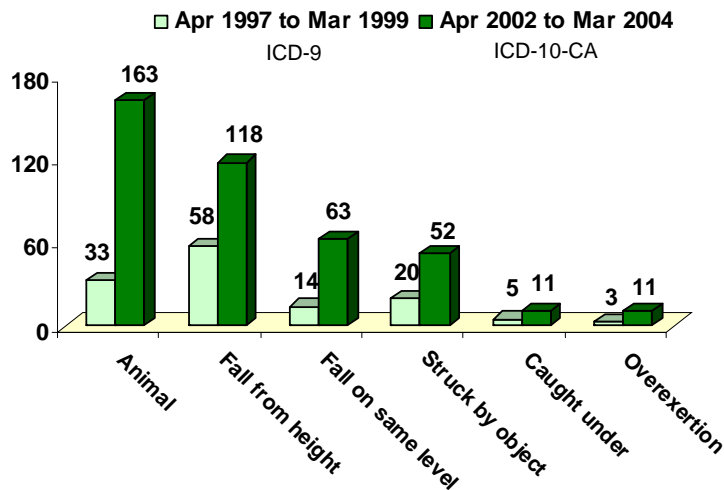


Figure 2. The number of non-machine-related agricultural injuries identified in Ontario under ICD 9 compared with ICD 10 CA, by injury mechanism.



Some patterns of injury that are known to be important in older persons, such as falls on the same level and animal-related injuries, are better identified under ICD 10 CA. As the agricultural population ages, it will become increasingly important to detect and respond rapidly to emerging patterns of injury among older farmers.

### 2.2.3 Basic Hospital Separation Data

Hospital separation data are obtained by Ontario CAIR collaborators through an agreement with the Ontario Ministry of Health. Agricultural injuries are identified using a systematic computer search of the hospital separation database. Cases are considered for inclusion if they meet CAIR's selection criteria (2.2.1). The range of codes excluded from these criteria include some that may be associated with agricultural injuries; for example, hospitalizations that resulted from transportation-related injuries (including motor vehicle traffic, motor vehicle non-traffic, rail, water, animal and air) and the late effects of accidental injuries.

### 2.2.4 Enhanced Hospital Data

The patient identifier and institution code in the basic hospital separation data set are used to identify individual cases and the institutions to which they were admitted. The Chief Executive Officer (or equivalent) from each hospital or health district is approached for permission to request chart data from their medical records department. Once permission is granted, information is requested using a mail survey format. A standardized data abstraction form (Appendix C) for each case is mailed to the medical records personnel at the appropriate institution. Medical records personnel abstract specific information from the individual patient charts. Regular mail and telephone follow-ups are conducted following the initial mailing in order to ensure a high response rate.

The information from the computerized hospital record, combined with that obtained from the mail survey abstraction form, constitutes the enhanced data set. This data set includes variables in addition to those in the basic data set that can be used to better describe injury patterns. For instance, there is information describing what happened to cause each of the injuries, and whether or not a tractor or other agricultural machine was involved.

### 2.2.5 Issues and Challenges

For hospitalized injuries, the enhanced data abstraction is completed by medical records technicians at hospitals across Ontario. The process relies on the amount and completeness of data available within the medical record, the vigilance of the technicians who are abstracting the data and, to some extent, on the technicians' knowledge of agricultural operations. We recognize that these factors contribute to variations in the quantity and the accuracy of the information that is returned on the data abstraction forms. The data cleaning process is an important step in attempting to improve the accuracy of the data, but it is constrained by the amount of information recorded in the open-ended descriptions of injury circumstances.

### 2.2.6 Use of Calendar Versus Fiscal Year

Fatalities are reported on a calendar year basis whereas hospitalization records are kept according to fiscal years (April 1 to March 31). For this reason, hospitalization data are reported by CAIR on a fiscal year basis.

### 2.2.7 Length of Stay Analyses

Readmissions to hospital, transfer cases, and cases treated in rehabilitation hospitals are excluded from the hospitalized injury database. This was done in order to avoid the "double counting" of injury events. Length of hospital stay data appear in this report. In order to avoid missing days of admission that are experienced by hospitalized cases, a value for the *total* length of stay variable was calculated for each case. This variable includes all days in hospital for the treatment of the same injury.

## 2.3 Confidentiality

All data collected as part of the CAIR program are maintained according to data security and confidentiality protocols. Information that could identify an individual, such as name and address, is never collected or recorded. Unique numerical identifiers (record numbers, chart numbers and institution codes) are retained in the province of origin and replaced by CAIR study numbers in the national database. Researchers are never allowed to access unique identifiers. Paper and electronic copies of data abstraction forms are retained in the Kingston office of the Ontario CAIR collaborators.

## 2.4 Database Management and Access

National and Ontario data are maintained in electronic databases that are managed by the national coordinator under the supervision of the program director.

Access to the national and Ontario datasets is strictly limited to CAIR collaborators for the following activities:

- CAIR provincial collaborators assigned the task of producing special technical reports.
- CAIR collaborators who have permission from the entire CAIR group to conduct special analyses for the purpose of producing scientific reports for submission to peer-reviewed journals.
- The national program coordinator and program director for the purpose of maintaining the database and producing periodic comprehensive reports for Ontario and for Canada.
- To support agricultural injury prevention initiatives by others through analyses presented as tabular data.

## 2.5 Analysis

The analysis presented in this report is descriptive. It has three main objectives: 1) to illustrate the magnitude of the agricultural fatality problem, 2) to compare trends in the causes and occurrence of fatal agricultural injuries among genders and age groups and 3) to identify emerging patterns of injuries in Ontario.

The statistics used include simple counts and frequencies as well as cross-tabulations. Where appropriate, injury rates were calculated. Formal hypothesis-testing methods and tests of statistical significance were not employed in comparisons.

Age standardized rates were calculated for fatal agricultural injuries and hospitalizations. The numerators used in calculating these rates are the numbers of fatal or hospitalized agricultural injuries for particular age categories. These include injuries to farm residents, hired agricultural workers, contractors, persons traveling on public highways and a small number of visitors to farms. Denominators for these rate calculations are taken from the 1996, 2001 and 2006 Canada Census of Agriculture and extrapolated for the years in which the census was not performed. In addition to the Canada Census of Agriculture population, temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada were included.

Some caution is warranted in the interpretation of the rates because it is not possible to obtain complete data on the full population at risk, or to determine relative amounts of exposure to agricultural work and associated hazards. Also, the Canada Census of Agriculture includes all farm and ranch residents, some of which have relatively little exposure to agricultural work hazards, but excludes visitors to farms or ranches as well as most agricultural workers who are not resident on farms or ranches. The accuracy of agriculture census information may vary, but is the best source of denominator information available at this time.

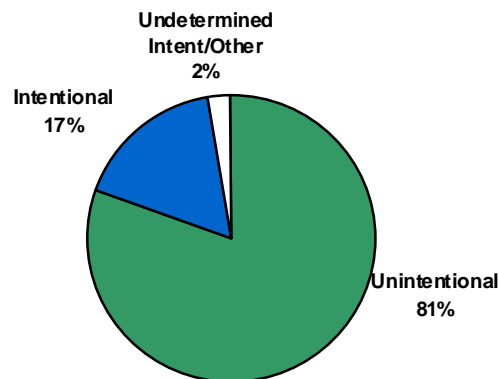
In order to ensure the data in this report are illustrated in an effective and useful manner, data fields with small numbers are often not included in graphs. In these cases, a note is included below the graph.

## 2.6 ECONOMIC BURDEN OF AGRICULTURE-RELATED INJURIES IN CANADA

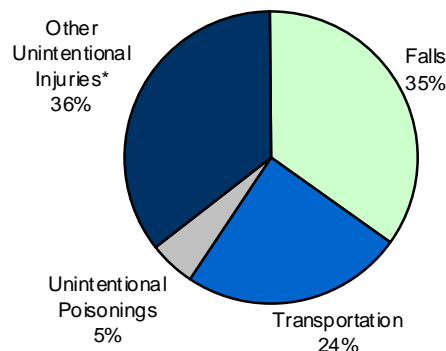
Injury has been identified as a major public health problem in Canada and a significant threat to the economy, health care system and overall quality of life and this is especially true with in agriculture because of the unique nature of the work environment.

Although the greatest cost of an agriculture-related injury is human suffering and loss to individuals and families, the financial costs are far from trivial. In 2004, agriculture-related injuries in Canada cost \$465 million dollars. This includes costs arising from the use of health care and costs related to reduced productivity from hospitalization, disability and premature death. The vast majority of the injuries described in this report are both predictable and preventable.

Injuries can be classified by examining intent. Unintentional injuries such as motor vehicle collisions, falls, poisonings, drownings and grain suffocations accounted for 81% of all agriculture-related injury costs (\$374 million). Intentional injuries, those resulting from violence directed at oneself or another person (suicide, self-harm, assaults, homicide) accounted for 17% of the costs (\$80 million). For the remaining 2% (\$11 million) of agriculture-related injury costs, the intent of injury could not be determined.<sup>10</sup>



Falls were the leading cause of unintentional injuries accounting for 35 percent (\$130 million), this was followed by transportation collisions 24 per cent (\$91 million) and unintentional poisonings 5 per cent (\$18 million).



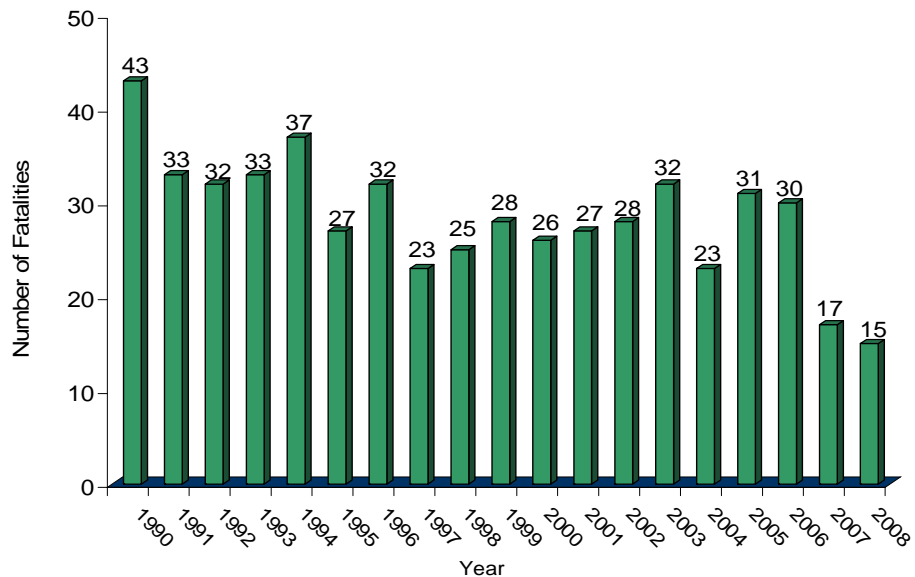
<sup>10</sup> SMARTRISK, (2010). The Economic Burden of Injury within the Agricultural Population in Canada. SMARTRISK: Toronto, ON (unpublished).



# 3 AGRICULTURAL FATALITIES IN ONTARIO 1990-2008: OVERVIEW

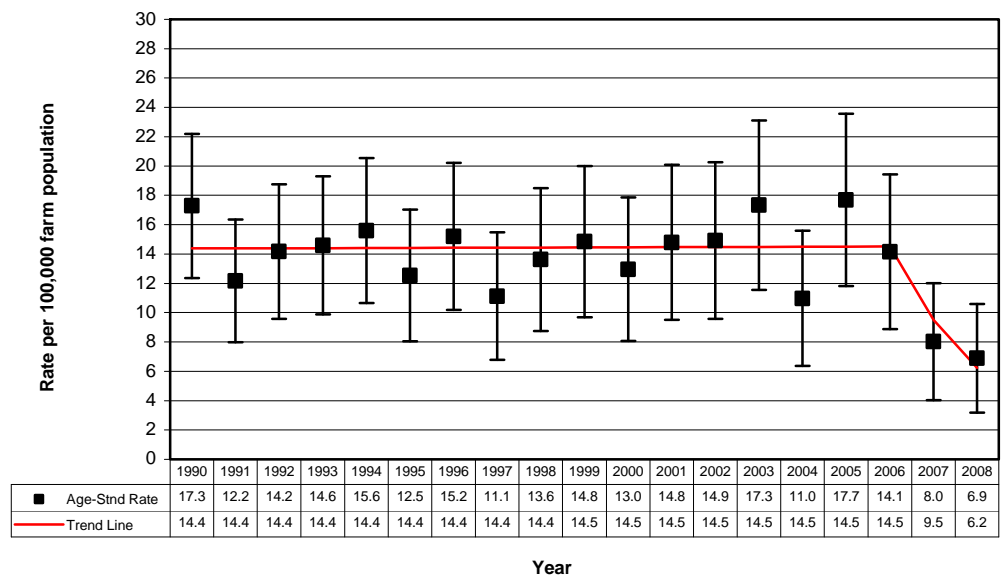
## 3.1 Fatal agricultural injuries by calendar year, 1990-2008

From 1990 to 2008, there were 542 agricultural fatalities in Ontario. This was an average of about 29 fatalities per year. During the first 10 years of the surveillance period (1990-1999), the average number of fatalities each year was 31. During the last nine years of the surveillance period (2000-2008), the average number of fatalities each year was 25.



## 3.2 Fatal agricultural injury rate by year (age-stnd), 1990-2008

Over the 19 year period there were 2 distinct trends. The first trend, from 1990 to 2006 the rate was unchanged. From 2006 to 2008 there was a significant decrease averaging 34 per cent each year.

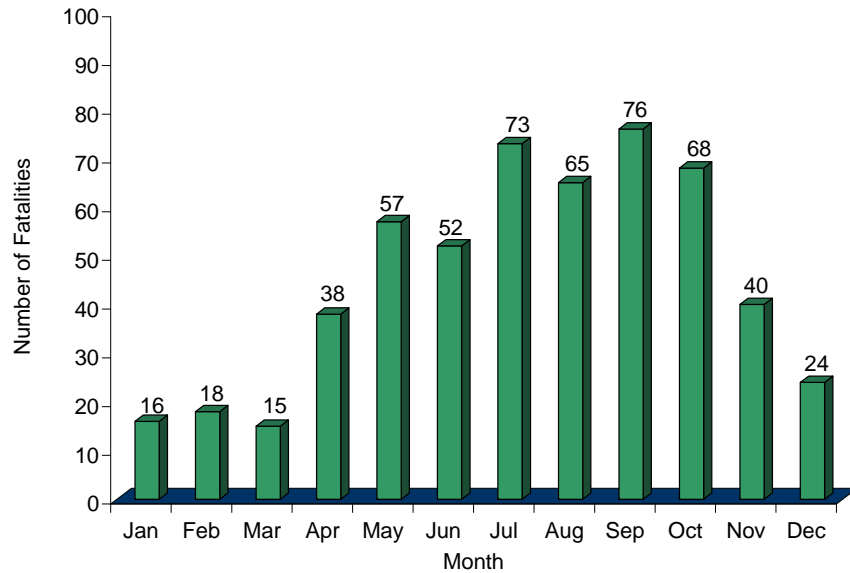


### 3.3 Fatal agricultural injuries by month, 1990-2008

72% of all agricultural fatalities in Ontario occurred from May to October (391 fatalities).

The highest proportion of fatalities took place in September with 14%. 13% of the deaths were in the months of July and October and 12% occurred in August.

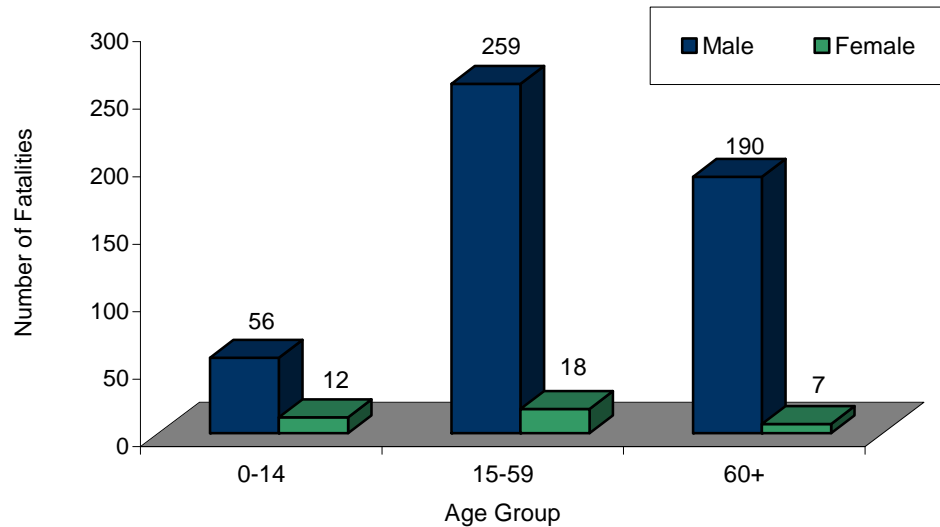
Relatively few fatal agricultural injuries occurred in the winter months of December to March.



### 3.4 Fatal agricultural injuries by age group and gender, 1990-2008

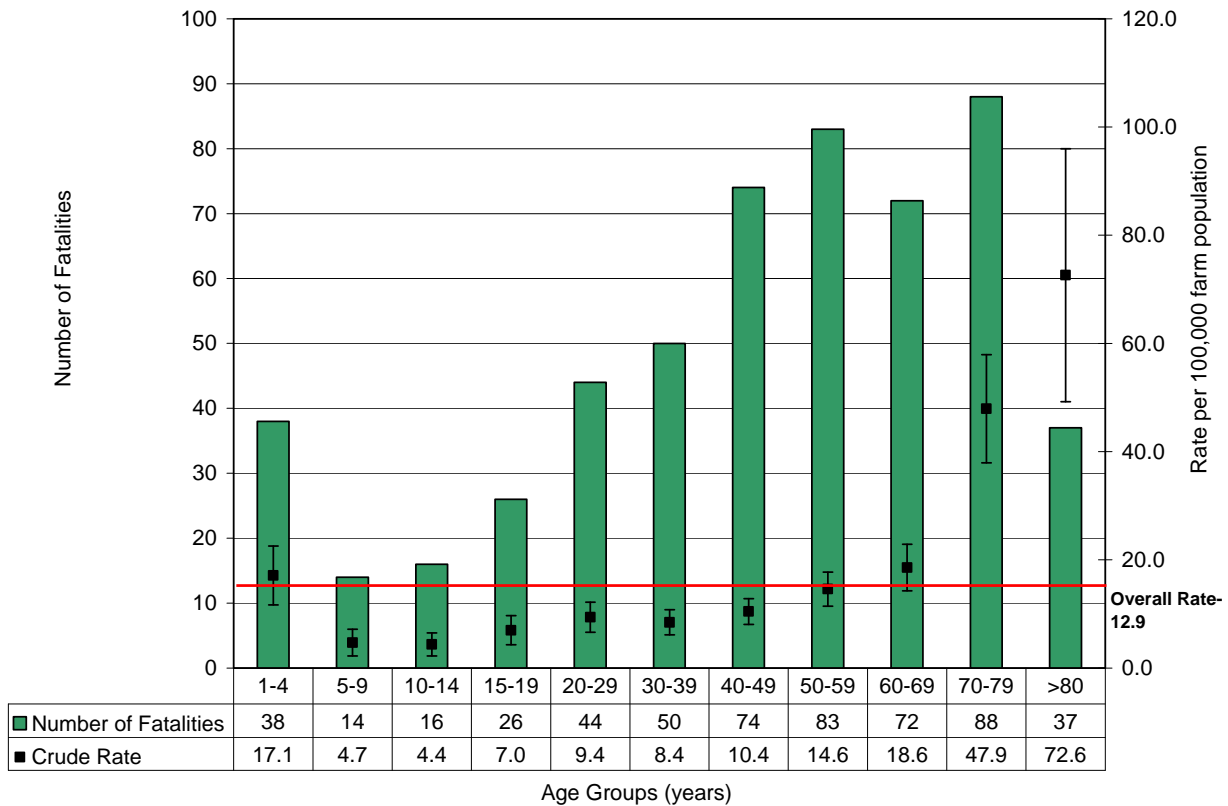
93% of the persons killed in agricultural injury events were male (505 fatalities). The ratio of males to females was highest for the 60+ age group (27.1:1), and lowest for the 0-14 year age group (4.7:1).

The majority (51%) of those fatally injured were in the 15 to 59 age group (277 fatalities).



Sex	0-14 yrs	15-59 yrs	60+ yrs	Total	%
Male	56	259	190	505	93
Female	12	18	7	37	7
Total	68	277	197	542	100
Percent	13	51	36	100	

### 3.5 Agricultural fatality number and rates by age group, 1990-2008



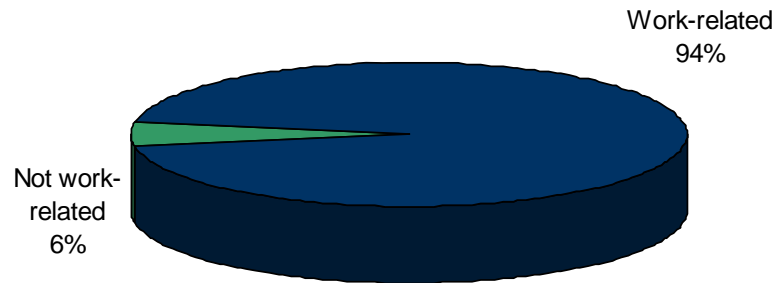
The overall crude fatality rate was 12.9 fatalities per 100,000 farm population.

The age groups with the highest number of fatalities were those in the 70 to 79 years age group with 88 deaths. However, this age group with a fatality rate of 47.0 fatalities per 100,000 farm population, did not have the highest fatality rate. The age group with the highest fatality rate was experienced by those 80 years of age and older with a rate of 72.6 fatalities per 100,000 farm population. There were 37 deaths in this group.

### 3.6 Fatal agricultural injuries; the relationship to agriculture work, 1990-2008

94% of the agriculture fatalities in Ontario were work-related (512 fatalities). 6% of fatalities were not work-related and were due to hazards of the farm environment (30 fatalities).

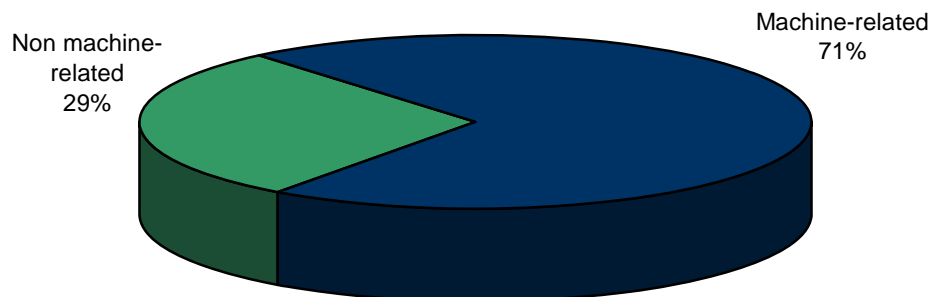
Most adults who died were engaged in agriculture work, whereas the majority of children killed in work-related injury events were not working themselves.



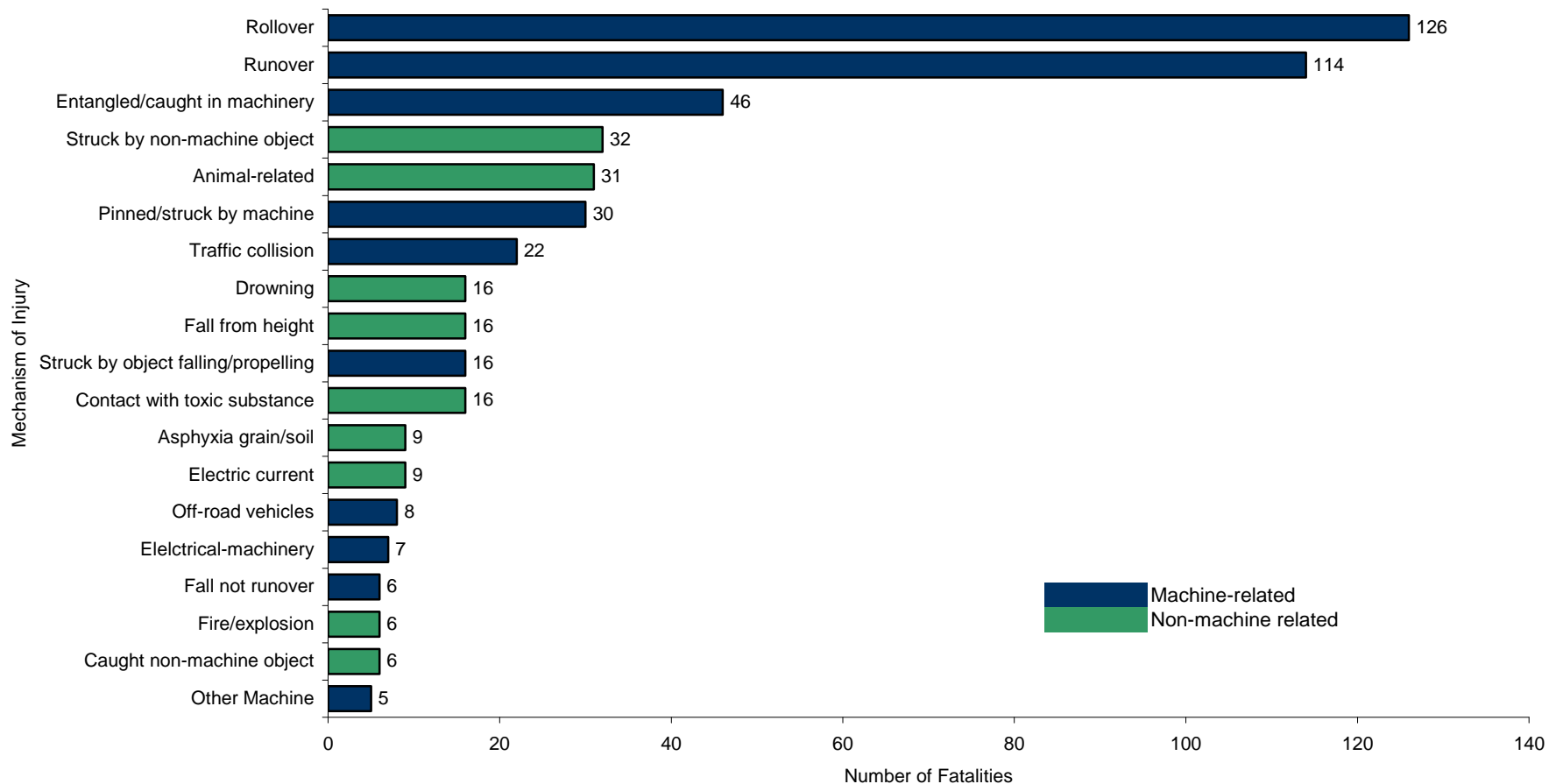
### 3.7 Fatal agricultural injuries by major cause, 1990-2008

71% of the agriculture fatalities in Ontario were machine-related (386 fatalities). The leading machine-related mechanisms of fatal injury were rollovers, runovers, and machine entanglements.

The 29% fatalities that were non-machine-related (156 fatalities), included being struck by an animal or an object, drowning (mainly in children), and fall from height.



### 3.8 Fatal agricultural injuries by mechanism of injury, 1990-2008

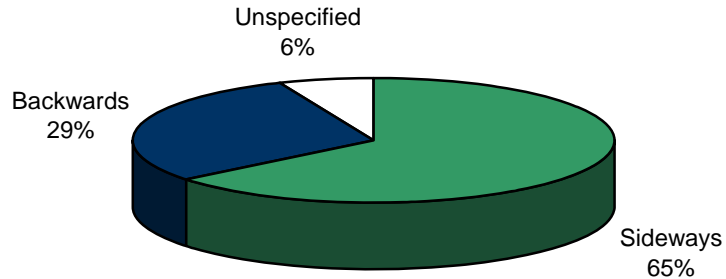


Over half of all agricultural fatalities in Ontario (53%) were due to three leading machine-related causes: machine rollovers, machine runovers and machine entanglements. Over all age groups, the top five causes of agricultural fatalities in Ontario were machine rollovers (23%), machine runovers (21%), machine entanglements (8%), struck by a non-machine object and animal-related events both with 6%.

There were 9 mechanisms of injury not illustrated above accounting for 14 fatalities.

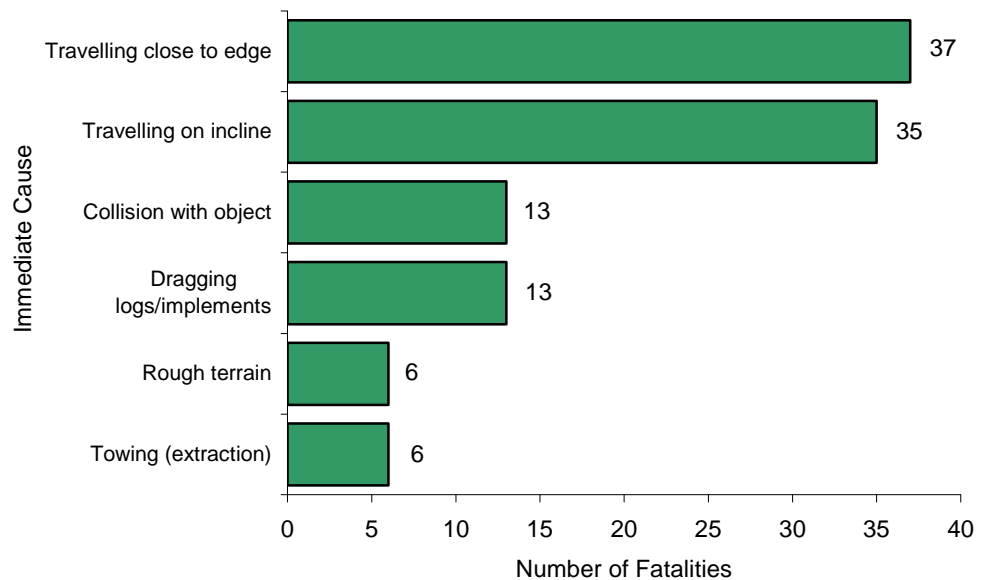
### 3.9 Fatal agricultural rollovers by rollover type, 1990-2008

Overall, 65% of the machine rollovers in Ontario were sideways in direction (81 fatalities) and 29% were backwards (37 fatalities). In 6% of the cases, the direction of rollover could not be determined (8 fatalities). Sideways rollovers were more frequent in younger adults while backwards rollovers were more frequent in adults aged 60 or over.



### 3.10 Fatal agricultural sideways rollovers by main cause, 1990-2008

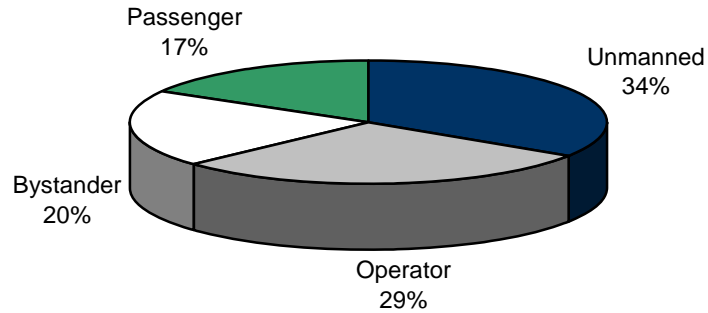
In 29% of the fatal sideways rollovers, circumstance text descriptions attributed the rollover to the machine or vehicle travelling too close to the edge of a ditch or other steep slope bordering a road or field (37 fatalities). In another 28% of the cases, the side rollover was due to the machine travelling on a steep incline (35 fatalities). Collision with an object and dragging logs/implements each accounted for 10% (13 fatalities).



There were 6 immediate causes not illustrated above accounting for 16 fatalities.

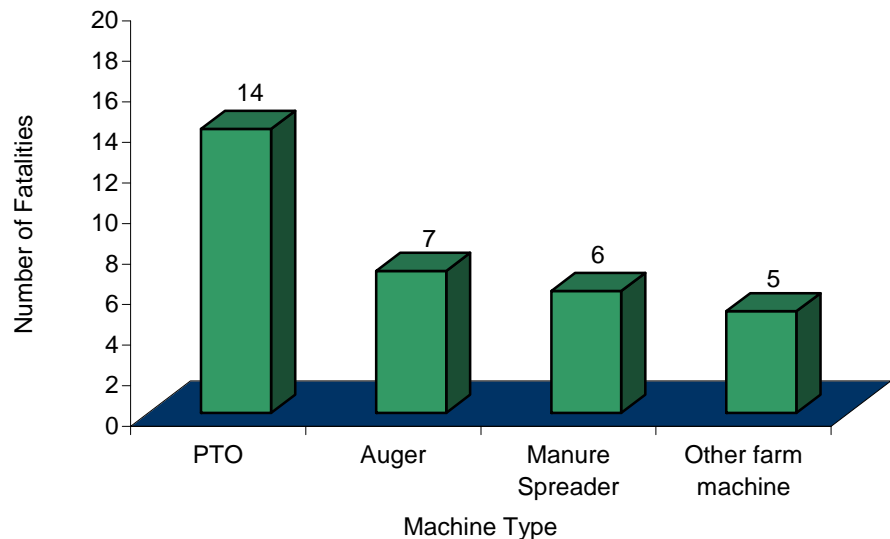
### 3.11 Fatal agricultural runover by runover type, 1990-2008

Most runovers involved unmanned machines which had been bypass started, left running, or left unblocked on a slope accounting for 34% of runover fatalities (39 fatalities). Operator runovers subsequent to falls from machines accounted for 29% (33 fatalities), bystander runovers accounted for 20% (23 fatalities) and passengers/extra rider runovers accounted for 17% (19 fatalities).



### 3.12 Fatal agricultural entanglement by machine type, 1990-2008

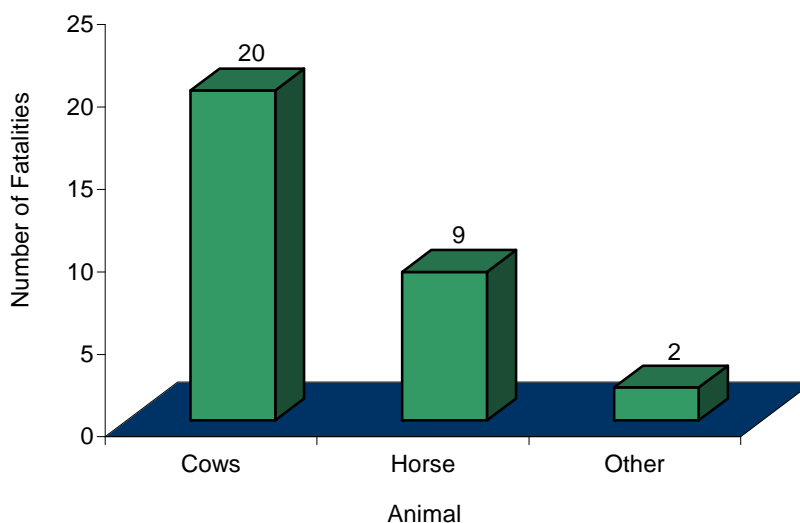
The machine most frequently involved with entanglement fatalities was power take off (PTO) accounting for 30%. Another 15% were due to an auger, 13% were due to a manure spreader and 11% were due to other farm machinery.



There were 10 machine types not illustrated above accounting for 14 fatalities.

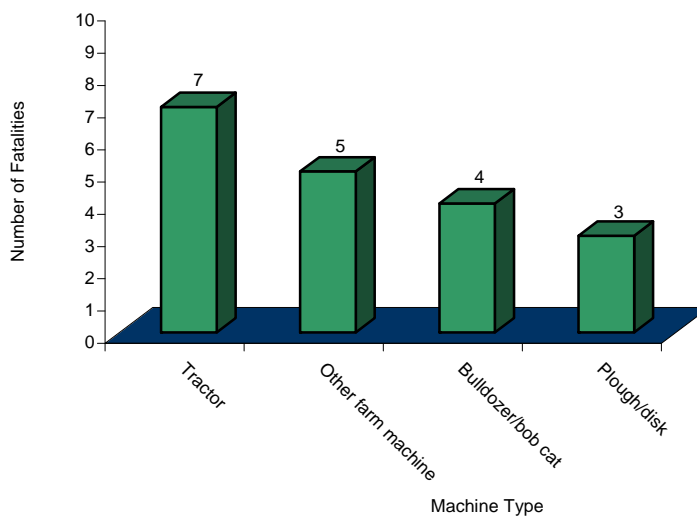
### 3.13 Animal-related fatal injuries by type of animal, 1990-2008

There were 31 animal-related fatalities in Ontario. Of those, 65% were caused by cows/bulls/calves, another 29% involved horses/stallions/colts and 6% were due to other animals.



### 3.14 Fatal struck or pinned by machine injuries, by type of object or component, 1990-2008

In 23% of all struck or pinned by machine object fatalities, the victim was killed by a tractor. Another 17% of the victims were pinned by other farm machinery, 15% by a bulldozer/bobcat and 10% by a plough/disk.

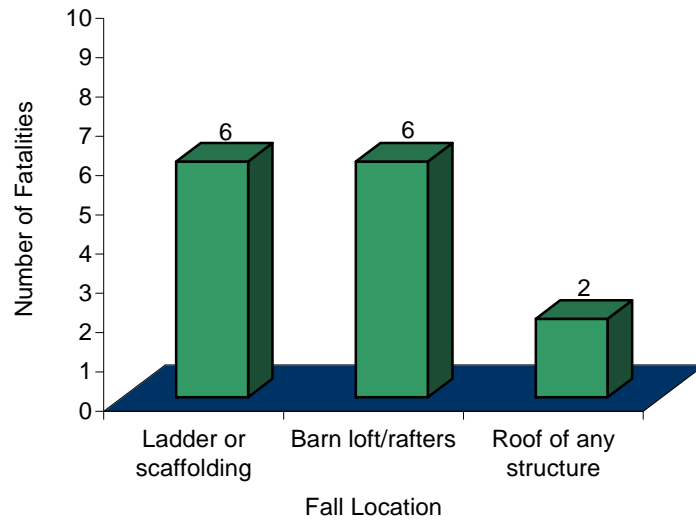


There were 8 machine types not illustrated above accounting for 11 fatalities.



### 3.15 Fatal agricultural non-machine falls from height by fall location, 1990-2008

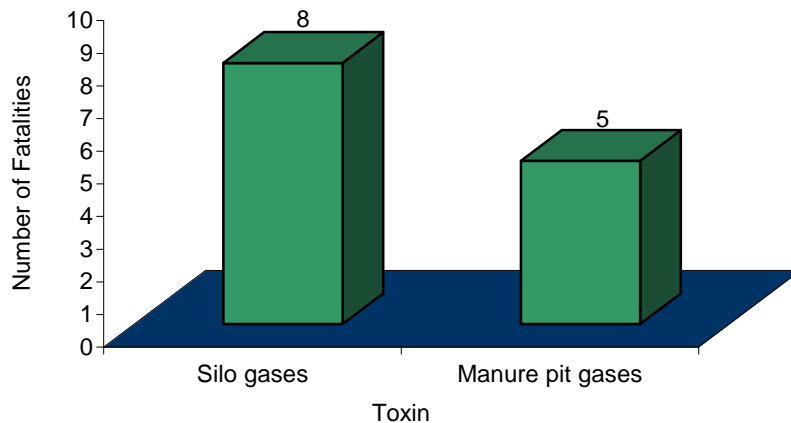
In Ontario, of the 16 non-machine-related falls from height, 38% were from a ladder/scaffolding and another 38% were from a barn loft/rafters.



There were 2 fall locations not illustrated above accounting for 2 fatalities.

### 3.16 Fatal agricultural contact with toxic substance injuries by type of substance, 1990-2008

Silo gases and hydrogen sulfide were both cited as causes of death in eight (50%) of the agricultural fatalities due to toxic substance exposure. There were five instances (31%) of extreme reaction due to manure pit gases. There were a total of 3 additional fatalities due to allergens and carbon monoxide.



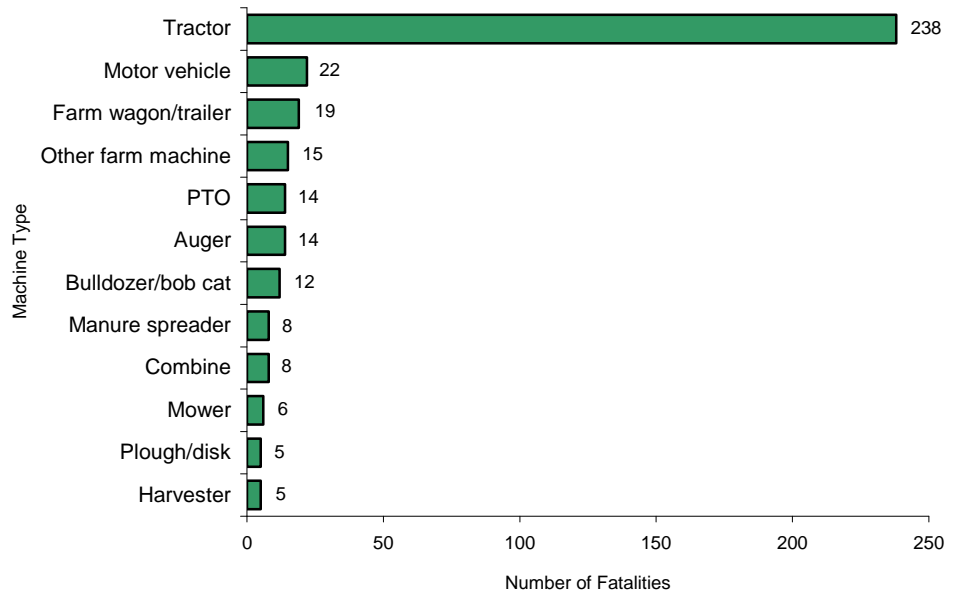
There were 2 toxic agents not illustrated above accounting for 3 fatalities

Hydrogen sulfide exposure occurs when workers enter a poorly ventilated area containing manure or sewage.

### 3.17 Fatal machine-related agricultural injuries by machine type, 1990-2008

The machine types most frequently involved in machine-related fatalities were tractors (62%), followed by motor vehicles (6%), farm wagon/trailers (5%), other farm machines, power take offs (PTOs), augers each with 4%.

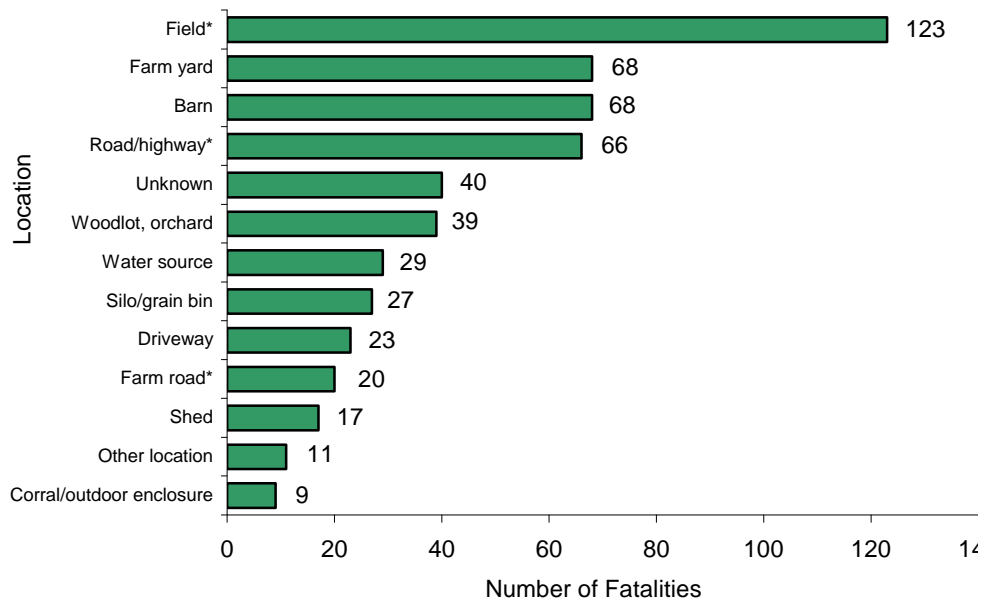
Tractors were associated with 44% of all agricultural fatalities in Ontario.



There were 9 machine types not illustrated above accounting for 20 fatalities

### 3.18 Fatal agricultural injuries by location of injury, 1990-2008

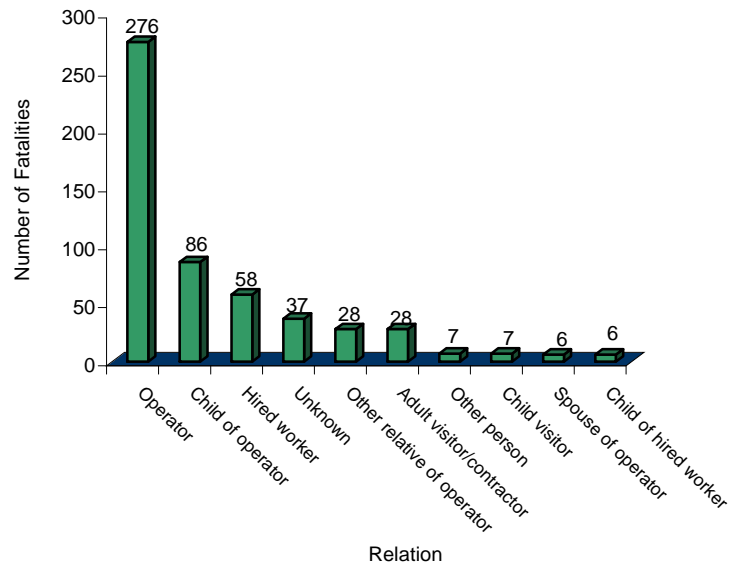
The most common locations of injury for agricultural fatalities in Ontario were fields and their adjacent ditches (23%), farm yards and barns both with 13%, public roads and their adjacent ditches (12%).



\* These locations include adjacent dry ditches. There were 2 deaths in a ravine/embankment.

### 3.19 Fatal agricultural injuries by relationship to farm operator, 1990-2008

In Ontario, the majority 51% of persons killed in agricultural injury events were farm operators. A further 16% of the victims were children of farm operators and 11% were hired workers.

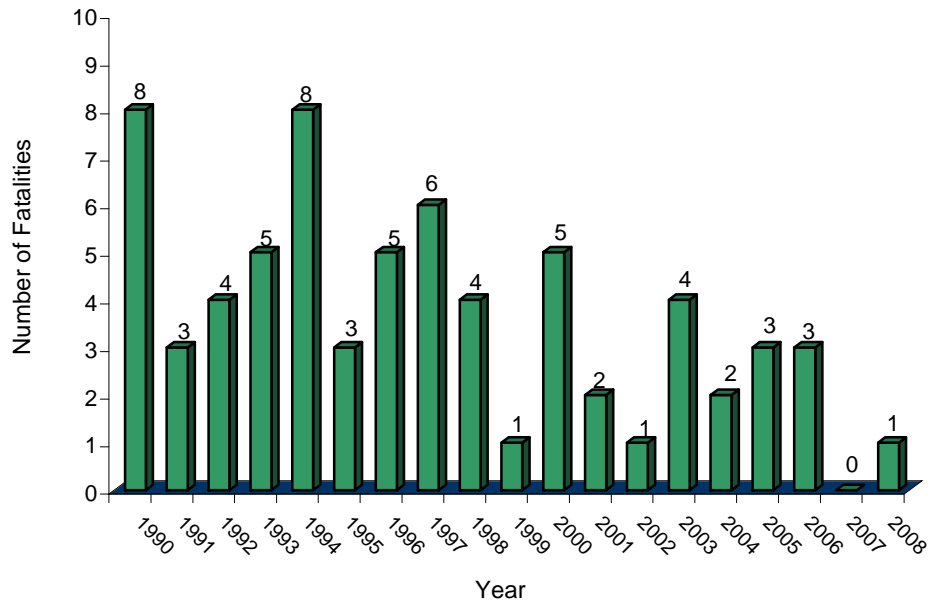


There were 3 relationships not illustrated above accounting for 3 fatalities.

## 4 AGRICULTURAL FATALITIES IN ONTARIO: CHILDREN AND YOUTH UNDER AGE 15

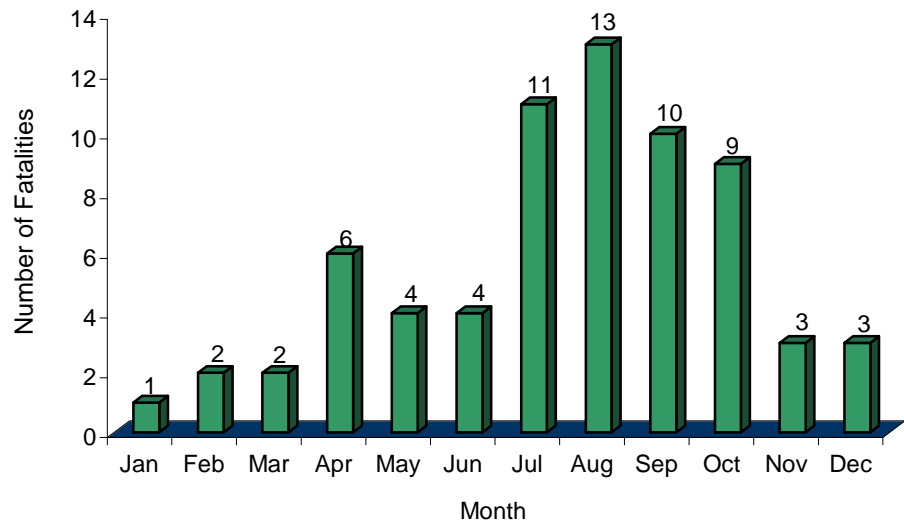
### 4.1 Fatal agricultural injuries in children and youth by calendar year, 1990-2008

From 1990 to 2008, there were 68 agricultural fatalities among Ontario children aged 15 and under. There was an average of 4 deaths per year. The peak years for fatalities were 1990 and 1994 each with 8 fatalities. During the first 10 years (1990-1999) there was an average of 5 fatalities each year. During the last 9 years (2000-2008) there was an average of 2 fatalities each year.



### 4.2 Fatal agricultural injuries in children and youth by month, 1990-2008

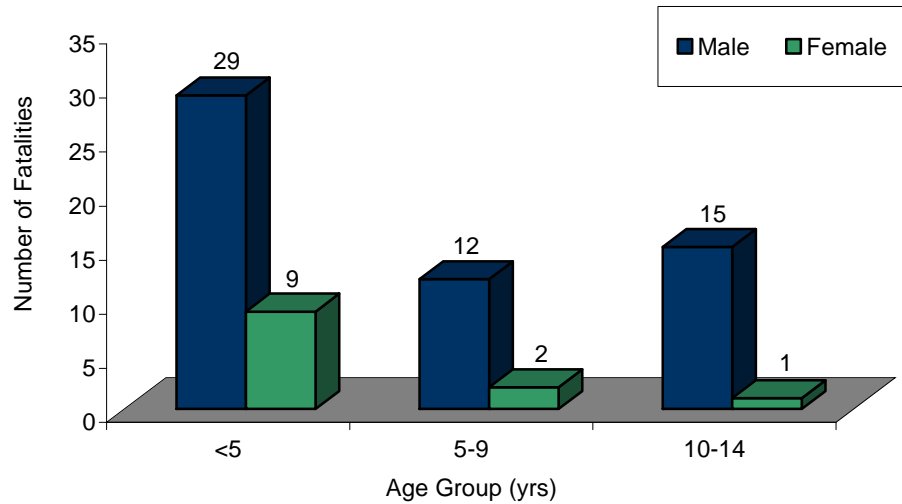
35% of all child agricultural fatalities occurred during the school holiday months of July and August (24 fatalities). August had the highest proportion of fatalities (19%). July accounted for 16% of the fatalities and September accounted for another 15%. Very few children were killed in the winter months of January and February.



### 4.3 Fatal agricultural injuries in children and youth by age group and gender, 1990-2008

82% of the child victims of agricultural fatalities were male (56 fatalities). The ratio of males to females was highest for the 10 to 15 year old age group (15.0:1), and lowest for the 1 to 4 year old age group (3.2:1). There were a higher proportion of female victims among children aged one to four than in any other age group, including adults.

56% of the children killed were less than five years old. Among the 38 agricultural fatality victims under age five, six were one year old infants and 26 were two- and three-year old toddlers. 25 of the infants and toddlers were male.

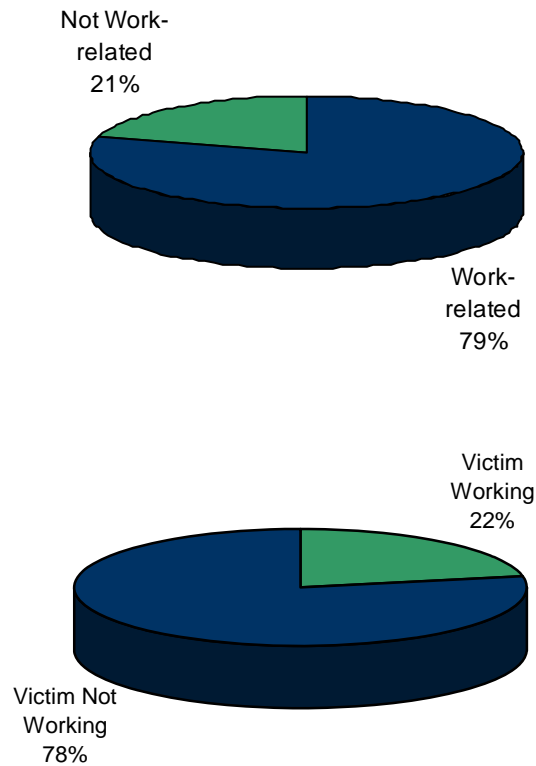


Sex	<5 yrs	5-9 yrs	10-14 yrs	Total	%
Male	29	12	15	56	82
Female	9	2	1	12	18
Total	38	14	16	68	100
Percent	56	21	24	100	

#### 4.4 Fatal agricultural injuries in children and youth: the relationship to agricultural work, 1990-2008

Although 79% of the agricultural fatalities among children were work-related (54 fatalities), in most cases (78%) the victim was not performing the work (53 fatalities). He or she was killed by someone else who was engaged in agricultural work.

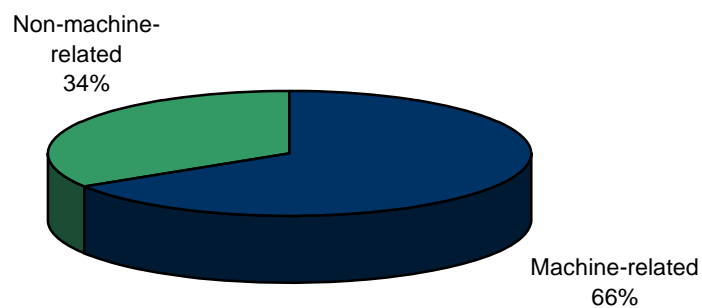
Non-work-related agricultural fatalities (14 fatalities) included those due to hazards of the farm environment such as large animals, stored equipment, barn lofts, dugouts and troughs.



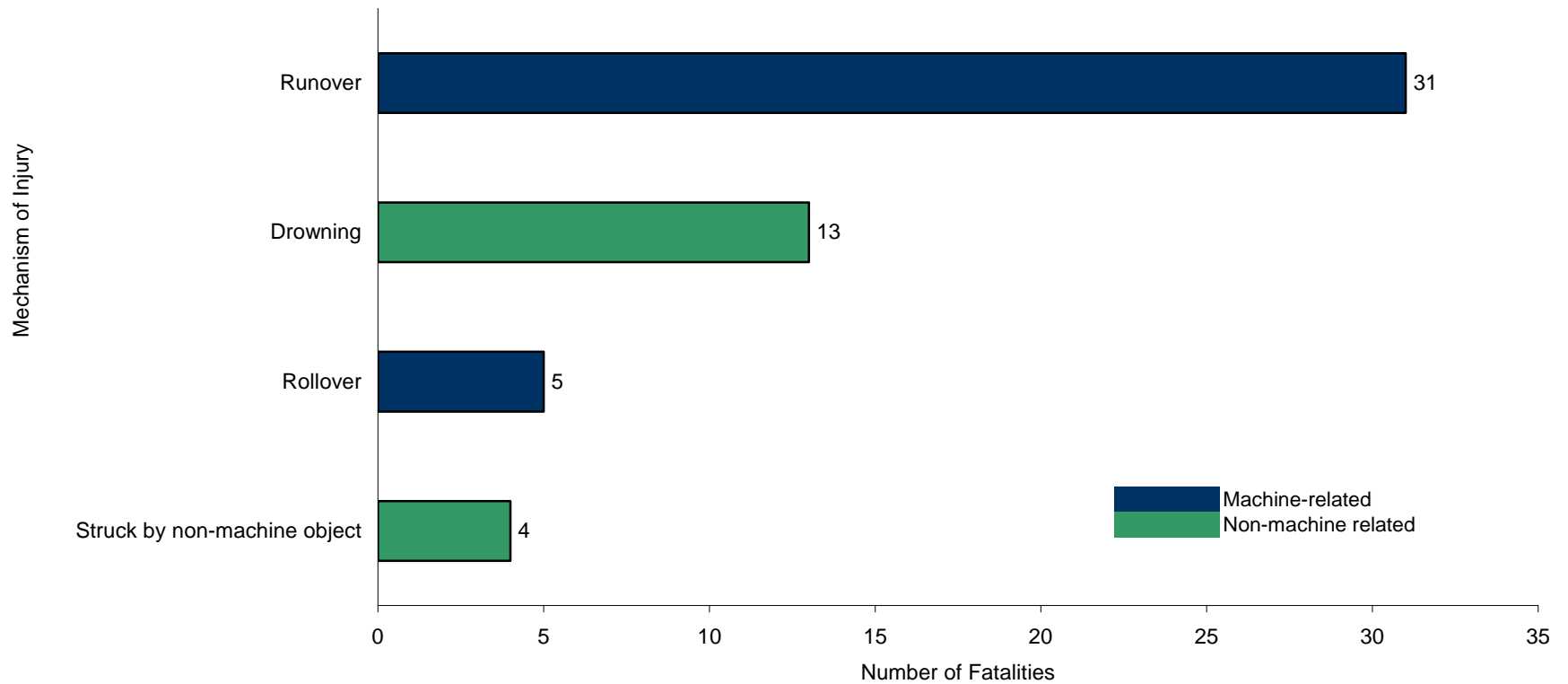
#### 4.5 Fatal agricultural injuries in children and youth by major cause, 1990-2008

66% of agricultural fatalities in children were machine-related (45 fatalities). These included machine runovers, machine rollovers and machine entanglements.

The 34% of agricultural fatalities that were non-machine-related (23 fatalities) included drownings, being struck by objects, being caught under heavy objects and falls from heights.



#### 4.6 Fatal agricultural injuries in children and youth by mechanism of injury, 1990-2008

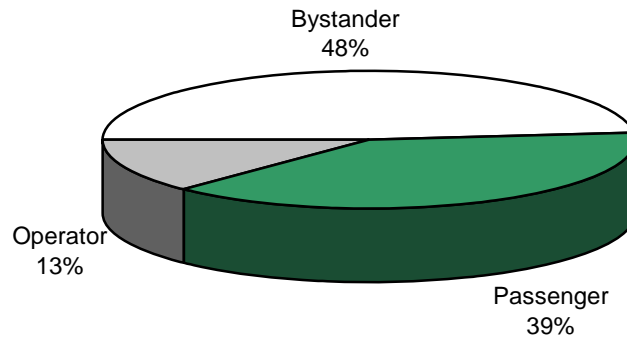


In children, three mechanisms of injury (machine runovers, drownings and machine rollovers) were responsible for 72% all deaths. For children aged fourteen and under, machine runovers caused the largest proportion of fatal injuries (46%), followed by drownings (19%), machine rollovers (7%), being struck by a non-machine object (6%), and being entangled or pinned/struck by a machine (both 4%). Runovers and drownings were most common among young children. Of the thirteen non-machine-related drownings, five occurred in a slough or pond, two in a manure pit, and two in animal troughs.

There were 9 mechanisms of injury not illustrated above accounting for 15 fatalities.

#### 4.7 Fatal agricultural runovers in Ontario children and youth by runover type, 1990-2008

Of the 31 runover fatalities, bystander runovers were the most frequent type of runover in children 48% (15 fatalities). A further 39% (12 fatalities) of child runover victims were killed when they fell from a machine that they had been riding as a passenger and were subsequently runover and 13% (4 fatalities) of children were runover by machines that they had been operating themselves.



#### 4.8 Fatal agricultural drowning deaths in Ontario children and youth by location, 1990-2008

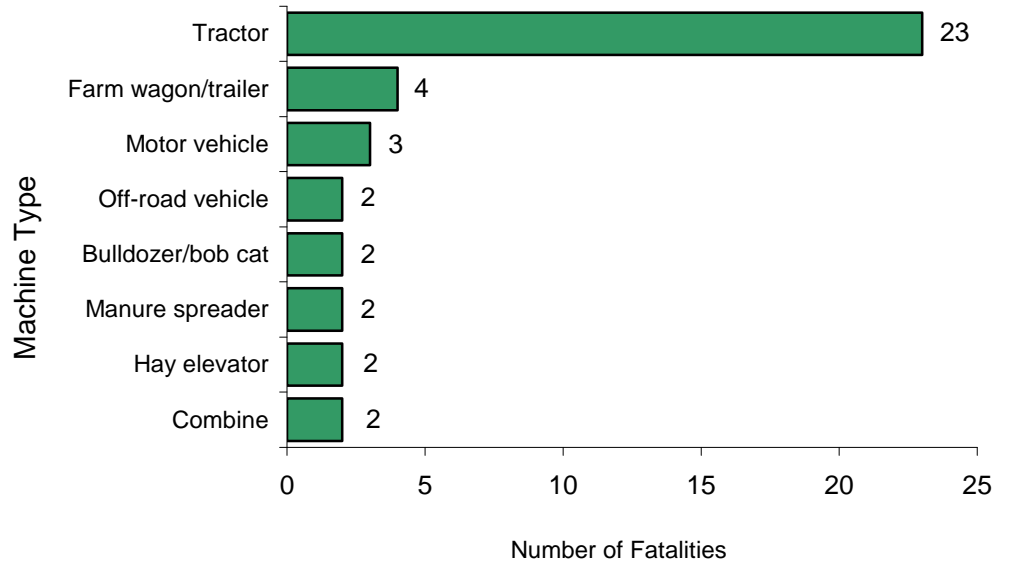
Of the 13 children and youth who died as a result of drowning, 38% drowned in a slough/pond (5 fatalities), another 15% (2 fatalities) the location was not identified, 15% (2 fatalities) in sewage/manure pit and another 2 fatalities in a trough. Due to the small numbers, a graph is not being presented.



#### 4.9 Fatal agricultural injuries in children and youth by machine type, 1990-2008

Of the 45 machine-related deaths among children, more than half (51%) involved tractors, followed by farm wagons/trailers (8%), and motor vehicles (6%).

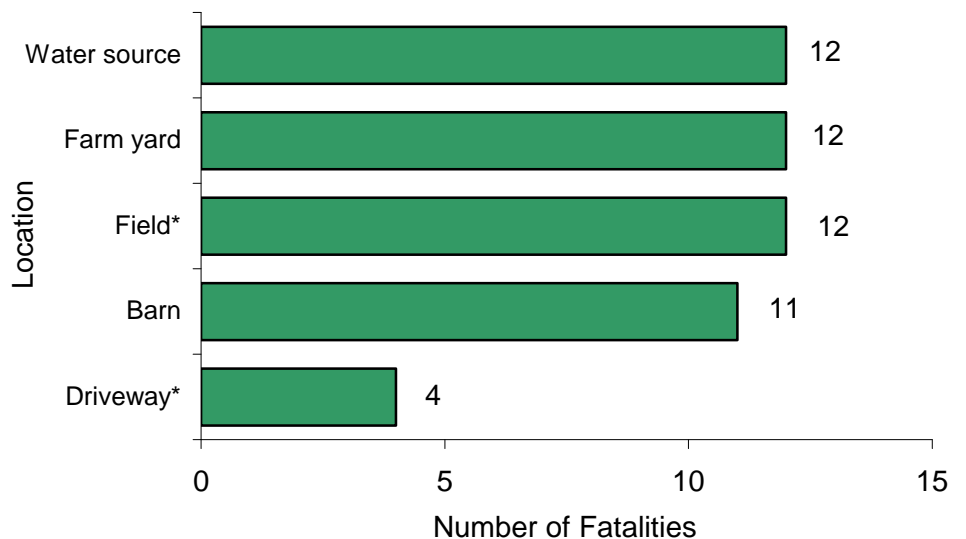
Tractors were associated with 34% of child deaths overall.



There were 5 machine types not illustrated above accounting for 5 fatalities

#### 4.10 Fatal agricultural injuries in children and youth by location of injury, 1990-2008

The top 5 locations accounted for 75% of the injury locations. Field, farm yard, and water source each accounted for 18%. Fatalities in the barn accounted for 16% and deaths in the driveway accounted for 6%.

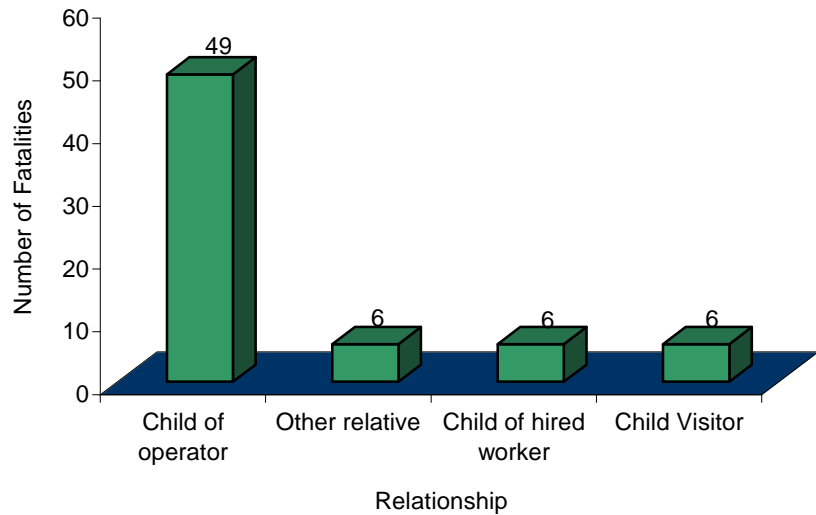


\*Includes adjacent dry ditches.

There were 9 locations not illustrated above accounting for 17 fatalities

#### 4.11 Fatal agricultural injuries in Ontario children and youth by relationship to farm operator, 1990-2008

The majority of the child and youth agricultural fatality victims under 15 years old were children of owner/operator (72%). Other relatives such as grandson, nephew and cousin, children of a hired worker and a child visitor each accounted for 9% of the fatalities.



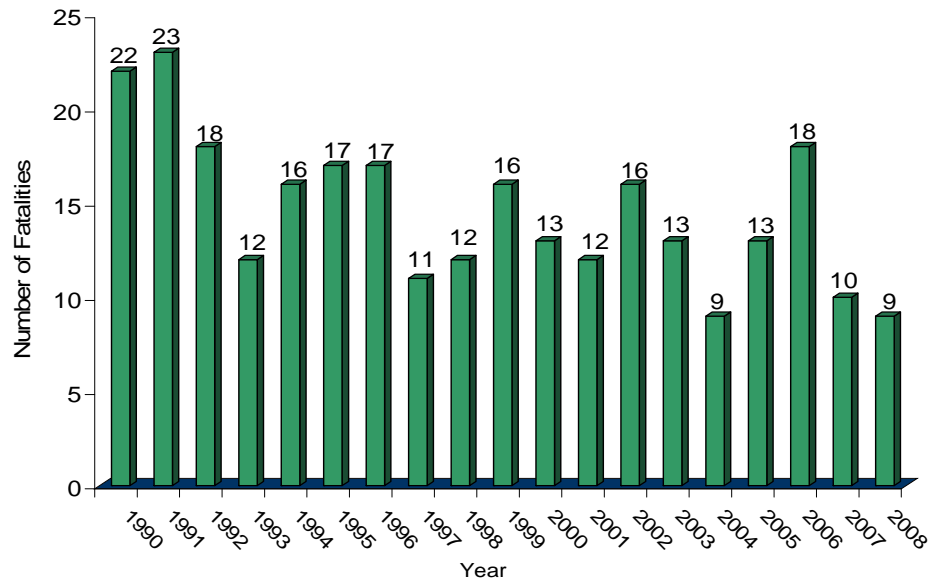
There was 1 relationship not illustrated above accounting for 1 fatality.

## 5 AGRICULTURAL FATALITIES IN ONTARIO: ADULTS AGED 15 TO 59

### 5.1 Fatal agricultural injuries in adults aged 15 to 59 by calendar year, 1990-2008

From 1990 to 2008, there were 277 agricultural fatalities among Ontario adults aged 15 to 59. This was an average of 15 per year.

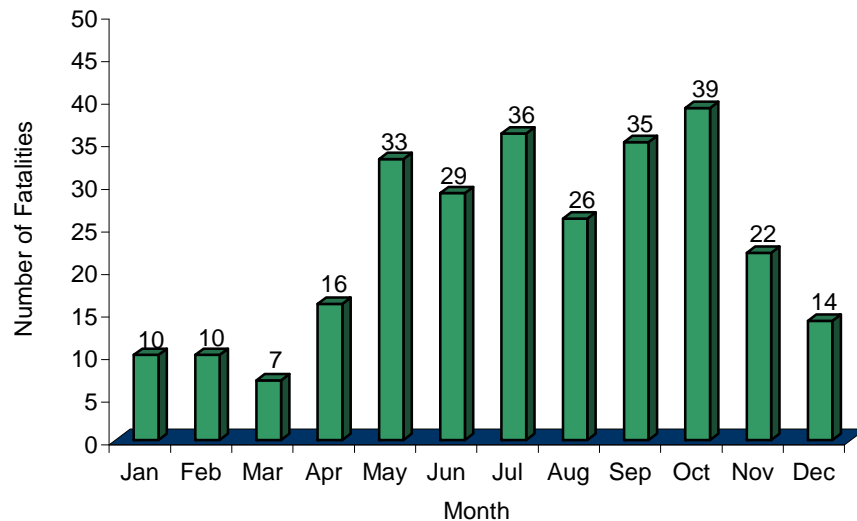
During the first 10 years (1990-1999) the average number of fatalities was 16 deaths each year. During the last 9 years (2000-2008) the average number of fatalities was 13 deaths each year.



### 5.2 Fatal agricultural injuries in adults aged 15 to 59 by month, 1990-2008

71% of all agricultural fatalities in adults aged 15 to 59 occurred from May to October (198 fatalities).

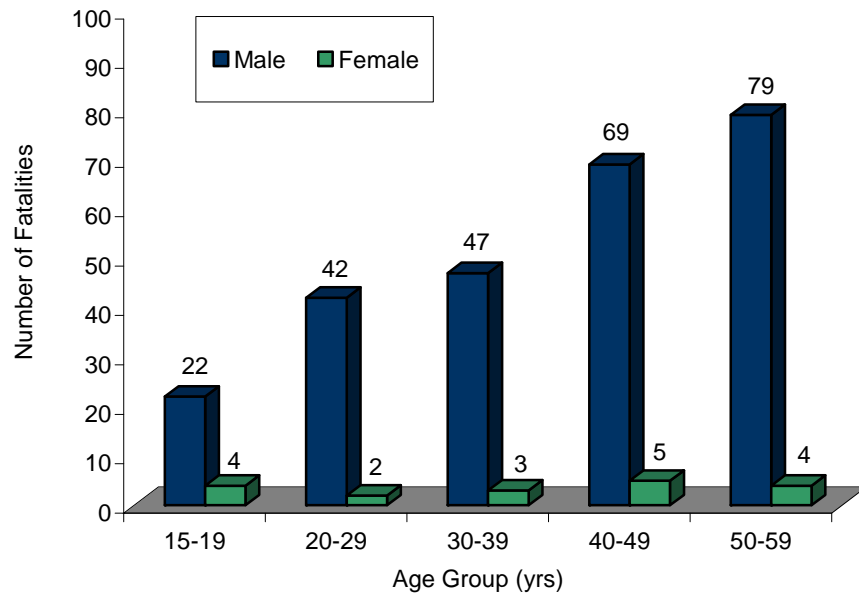
October was the peak month with 14% of all fatalities. This was followed by July and September each with 13% of all fatalities.



### 5.3 Fatal agricultural injuries in adults aged 15 to 59 by age group and gender, 1990-2008

94% of the younger adults killed in agricultural injury events were male (259 fatalities). The ratio of males to females was highest for the 20 to 29 year age group (21.0:1), and lowest for the 15 to 19 year age group (5.5:1).

Older members of the 15 to 59 year age group were more likely to be killed in an agricultural injury event than younger members were. 43% of the younger adults killed were aged 15 to 39 (120 fatalities), whereas 57% were 40 to 59 years old (157 fatalities).

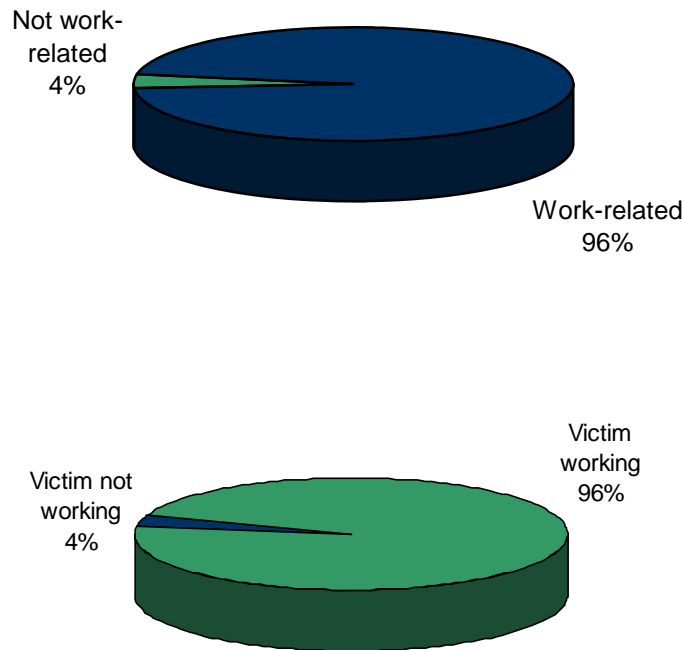


Sex	15-19 yrs	20-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	Total	%
Male	22	42	47	69	79	259	94
Female	4	2	3	5	4	18	6
Total	26	44	50	74	83	277	100
Percent	9	16	18	27	30	100	

## 5.4 Fatal agricultural injuries in adults aged 15 to 59: the relationship to agricultural work, 1990-2008

96% of the deaths in younger adults were work-related (266 fatalities). The few deaths that were not work-related (4%) were due to hazards of the farm environment (11 fatalities).

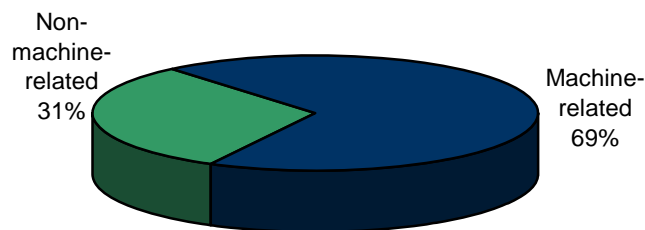
Of the younger adults who died, 96% were engaged in agricultural work (266 fatalities), in contrast, the majority (78%) of children who were killed in work-related injury events were not working themselves.



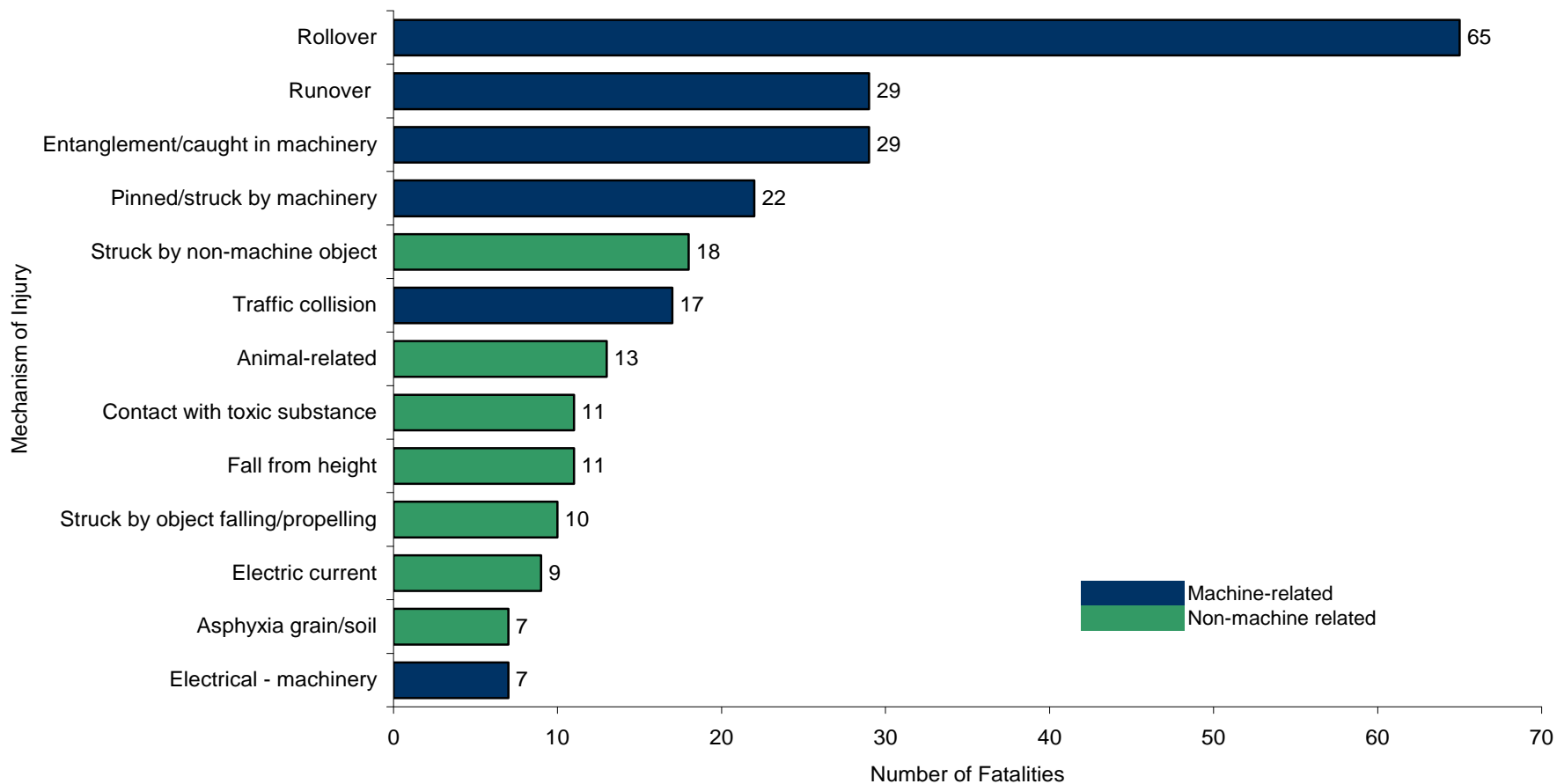
## 5.5 Fatal agricultural injuries in adults aged 15 to 59 by major cause, 1990-2008

69% of agricultural fatalities in younger adults were machine-related (191 fatalities). The leading machine-related mechanisms of injury were machine rollovers, machine runovers and machine entanglements.

The agricultural fatalities that were non-machine-related (31%) included struck by object events, animal-related events, exposure to toxic substances, and falls from height (86 fatalities).



## 5.6 Fatal agricultural injuries in adults aged 15 to 59 by mechanism of injury, 1990-2008

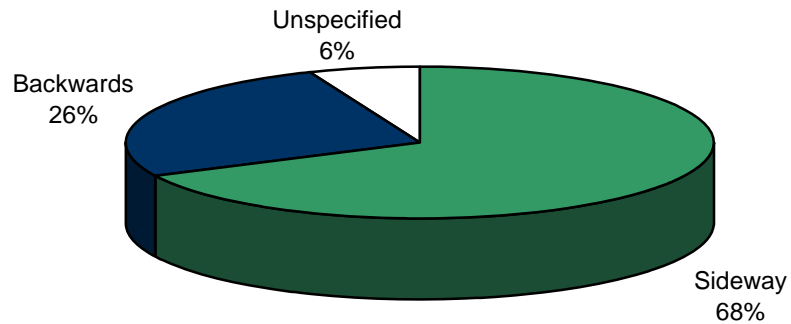


In adults aged 15 to 59, the top three causes of fatal injuries accounted for 44% of the fatalities. They were machine rollovers (23%), machine runovers and machine entanglements each with 10%. Being pinned/struck by machinery accounted for 8%, being struck by a non-machine object and traffic collisions each accounted for 6%. Animal-related events accounted for 5%, and exposure to toxic substances accounted for another 4%.

There were 15 mechanisms of injury not illustrated above accounting for 29 fatalities.

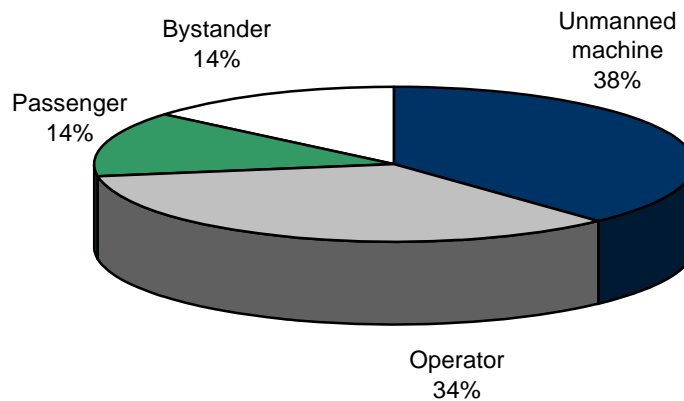
## 5.7 Fatal agricultural rollovers in adults aged 15 to 59 by rollover type, 1990-2008

In adults aged 15 to 59, 68% of the machine rollovers were sideways in direction (44 fatalities) and 26% were backwards (17 fatalities). In 6% of the cases, the direction of rollover could not be determined (4 fatalities). Sideways rollovers were more frequent in younger adults while backwards rollovers were more frequent in adults aged 60 or over.



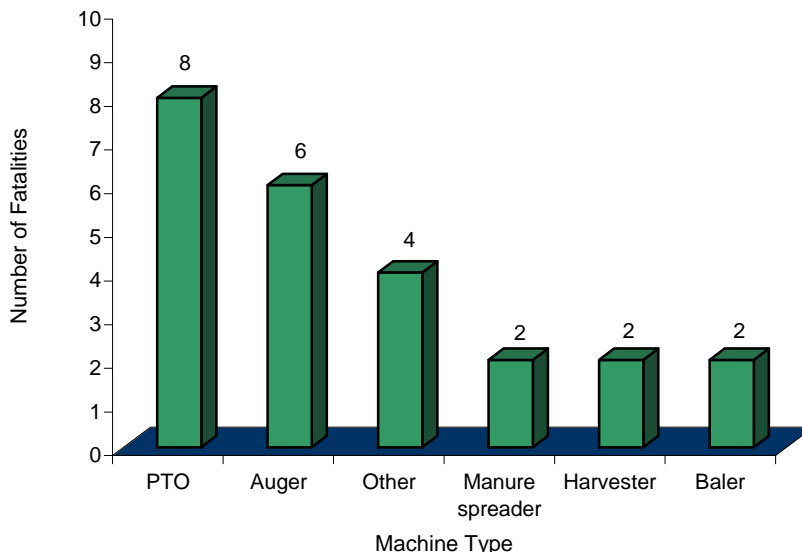
## 5.8 Fatal agricultural runovers in adults aged 15 to 59 by runover type, 1990-2008

Adults aged 15 to 59, were most frequently runover by unmanned machines (38%) which had been bypass started, left running or left unblocked on a slope (11 fatalities). In a further 34% of the runovers, an operator was struck by a moving machine after falling from it (10 fatalities). Passenger/extra rider and bystanders accounted for 14% each (4 fatalities each).



### 5.9 Fatal agricultural entanglements in adults aged 15 to 59 by machine type, 1990-2008

The most common equipment involved in entanglements was power take off (PTOs), accounting for 28%. Another 21% involved an auger.

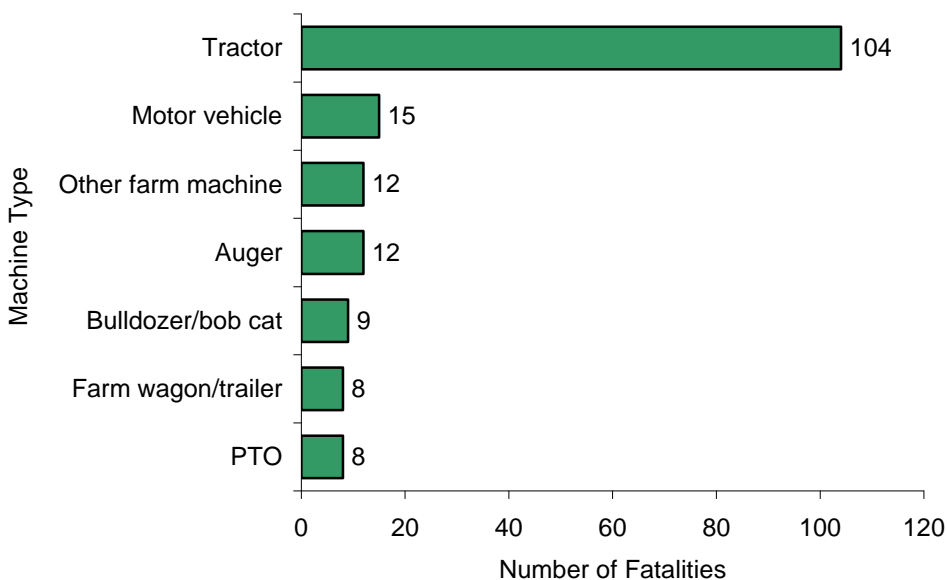


There were 5 machine types not illustrated above accounting for 5 fatalities.

### 5.10 Fatal agricultural injuries in adults aged 15 to 59 by machine type, 1990-2008

The machine types most frequently involved in machine-related fatalities among younger adults were tractors (54%), followed by motor vehicles (8%), other farm machinery and augers, each accounted for 6%.

Tractors were associated with 38% of all agricultural deaths among younger adults.

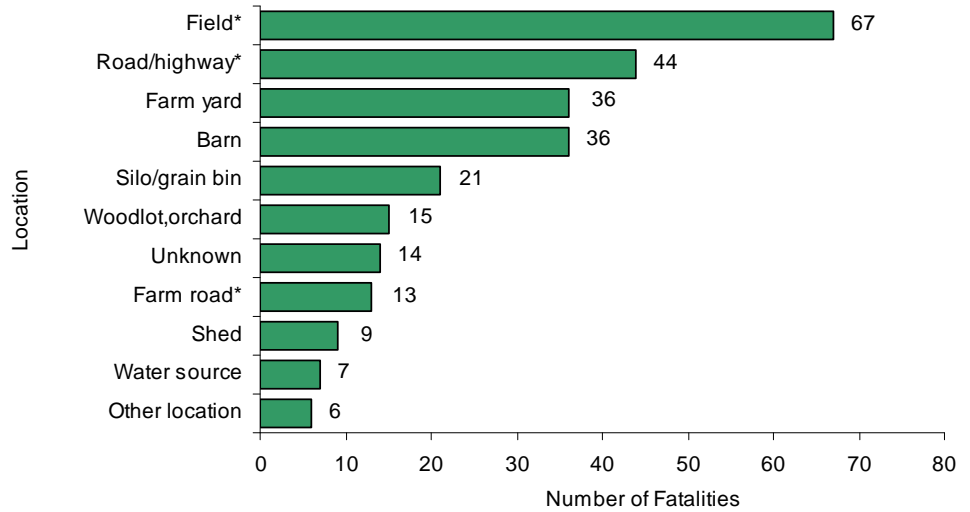


There were 12 machine types not illustrated above accounting for 23 fatalities.



### 5.11 Fatal agricultural injuries in adults aged 15 to 59 by location of injury, 1990-2008

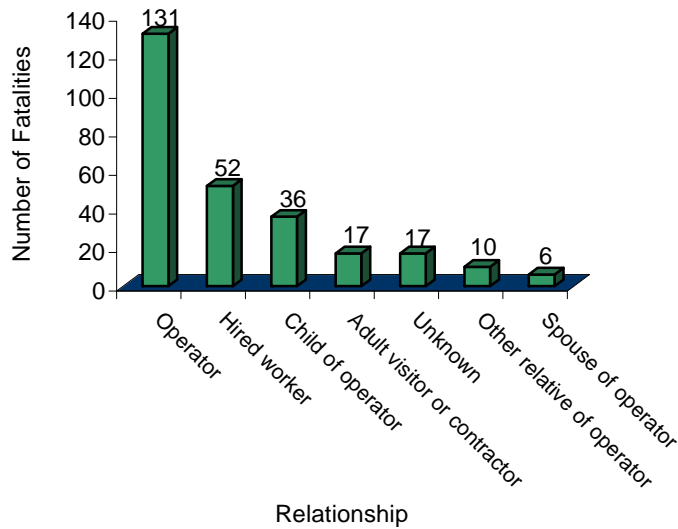
The most common locations of injury for agricultural fatalities in younger adults were fields and their adjacent ditches (24%), public roads and their adjacent ditches (16%), barns and farm yards accounting for 13%.



\*Includes adjacent dry ditches.  
There were 3 locations of fatal injuries not illustrated above accounting for 9 fatalities.

### 5.12 Fatal agricultural injuries in adults aged 15 to 59 by relationship to farm operator, 1990-2008

47% of younger adults killed in agricultural injury events were farm operators. A further 19% of the victims were hired workers and 13% were children of operators.



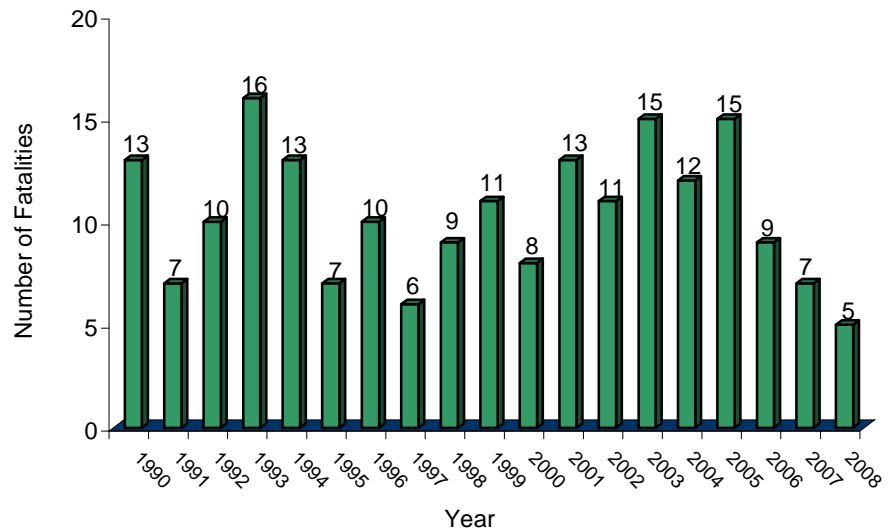
There were 4 relationships not illustrated above accounting for 8 fatalities.

## 6 AGRICULTURAL FATALITIES IN ONTARIO: ADULTS AGED 60 AND OVER

### 6.1 Fatal agricultural injuries in adults aged 60 and over by calendar year, 1990-2008

From 1990 to 2008, there were 197 agricultural fatalities among Ontario adults aged 60 and over. This is an average of 10 fatalities each year.

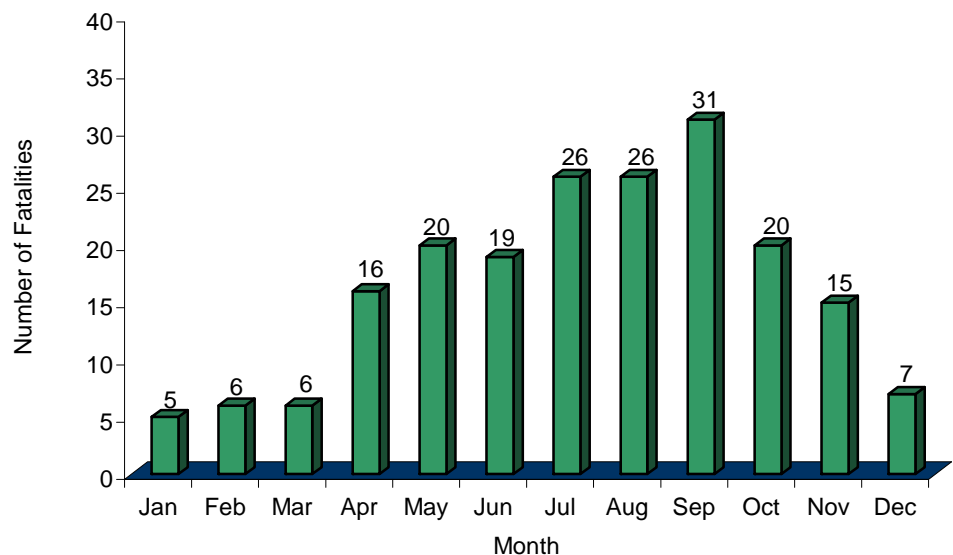
Each year an average of 10 fatalities occurred for both the first 10 years of surveillance (1990-1999) and the last 9 years of surveillance (2000-2008).



### 6.2 Fatal agricultural injuries in adults aged 60 and over by month, 1990-2008

72% of all agricultural fatalities in adults aged 60 and older occurred from May to October (142 fatalities).

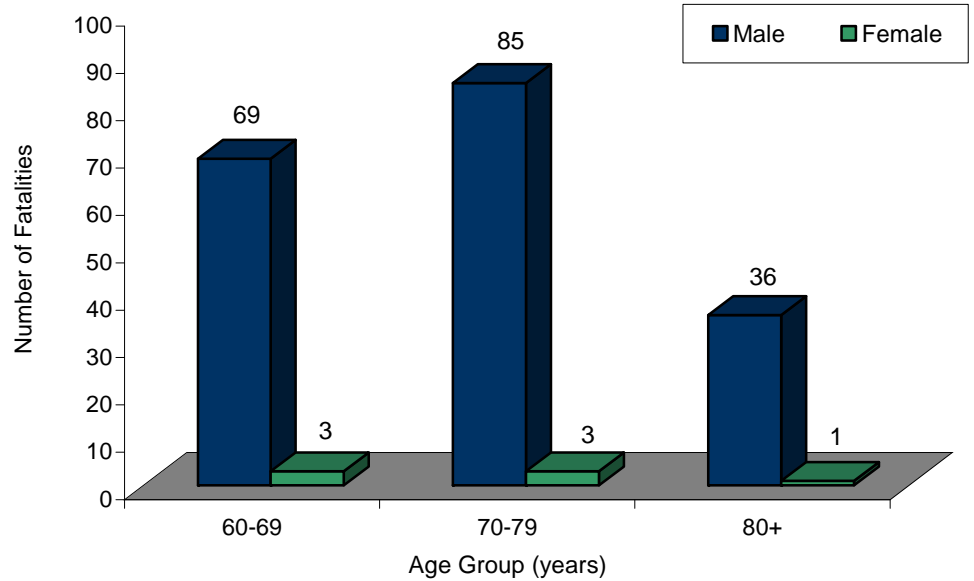
September was the peak month, with 16% of all fatalities. 13% of the fatalities occurred in each of the months of July and August. An additional 10% of the fatalities occurred in each of May, June and October. Very few older adults were killed from December to March.



### 6.3 Fatal agricultural injuries in adults aged 60 and over by age group and gender, 1990-2008

96% of the older adults killed in agricultural injury events were male (190 fatalities). The ratio of males to females was highest for the 80+ age group (36:1), and lowest for the 60 to 69 year age group (23:1).

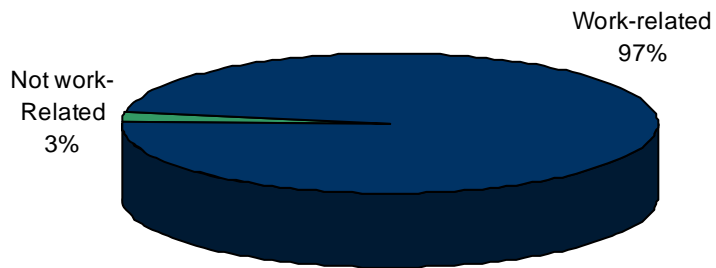
Even though farmers between 70 and 79 years of age had the highest number of deaths, farmers 80 years of age and older had the highest agriculture-related fatality rate (see section 3.5)



Sex	60-69 yrs	70-79 yrs	80+ yrs	Total	%
Male	69	85	36	190	96
Female	3	3	1	7	4
Total	72	88	37	197	100
Percent	37	45	19	100	

#### 6.4 Fatal agricultural injuries in adults aged 60 and over: the relationship to agricultural work, 1990-2008

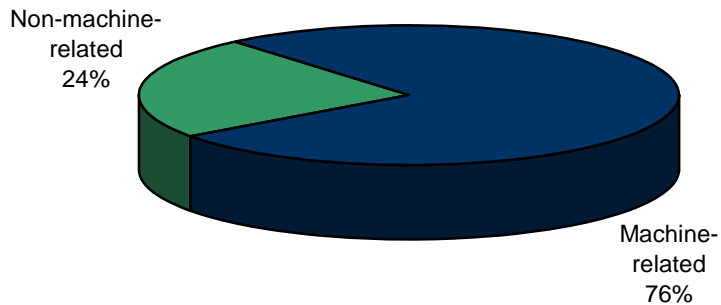
97% of the deaths in older adults were related to agricultural work (192 deaths). Of the five deaths that were not work-related, four were due to hazards of the farm environment. One tractor rollover occurred in a farmhouse garden, so it was not classified as work-related.



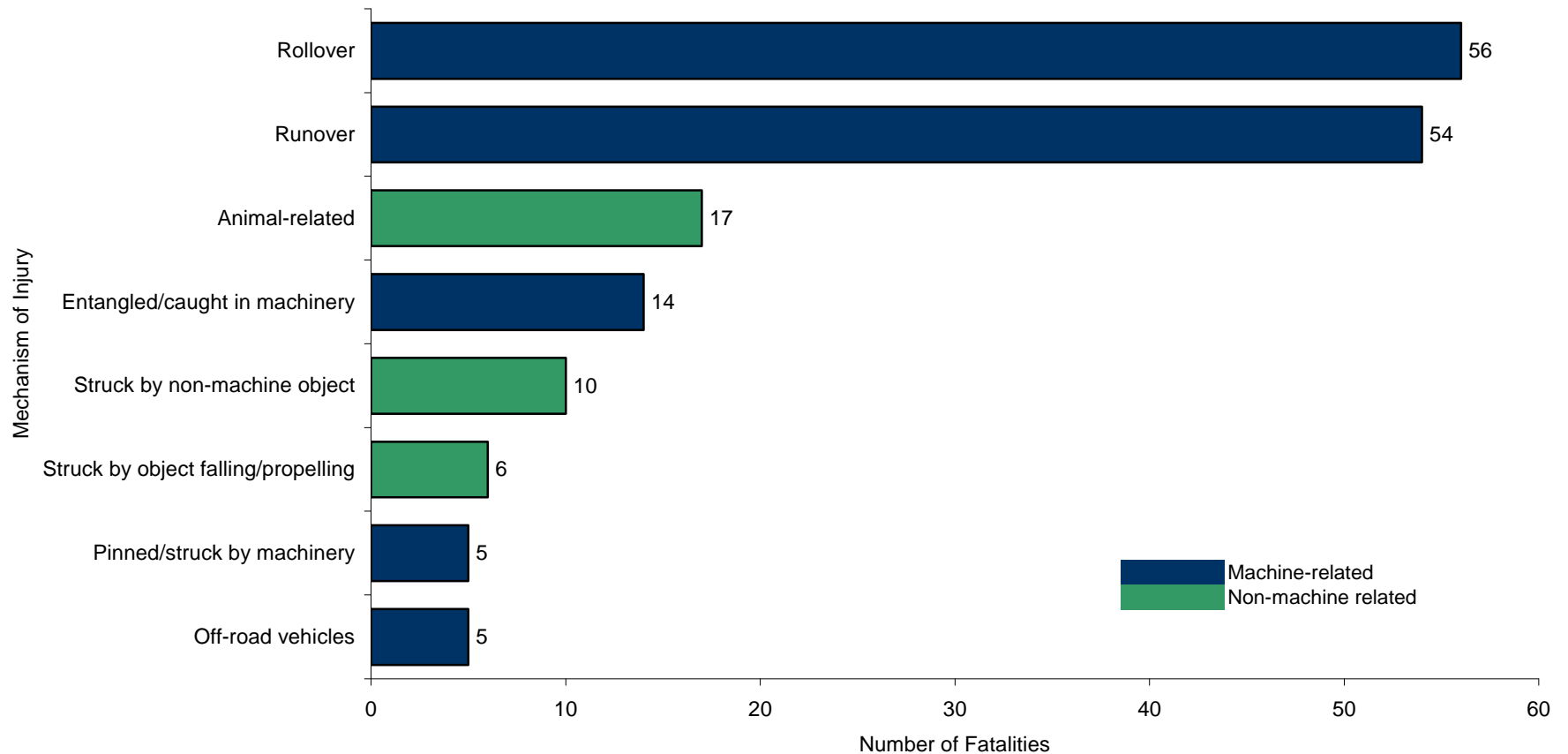
#### 6.5 Fatal agricultural injuries in Ontario aged 60 and over by major cause, 1990-2008

76% of agricultural fatalities in older adults were machine-related (150 deaths).

The leading machine-related mechanisms of injury were machine rollovers and machine runovers. Of the 47 non-machine-related agricultural fatalities (24%) the leading causes included animal-related and struck by object events.



## 6.6 Fatal agricultural injuries in adults aged 60 and over by mechanism of injury, 1990-2008

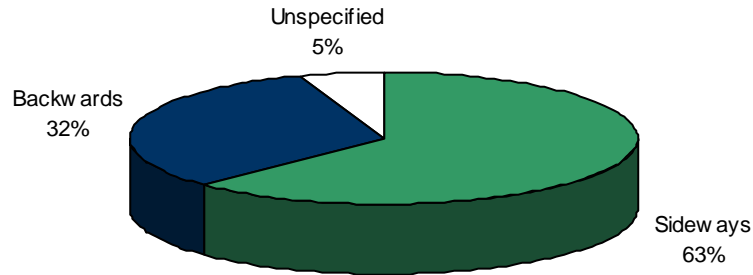


In adults aged 60 and over, 56% of all deaths were due to only two main mechanisms of injury, machine rollovers and machine runovers. Rollovers accounted for 28% of the deaths, and runovers accounted for 27% of the deaths. The next most common mechanism of fatal injury in older adults was animal-related (9%).

There were 18 causes not illustrated above accounting for additional 45 fatalities.

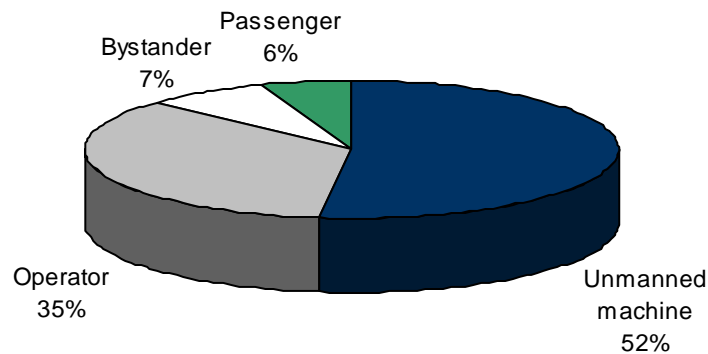
## 6.7 Fatal agricultural rollovers in adults aged 60 and over by rollover type, 1990-2008

Of the 56 rollovers, 63% were sideways (35 fatalities) and 32% were backwards (18 fatalities). Rollover direction could not be determined in 5% of the cases (3 fatalities). Sideways rollovers were more frequent in younger adults (68%) than in older adults, whereas backwards rollovers were less frequent in younger adults (26%). Most backwards rollovers occurred in woodlots.



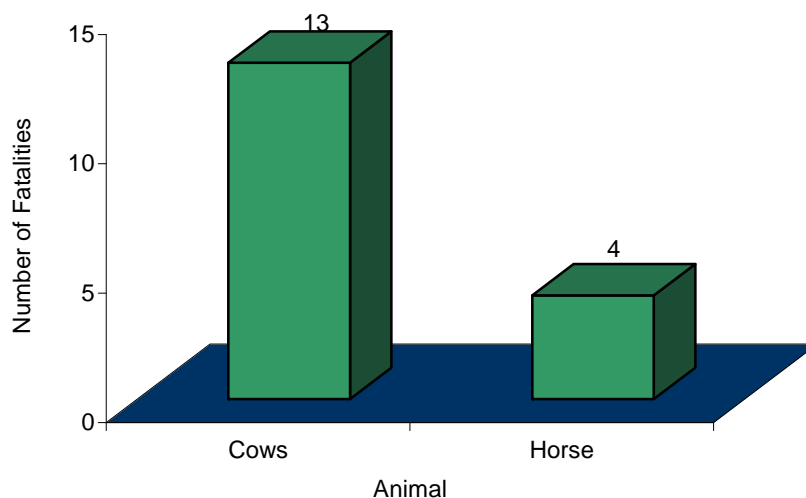
## 6.8 Fatal agricultural runovers in adults aged 60 and older by runover type, 1990-2008

Of the 54 runovers, most involved unmanned machines which had been bypass started, left running, or left unblocked on a slope (28 fatalities). Operator runovers subsequent to falls from machines (19 fatalities) were the next most frequent runover mechanism. Bystander runovers (4 fatalities) and passenger/extra rider runovers (3 fatalities) were not common fatal runover mechanisms among older adults. This pattern was similar to that seen in younger adults, but older adults were involved in higher proportions of both operator and unmanned runovers.



### 6.9 Fatal agricultural injuries in adults aged 60 and over by animal, 1990-2008

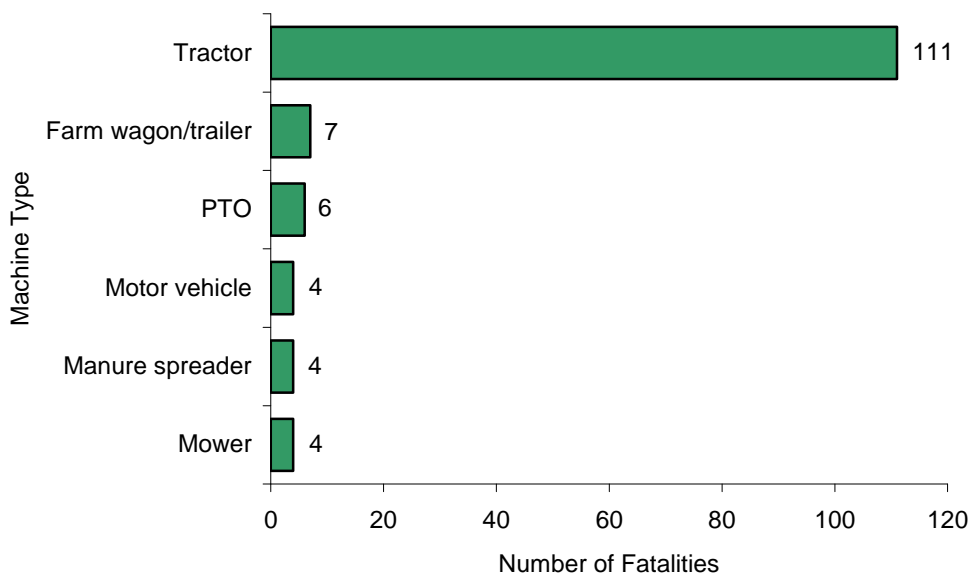
Of the 17 animal-related deaths to those 60 years of age and older, the majority 76% involved cows/steers/calves. The remaining 24% involved horses/stallions/colts.



### 6.10 Fatal agricultural injuries in adults aged 60 and over by machine type, 1990-2008

Of the 150 machine-related deaths, the machine most frequently involved in agricultural fatalities among older adults were tractors (74%), followed by wagons/trailers (5%), and power take offs (4%). The proportion of tractor-related deaths in adults aged 60 and over was 20% greater than for younger adults.

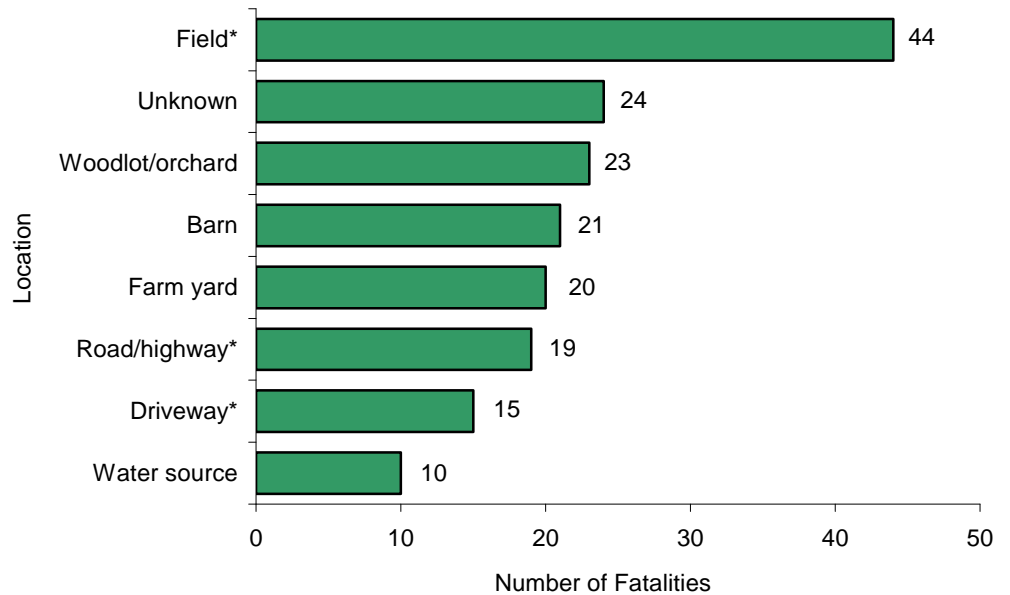
Tractors were associated with 56% of all agricultural deaths among older adults, which is 18% greater than the proportion for younger adults.



There were 9 machines not illustrated above accounting for additional 14 fatalities.

### 6.11 Fatal agricultural injuries in adults aged 60 and over by location of injury, 1990-2008

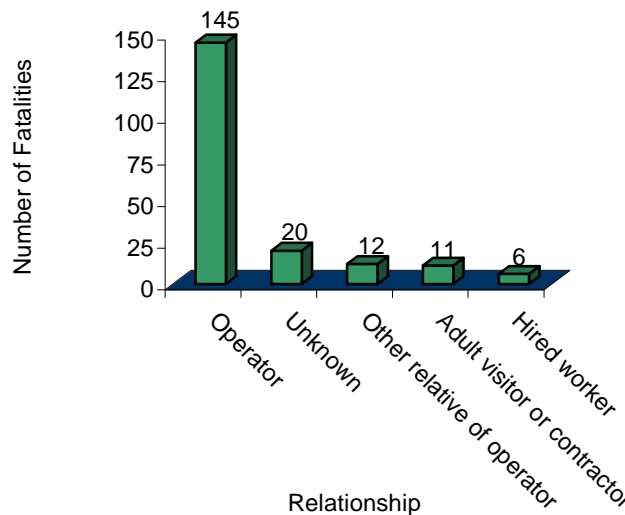
The most common locations of fatal injury for older adults were fields and their adjacent ditches (22%), 12% of the locations were unknown, and another 12% were in wood lot/orchard.



\* These locations include adjacent dry ditches.  
There were 5 locations not illustrated above accounting for additional 21 fatalities.

### 6.12 Fatal agricultural injuries in adults aged 60 and over by relationship to farm operator, 1990-2008

74% of older adults killed in agricultural injury events were farm operators. In a further 10% of the deaths the relationship to the owners was unknown. Other relative of operator (son-in-law, father of owner) and adult visitor/contractor each accounted for 6% of the deaths.



There were 2 relationships not illustrated above accounting for additional 3 fatalities.

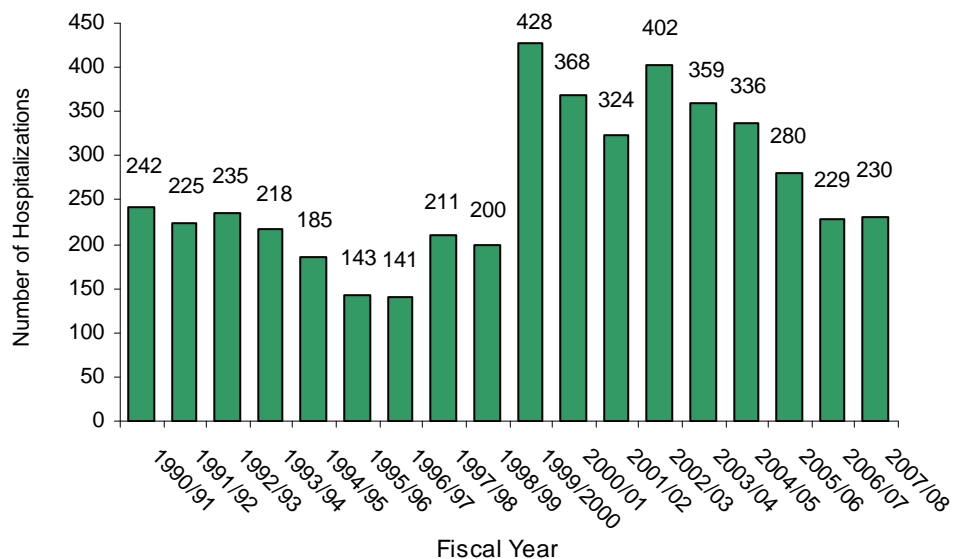


## 7 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO 1990-2008: OVERVIEW

### 7.1 Hospitalized agricultural injuries by fiscal year, 1990-2008

In the 18 fiscal years from April 1, 1990 to March 31, 2008, there were 4,756 agricultural hospitalizations identified in Ontario. This is an average of 264 admissions each year.

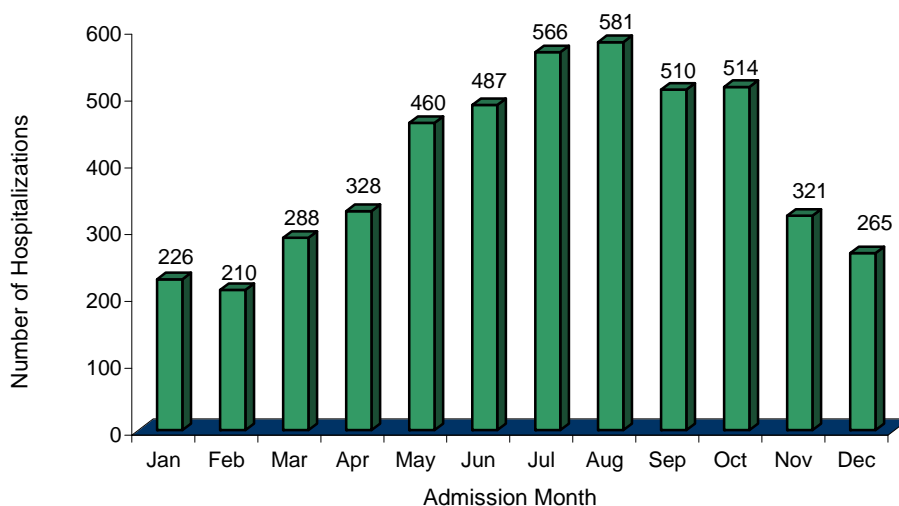
The ICD 10 CA coding system was implemented by most centers in fiscal year 1999-2000, resulting in greatly increased identification of non-machine-related agricultural injuries such as falls and animal-related events.



### 7.2 Hospitalized agricultural injuries by month, 1990-2008

66% of the agricultural hospitalizations in Ontario occurred from May to October (3,118 hospitalizations).

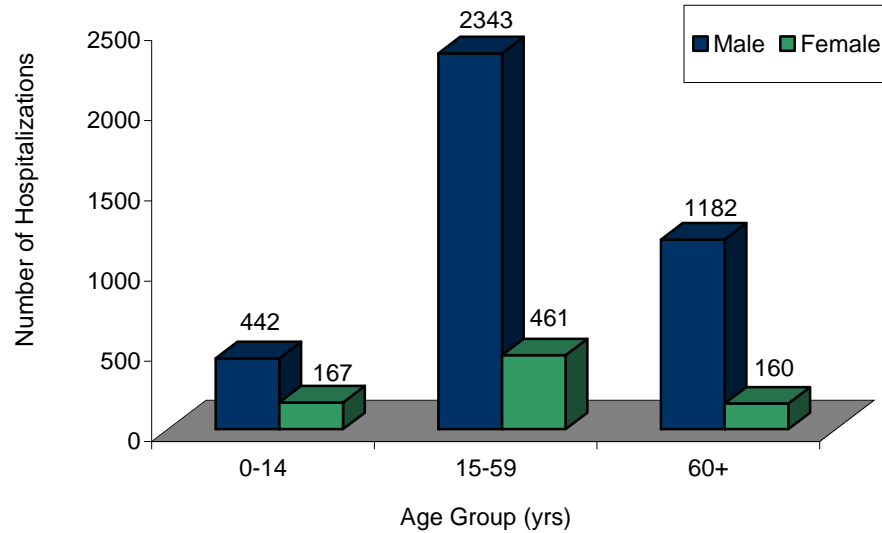
The highest proportions of hospitalizations took place in July and August, each accounting for 12%.



### 7.3 Hospitalized agricultural injuries by age group and gender, 1990-2008

Overall, 83% of the persons injured were male (3,967 hospitalizations) and 17% were female (788 hospitalizations). The lowest ratio of males to females was in children (2.6:1), whereas the highest ratio was in older adults those 60 years of age and older (7.4:1).

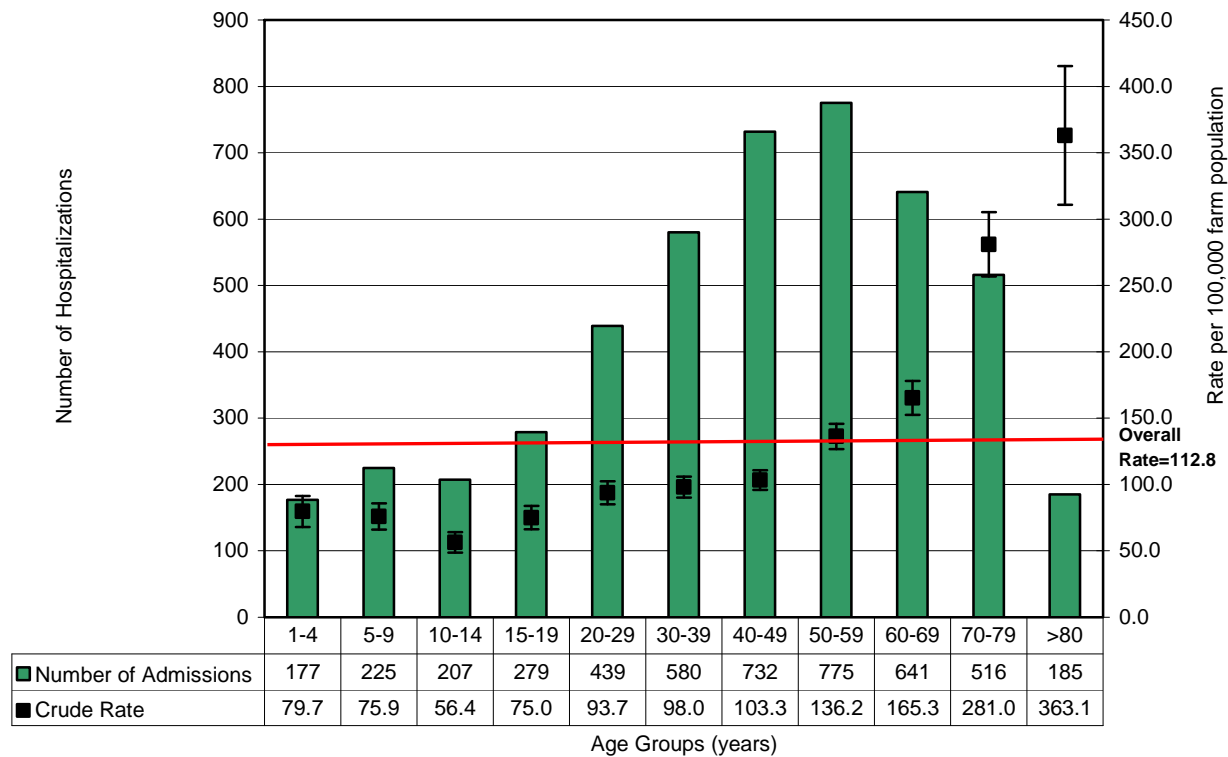
The majority of those injured were in the 15 to 59 age group. Although children should have considerably lower exposure to the hazards of agricultural work than adults, they still sustained 13% of the hospitalized agricultural injuries.



\* one gender was missing in the 15-59 age group.

Sex	0-14 yrs	15-59 yrs	60+ yrs	Total	%
Male	442	2343	1182	3967	83
Female	167	461	160	788	17
Total	609	2804	1342	4756	100
Percent	13	51	36	100	

## 7.4 Hospitalized agricultural injury rates by gender and age group, 1990-2008



The overall crude hospitalization rate was 112.8 per 100,000 farm population.

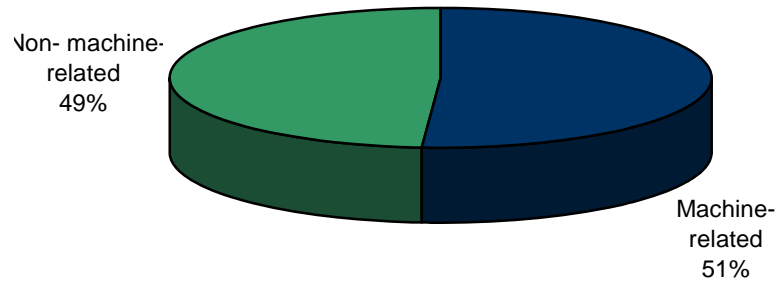
The age group which had the highest number of hospitalizations did not have the highest rates. Those between 50 and 59 years of age had the highest number of hospitalizations with 775, and had a rate of 136.2 admissions per 100,000 farm population. However, those 80 years and older only had 185 hospitalizations but had an admission rate of 363.1 admissions per 100,000 population.

## 7.5 Hospitalized agricultural injuries by major cause, 1990-2008

51% of agricultural hospitalizations were machine-related (2,437 hospitalizations), whereas only 49% of identified hospitalized injuries were non-machine-related (2,319 hospitalizations).

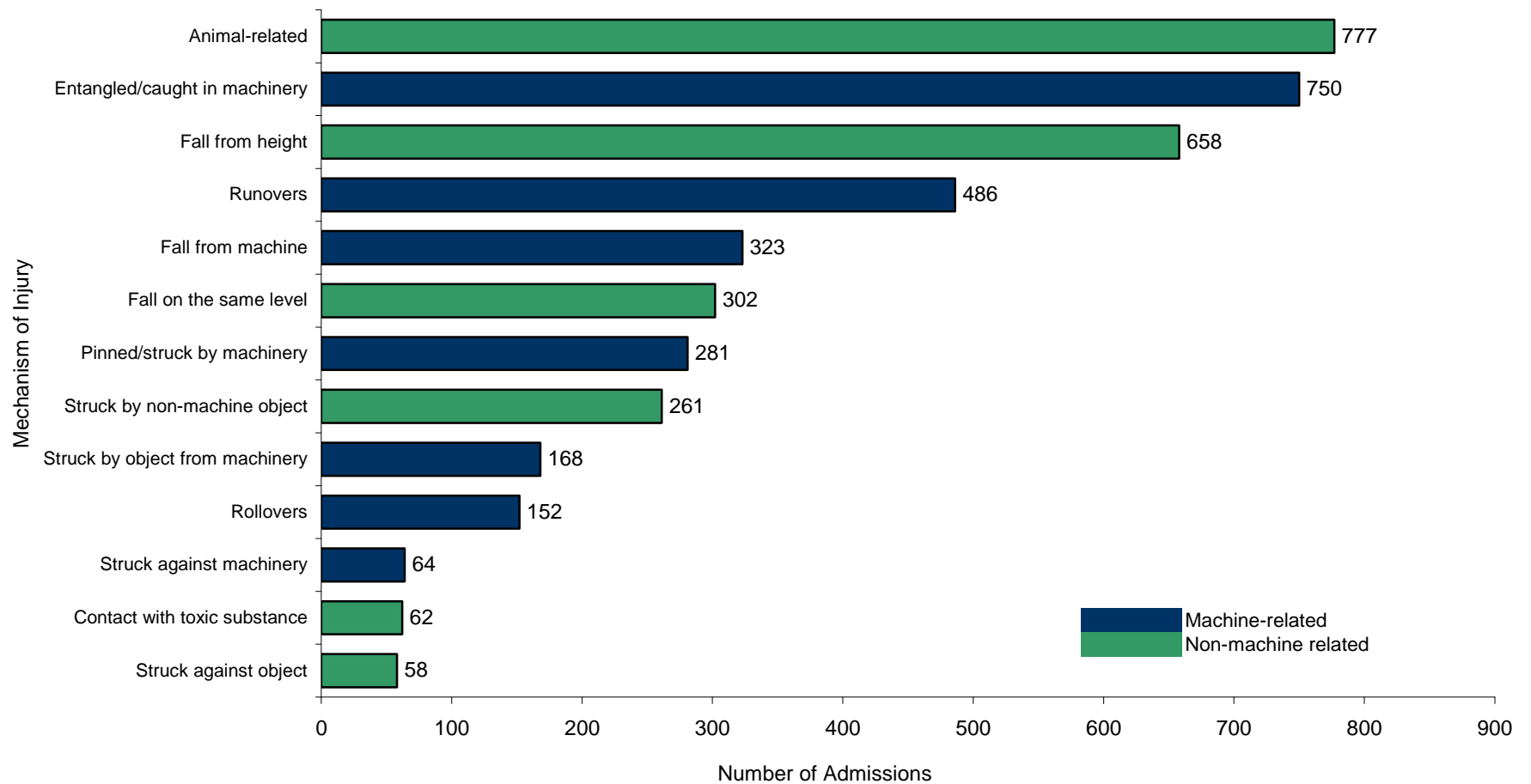
The leading machine-related mechanisms of injury were machine entanglements, machine runovers, and falls from machinery.

Non-machine-related causes of hospitalized agricultural injuries included animal-related events, falls from height, falls on the same level and being struck by a non-machine object.



Non-machine causes of injury are underestimated due to case identification problems with the ICD 9 coding system used prior to April 1999.

## 7.6 Hospitalized agricultural injuries by mechanism of injury, 1900-2008

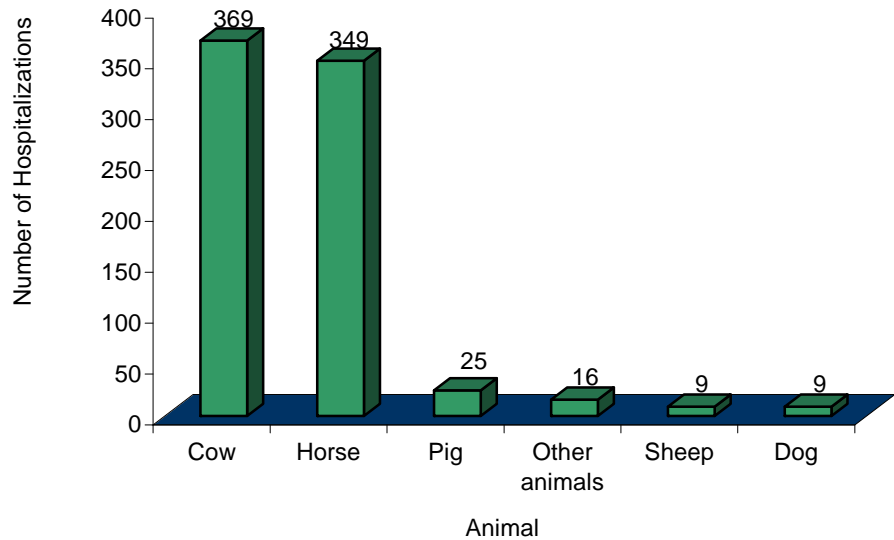


The leading causes of hospitalized agricultural injuries in Ontario, animal-related events and entanglement/caught in machinery accounted for 16% each, falls from height accounted for 14%, machine runovers (10%), and fall from machine not runover (7%).

There were 18 causes not illustrated above accounting for an additional 414 hospitalizations. Non-machine causes of injury are underestimated due to case identification problems with the ICD 9 coding system used prior to April 1999.

## 7.7 Animal-related hospitalized agriculture injuries by type of animal, 1990-2008

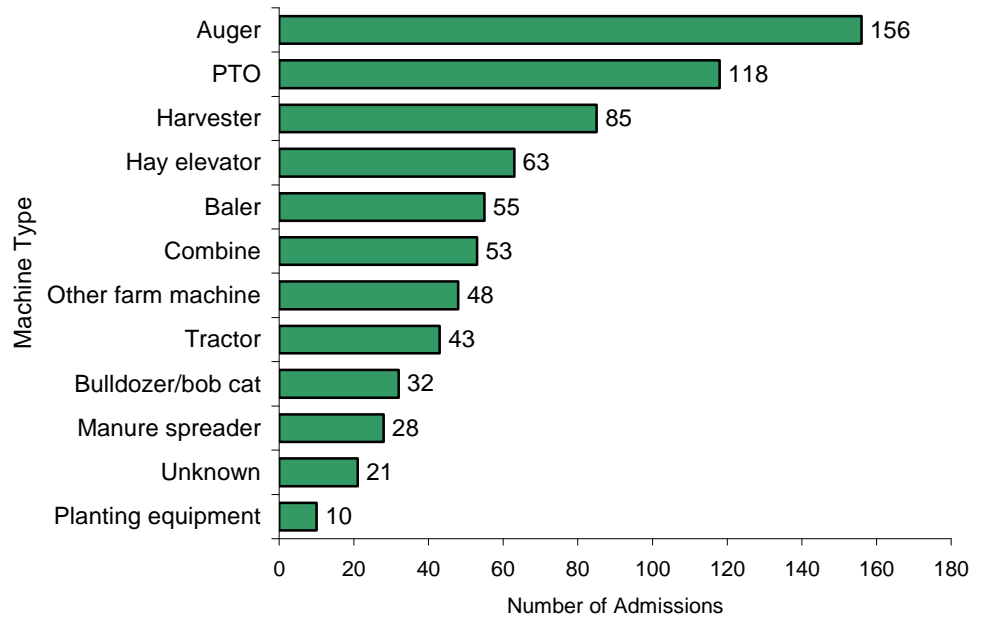
Animal-related injuries were the leading cause of hospitalized injuries. Of the 777 identified animal injuries, 47% were caused by cows/steers/ calves and another 45% were caused by horses/ stallions/colts.



Animal injuries are underestimated due to case identification problems with the ICD 9 coding system used prior to April 1999.

## 7.8 Hospitalized agricultural machine entanglement injuries by machine type, 1990-2008

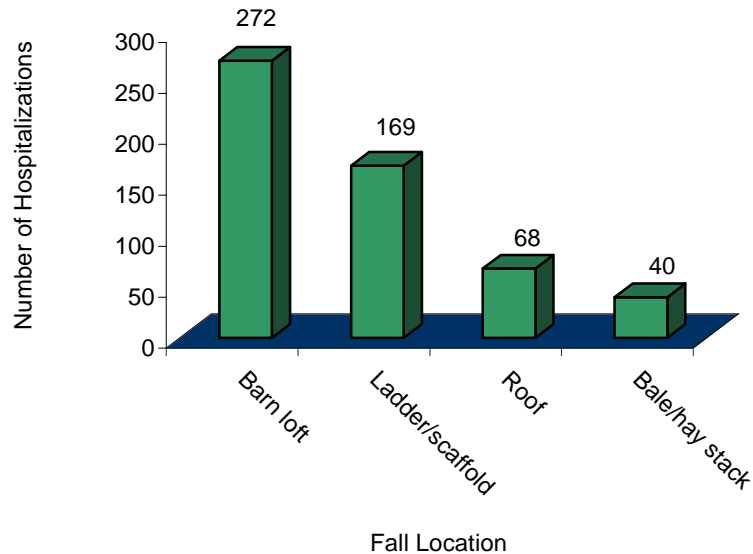
Of the 750 hospitalizations due to entanglements in machinery, augers were the most frequent piece of equipment, accounting for 20%, followed by power take offs (PTOs) with 15%, harvesters with 11%, hay elevators with 8% and balers and combines each with 7%.



There were 10 machine types not illustrated above accounting for an additional 38 admissions.

## 7.9 Hospitalized agricultural non-machine falls from height by fall location, 1990-2008

Non-machine falls from height were ranked third overall as a cause of hospitalized injuries. Of the 658 falls from heights, 41% happened in a barn loft. Another 26% involved a fall from a ladder/scaffolding, 10% were from roofs and 6% were from bale/hay stack.

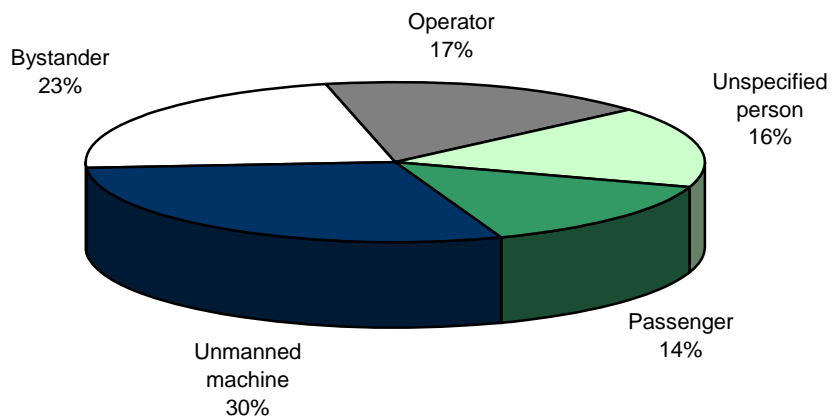


There were 8 fall locations not illustrated above accounting for an additional 108 admissions.

Of the 33 hospitalizations identified as "other" they included falling from stools or chairs, and for another 20 the location was unknown.

## 7.10 Hospitalized agricultural runovers by runover type, 1990-2008

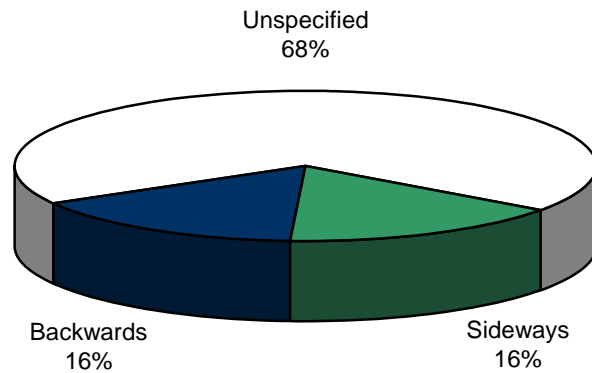
Runovers were ranked fourth as a cause of injury. Of the 486 runovers, unmanned machine runovers were the most common hospitalization with 143 admissions. In this type of injury event, the victim is runover by a vehicle/machine that had been bypass started, left running, or left unblocked on a slope. There were 110 bystander runover hospitalizations followed by 83 operator runover hospitalizations. In operator runovers, the victim is runover subsequent to a fall from the machine he/she had been operating. Passenger/extra rider runovers (70 hospitalizations) were most often seen in children.



Cases were assigned to the 'person runover by machine (no prior fall)' category, if it was not possible to place them in the 'unmanned machine' or 'bystander runover' categories because of the limited circumstance descriptions available.

## 7.12 Hospitalized agricultural rollovers by rollover type, 1990-2008

Machine rollovers were ranked tenth for hospitalizations but first as a cause of death because they are usually lethal. Of the 152 rollover hospitalizations a large proportion are unclassified rollovers because of the limited circumstance descriptions available (104 hospitalizations). Of those identified, both backwards and sideways rollovers accounted for 24 hospitalizations each.

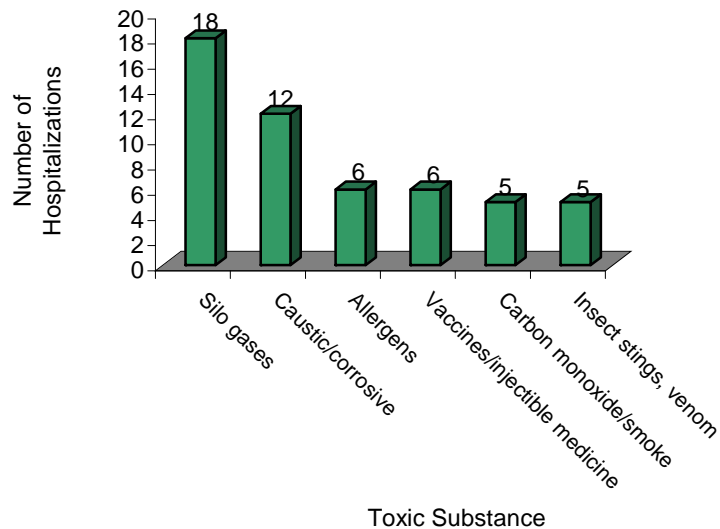




### 7.13 Hospitalized agricultural toxic substance injuries, by type of substance and means of contact, 1990-2008

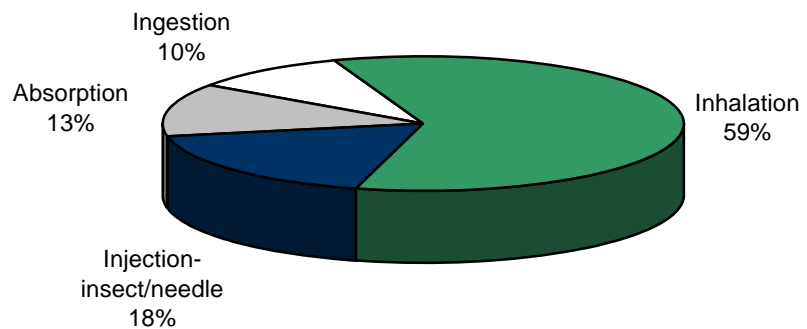
The most common toxic substances cited were silo gases (29%), followed by caustic or acidic chemicals (19%), allergens (10%) and vaccine or medication (10%), carbon monoxide/smoke (8%) and insect stings (8%).

Inhalation was by far the most common means of contact with toxic substances (59%). The other means of toxic substance contact were injection of medication intended for animals (18%), absorption (13%), and ingestion (10%).



There were 5 other toxic substances not illustrated above accounting for an additional 10 admissions.

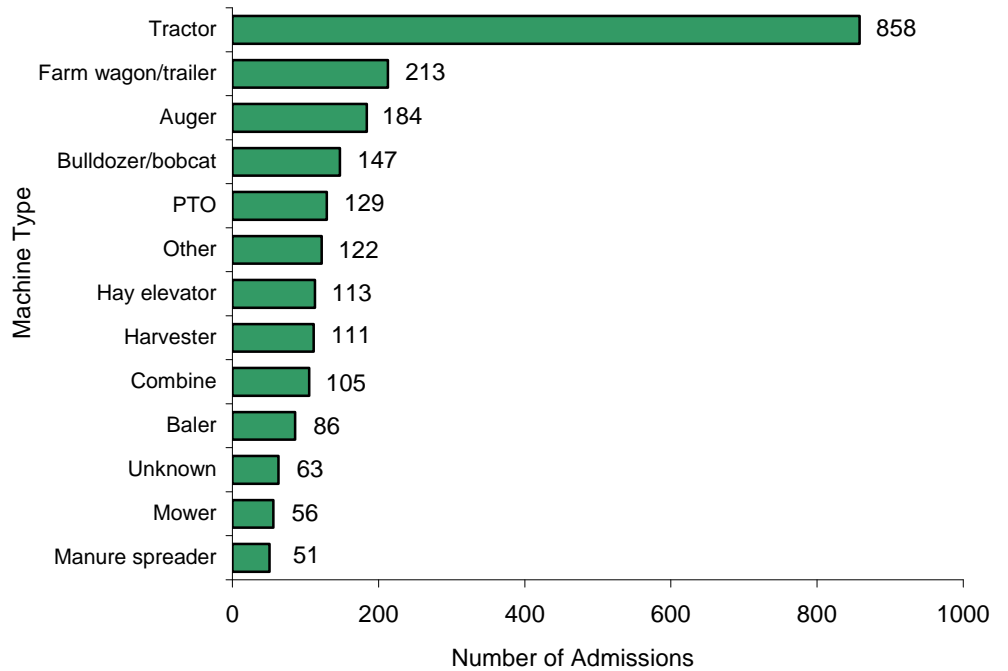
These injuries are underestimated due to case identification problems with the ICD 9 coding system used prior to April 1999.



## 7.14 Hospitalized agricultural machine-related injuries by machine type, 1990-2008

Of the 2,437 machine-related hospitalizations, 35% of the injuries involved tractors. The next most common machine type was wagons/trailers (9%), followed by augers (8%), bulldozers/bobcat (6%) and power take offs (PTOs) (5%).

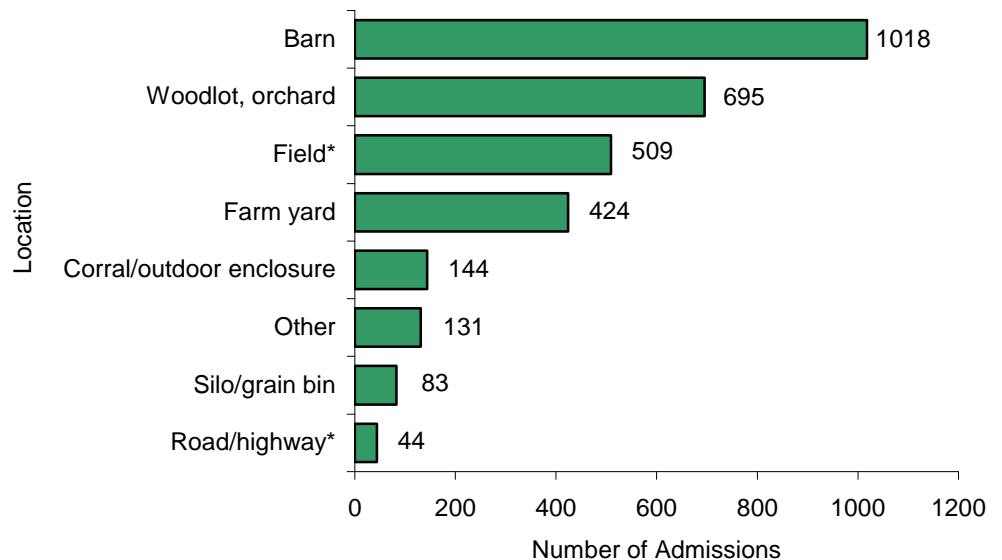
Tractors were involved in 18% of all agriculture injury hospitalizations.



There were 10 machine types not illustrated above accounting for an additional 199 admissions.

## 7.15 Hospitalized agricultural injuries by location, 1990-2008

Of the 4,756 hospitalizations 3,133 had documentation of the location of the injury. Of those with the location documented, injuries in the barn accounted for 32%, woodlot/orchard accounted for 22%, field accounted for 16% and farm yard accounted for 14%.



\* These locations include adjacent dry ditches.

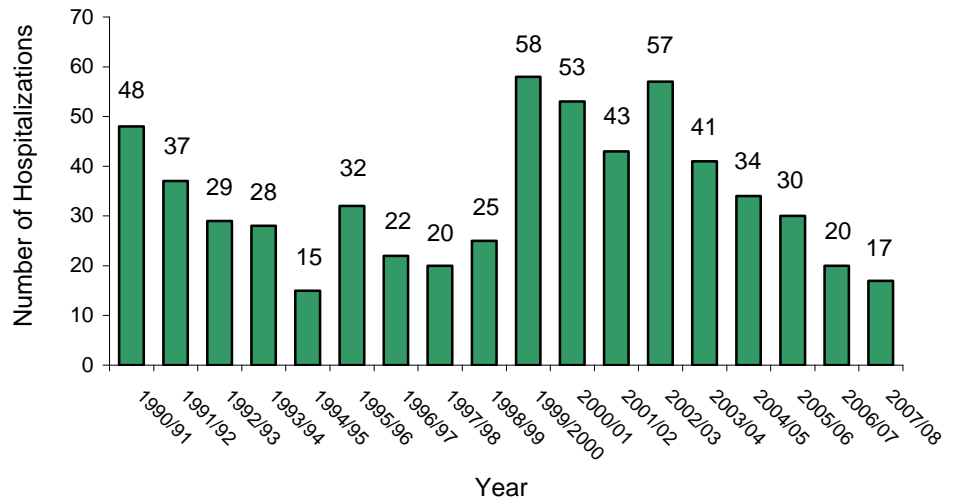
There were 6 locations not illustrated above accounting for an additional 129 admissions.

## 8 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: CHILDREN AND YOUTH UNDER AGE 15

### 8.1 Hospitalized agricultural injuries in children and youth by fiscal year, 1990-2008

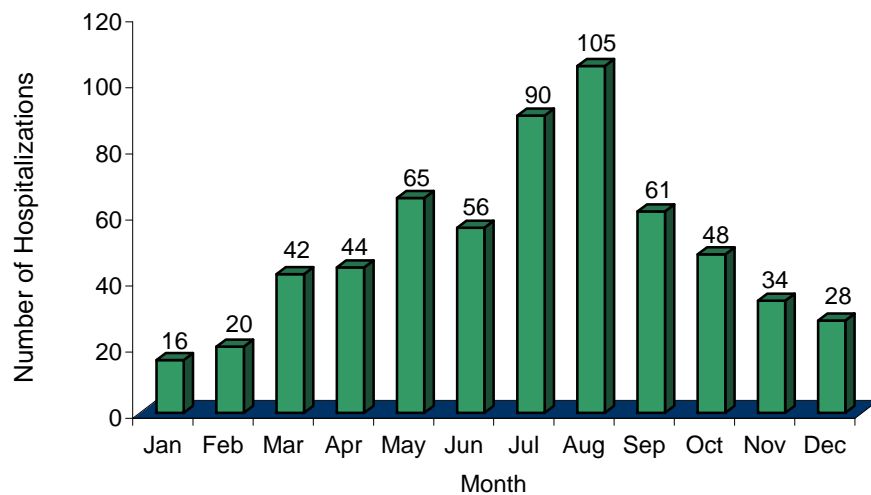
From April 1, 1990 to March 31, 2008, there were 609 children under fifteen who were injured seriously enough to be admitted to hospital. This is an average of 40 children per year.

The ICD 10 CA coding system was implemented at most centres in Ontario during the 1999 to 2000 fiscal year, resulting in greater identification of non-machine-related agricultural injuries.



### 8.2 Hospitalized agricultural injuries in children and youth by month, 1990-2008

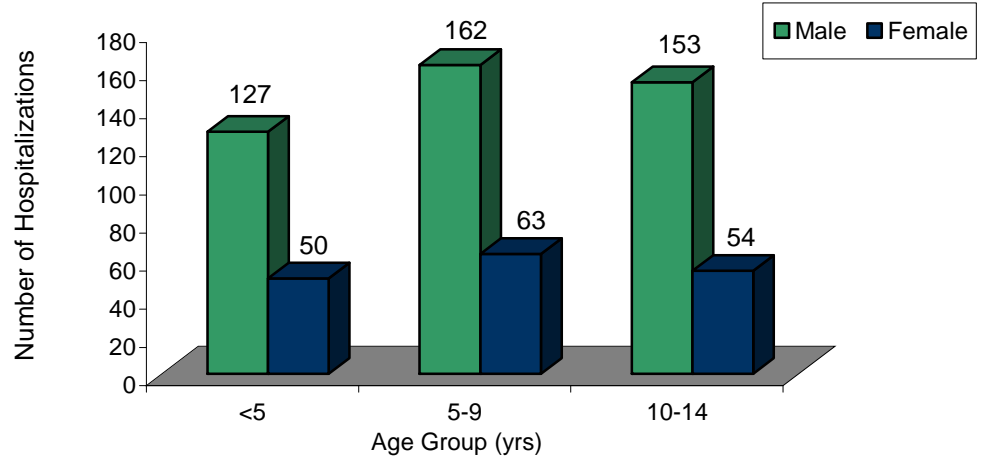
32% of all agricultural hospitalizations in children occurred during the school holiday months of July and August (195 hospitalizations). August had the highest proportion of hospitalizations accounting for 17%, injuries in July accounted for 15%.



### 8.3 Hospitalized agricultural injuries in children and youth by age group and gender, 1990-2008

73% of the children hospitalized for agricultural injuries were male (442 hospitalizations). The ratio of males to females was highest for the 10 to 14 year old age group (2.9:1), and lowest for children under five years old (2.5:1). There is a higher proportion of hospitalized females among children under five than in any other age group.

Of the 177 hospitalizations of children less than 5 years of age, 71 (40%) were age one or two. Four children were infants under a year old.

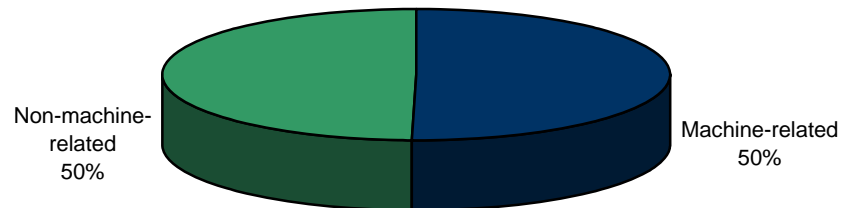


Sex	<5 yrs	5-9 yrs	10-14yrs	Total	%
Male	126	162	154	442	73
Female	50	63	54	167	27
Total	177	225	207	609	100
Percent	29	37	34	100	16

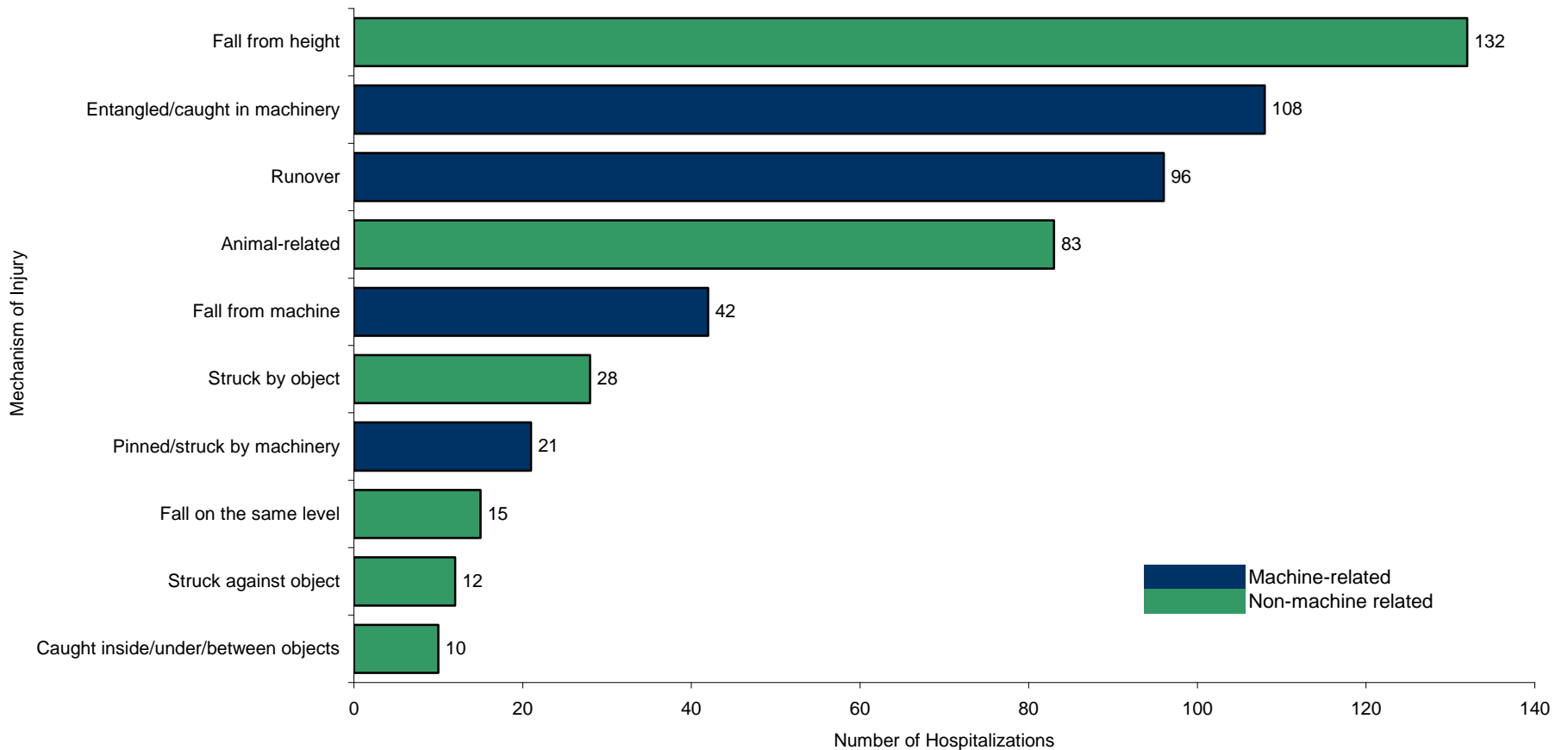
### 8.4 Hospitalized agricultural injuries in children and youth by major cause, 1990-2008

50% of agricultural hospitalizations in children were machine-related (306 hospitalizations). These included a large number of machine entanglements and machine runovers.

50% of agricultural hospitalizations were non-machine-related (303 hospitalizations). These included numerous falls from height and animal-related injuries.



## 8.5 Hospitalized agricultural injuries in children and youth by cause of injury, 1990-2008

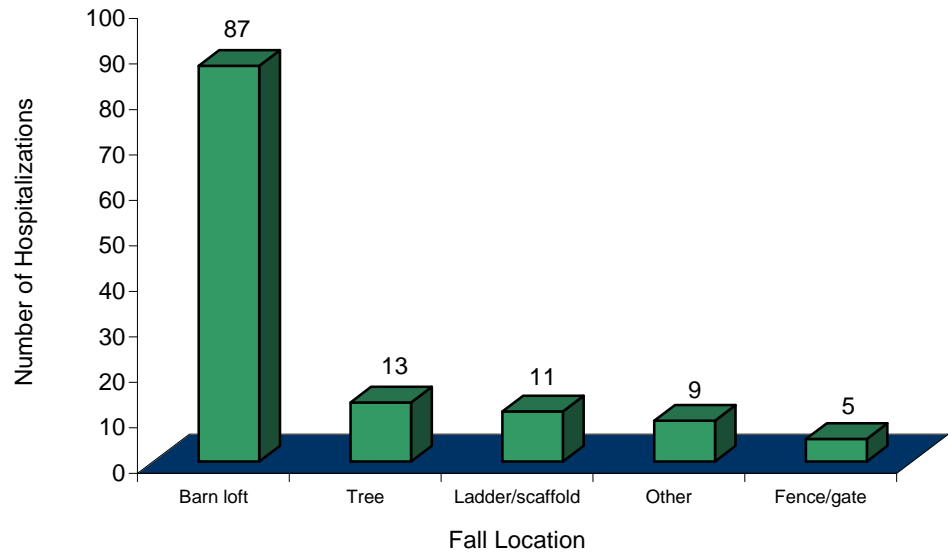


For children aged fourteen and under, falls from height (22%) and machine entanglements (18%) were the leading causes of hospitalized injuries. A further 16% of the hospitalized injuries were due to machine runovers, another 14% of hospitalized injuries were caused by incidents with animals.

There were 16 mechanism of injuries not illustrated above accounting for an additional 62 hospitalizations. Non-machine injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

## 8.6 Hospitalized agricultural non-machine falls from height in children and youth by fall location, 1990-2008

Of the 132 hospitalizations due to a fall from height, 66% of the falls of children were from a barn loft or rafters. Another 10% were falls from a tree.

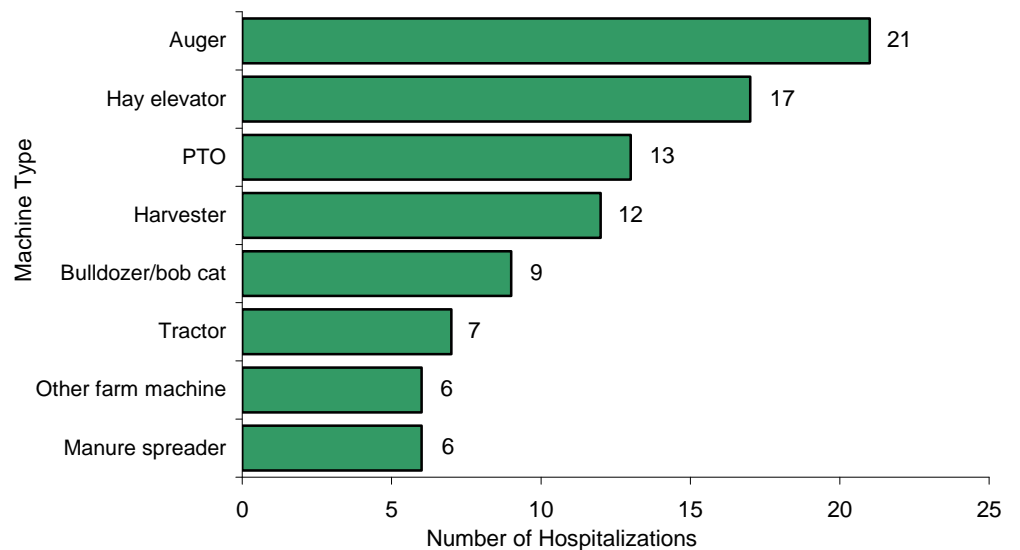


There were 4 fall locations not illustrated above accounting for an additional 7 hospitalizations.

Non-machine falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

## 8.7 Hospitalized agricultural entanglement injuries in children and youth by machine type, 1990-2008

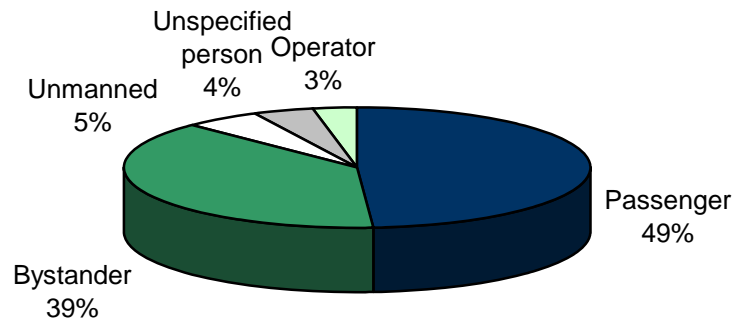
The four machine types most frequently involved in agricultural entanglements among children and youth were augers (19%), followed by hay elevators and conveyors (16%), power take offs (PTOs) (12%) and harvesters (11%).



There were 6 machines involved in entanglements not illustrated above accounting for an additional 17 hospitalizations.

## 8.8 Hospitalized agricultural runovers in children and youth by runover type, 1990-2008

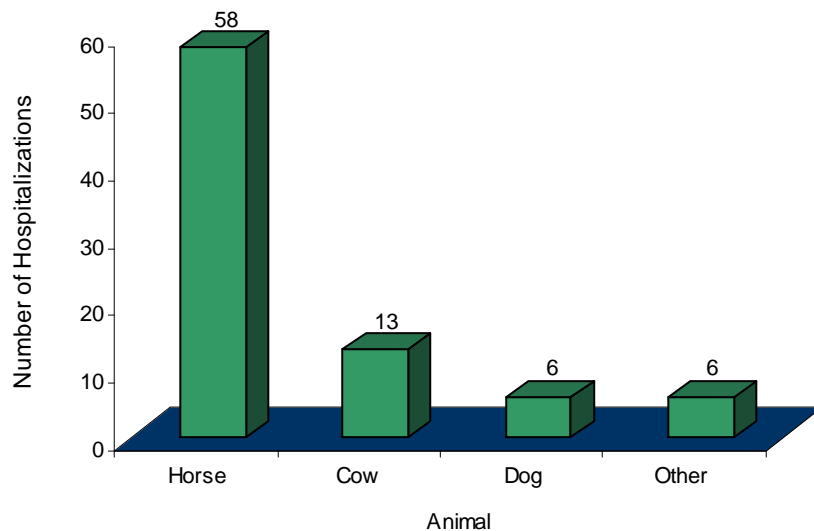
Extra rider runovers were the most common runover type causing hospitalized injuries in children (47 hospitalizations). In this type of runover, children are injured when they fall from machines they had been riding on as passengers and are subsequently run over. Another 37 hospitalizations of children are as bystander runovers. There were 5 unmanned machine runover hospitalizations, 4 hospitalizations of a person where the position was not identified, and 3 hospitalizations of children who were run over as an operator of a piece of machinery.



## 8.9 Animal-related hospitalized agricultural injuries in children and youth by type of animal, 1990-2008

70% of animal-related injuries were caused by horses/stallions/colts and 16% were due to cows/steers/calves.

66% of the persons injured by horses were female. This is one of the few categories of agricultural injuries where more females than males tend to be injured, mainly by falling from a horse or being struck by a horse.



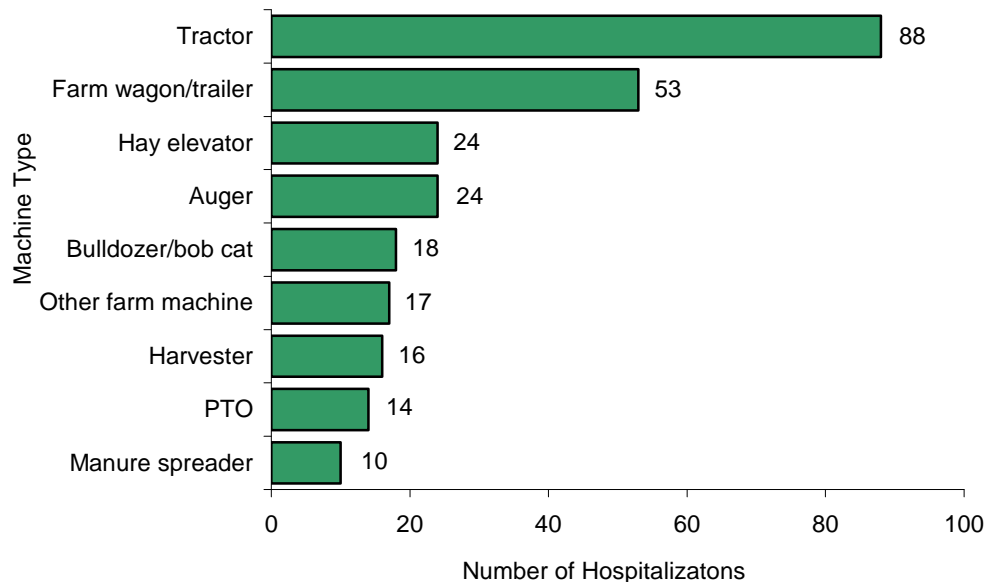
Animal injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

## 8.10 Hospitalized agricultural machine-related injuries in children and youth by machine type

The four machine types most frequently involved in agricultural hospitalizations among children and youth were tractors (29%), followed by wagons (17%), augers (8%) and hay elevators/conveyors (8%).

Tractors accounted for 14% of all agriculture hospitalizations of children and youth.

Tractors were more commonly associated with fatalities (51%) than with hospitalized injuries.



There were 11 other machine types not illustrated above accounting for an additional 42 hospitalizations.

## 8.10 Hospitalized agricultural injuries by location, 1990-2008

Of the 609 hospitalizations, 449 had documentation of the location of the injury. Of those with the location documented, injuries in the barn accounted for 42%, woodlot/orchard accounted for 20%, field accounted for 14%, and farm yard another 12%.



\* These locations include adjacent ditches.

There were 6 locations not illustrated above accounting for an additional 22 hospitalizations. There were 160 records in which the location was unknown.

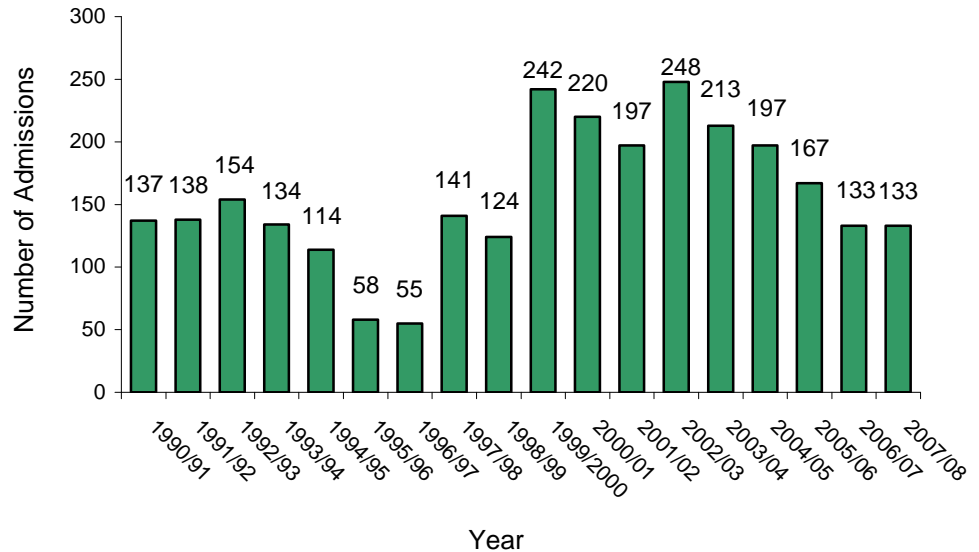


## 9 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: ADULTS AGED 15 TO 59

### 9.1 Hospitalized agricultural injuries in adults aged 15 to 59 by fiscal year, 1990-2008

From April 1, 1990 to March 31, 2008, 2,805 hospitalized agricultural injuries were identified for Ontario adults aged 15 to 59. There was an average of 156 admissions per year.

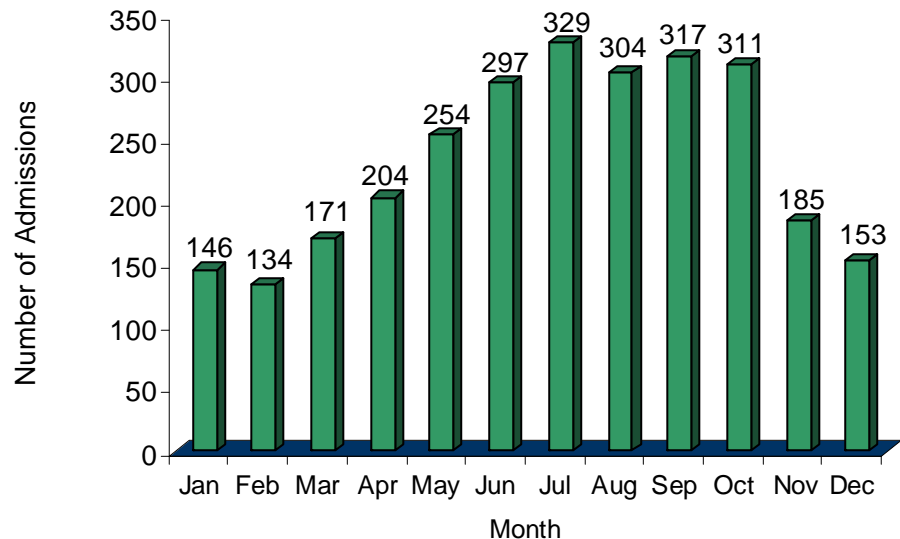
The ICD 10 CA coding system was implemented at most centres in Ontario during the 1999 to 2000 fiscal year, resulting in greater identification of non-machine-related agricultural injuries.



### 9.2 Hospitalized agricultural injuries in adults aged 15 to 59 by month, 1990-2008

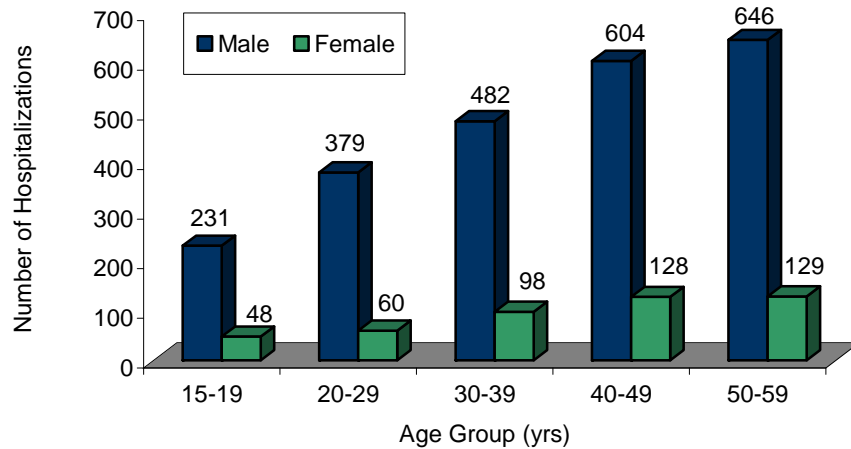
65% of all agricultural hospitalizations in adults aged 15 to 59 occurred from May to October (1812 hospitalizations).

July was the peak month, with 12% of all hospitalizations. This was closely followed by June, August, September and October each accounting for 11% of the hospitalizations.



### 9.3 Hospitalized agricultural injuries in adults aged 15 to 59 by age group and gender, 1990-2008

83% of the younger adults hospitalized for agricultural injuries were male (2342 hospitalizations). The ratio of males to females was highest for the 20 to 29 year age group (6.3:1), and lowest for the 40 to 49 year age group (4.7:1).



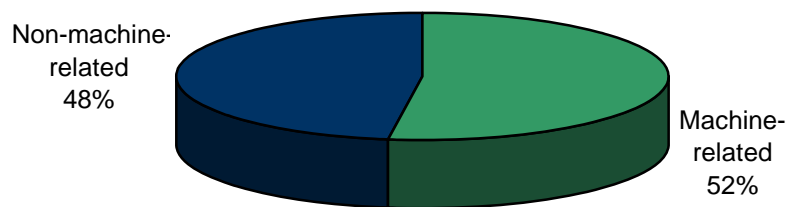
^one gender was missing in the 40 to 49 age group

Sex	15-19 yrs	20-29 yrs	30-39 yrs	40-49 yrs	50-59 yrs	Total	%
Male	231	379	482	604	646	2342	83
Female	48	60	98	128	129	462	17
Total	279	439	580	732	775	2805	100
Percent	10	16	21	26	28	100	

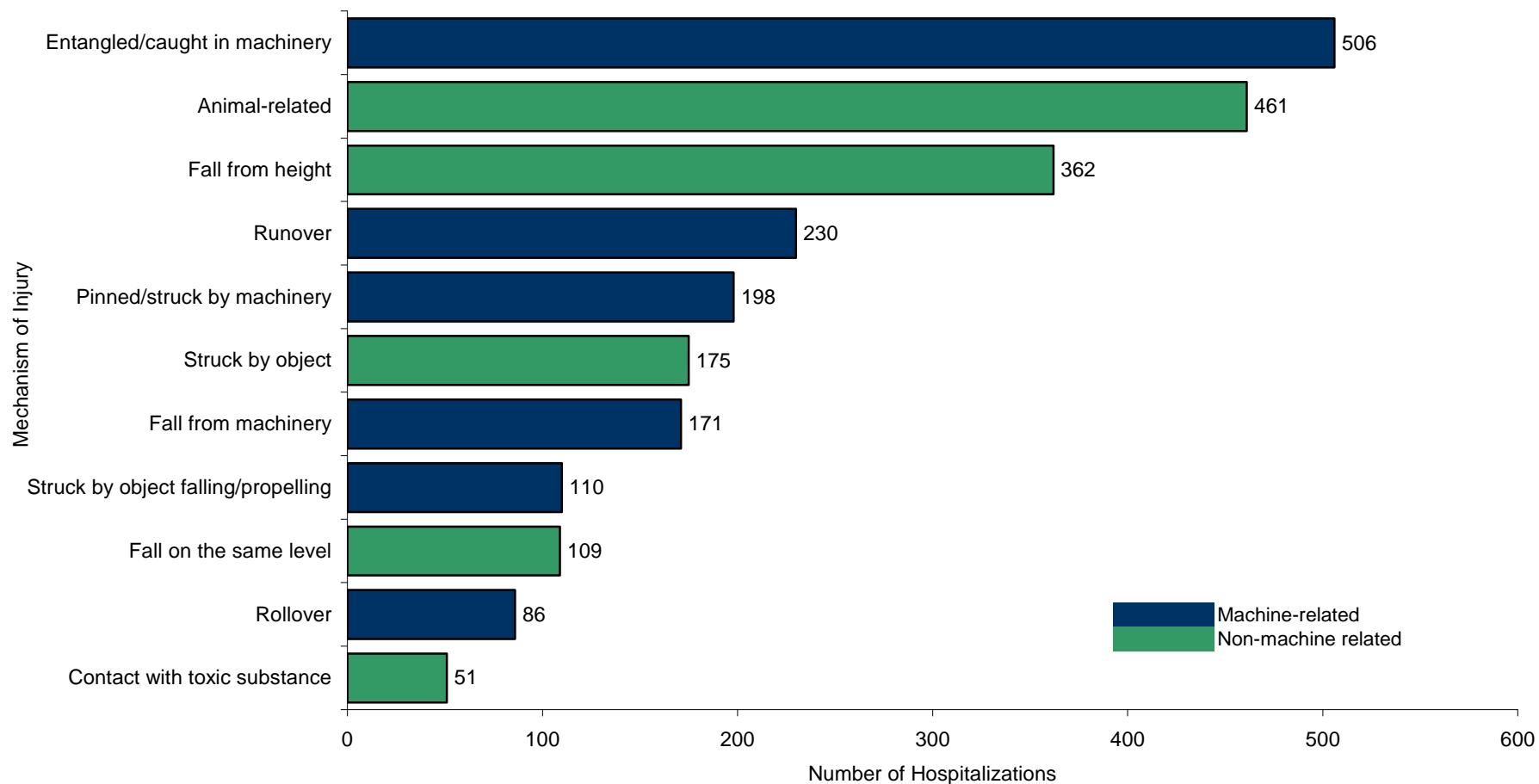
### 9.4 Hospitalized agricultural injuries in adults aged 15 to 59 by major cause, 1990-2008

52% of agricultural hospitalizations in adults aged 15 to 59 were machine-related (1,468 hospitalizations), whereas 69% of fatalities in the same age group were machine-related. The leading machine-related mechanisms of hospitalized injury were machine entanglements, machine runovers and being pinned or struck by a machine.

There were 1,337 agricultural hospitalizations that were non-machine-related. These included animal-related incidents, and falls from height.



## 9.5 Hospitalized agricultural injuries in adults aged 15 to 59 by cause of injury, 1990-2008

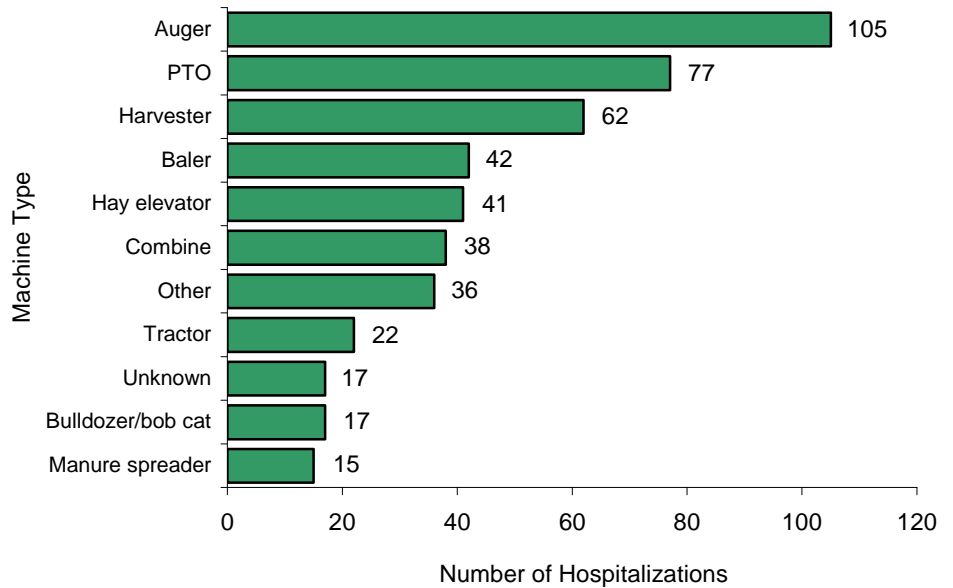


In adults aged 15 to 59, the top five causes of hospitalized injuries were machine entanglements (18%), animal-related events (16%), falls from height (13%), machine runovers (8%), and being pinned or struck by a machine (7%).

There were 19 mechanism of injury not illustrated above accounting for an additional 346 hospitalizations. Non-machine injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

## 9.6 Hospitalized agricultural machine entanglement injuries in adults aged 15 to 59 by machine type, 1990-2008

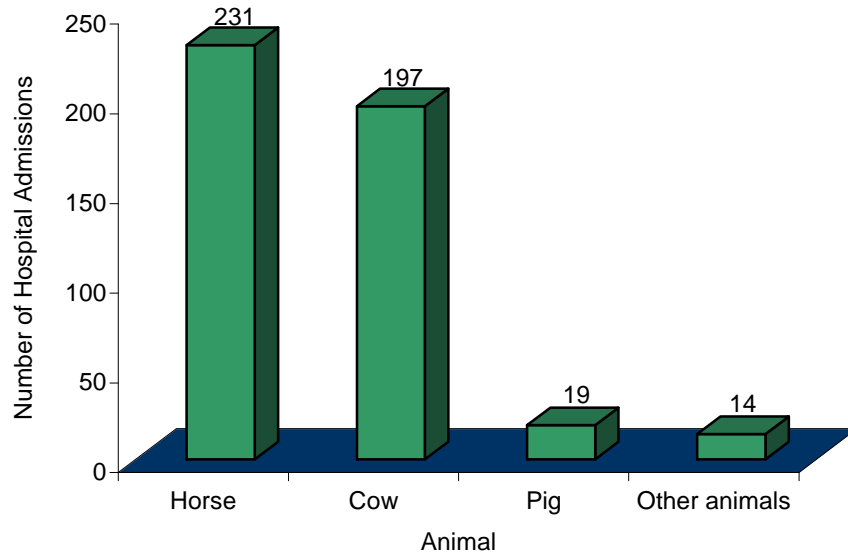
Of the 506 machine entanglements, the machines most frequently involved were augers (21%), power take offs (PTOs) (15%), harvesters (12%), balers (8%), hay elevators/conveyors (8%) and combines (8%).



There were 10 machines not illustrated above accounting for an additional 34 hospitalizations.

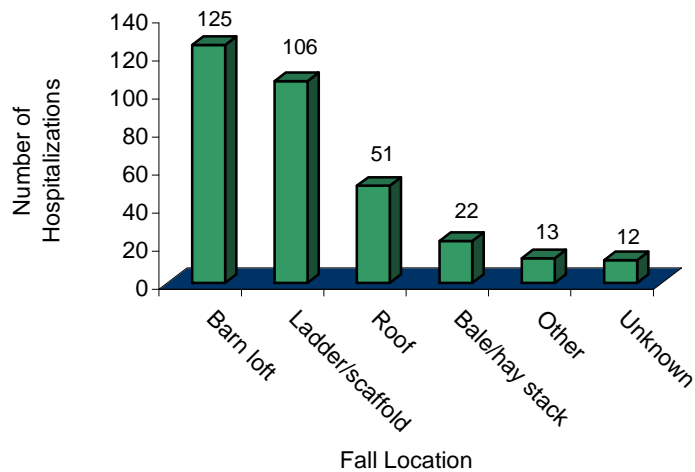
## 9.7 Animal-related hospitalized agricultural injuries in adults aged 15 to 59 by type of animal, 1990-2008

Of the 461 animal-related hospitalizations of adults aged 15 to 59, 50% of the injuries involved horses/stallions/colts. Cows/bulls/calves were responsible for another 43%; injuries involving pigs accounted for 4% and other animals accounted for 3%.



## 9.8 Hospitalized agricultural non-machine falls from height in adults aged 15 to 59 by fall location, 1990-2008

Of the 362 hospitalizations due to a fall from height, 35% were from barn lofts/rafters, 29% were from ladders/scaffolding, 14% were from roofs, and 6% were from bales/hay stacks.

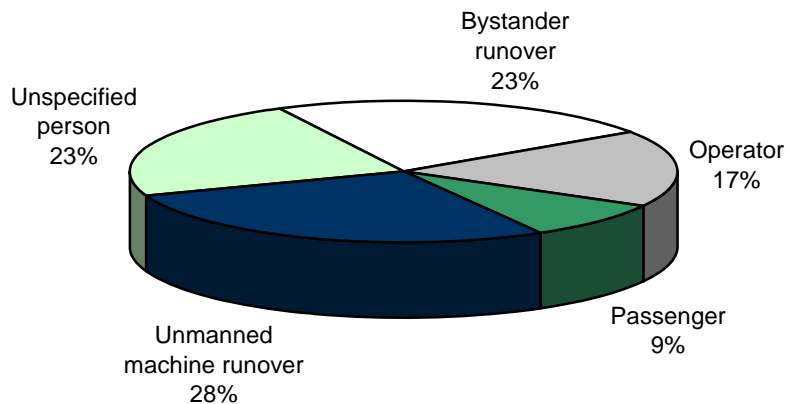


There were 6 locations not illustrated above accounting for an additional 33 hospitalizations.

Non-machine falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

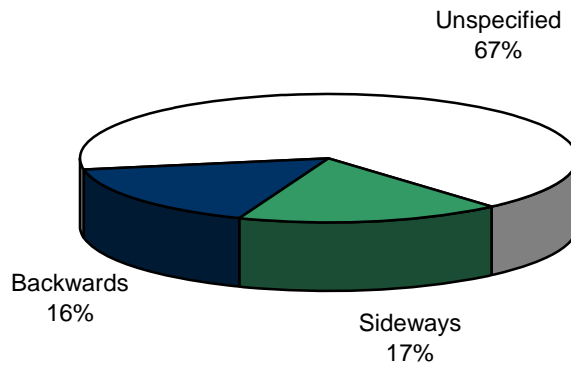
## 9.9 Hospitalized agricultural runovers in adults aged 15 to 59 by runover type, 1990-2008

Of the 203 runovers, most were runover by unmanned machines (64 hospitalizations) which had been bypass started, left running or left unblocked on a slope. Person unspecified and bystanders each had 53 hospitalizations. There were 40 hospitalizations in which an operator was struck by a moving machine subsequent to falling from it and 20 hospitalizations of passengers/extra riders being runover.



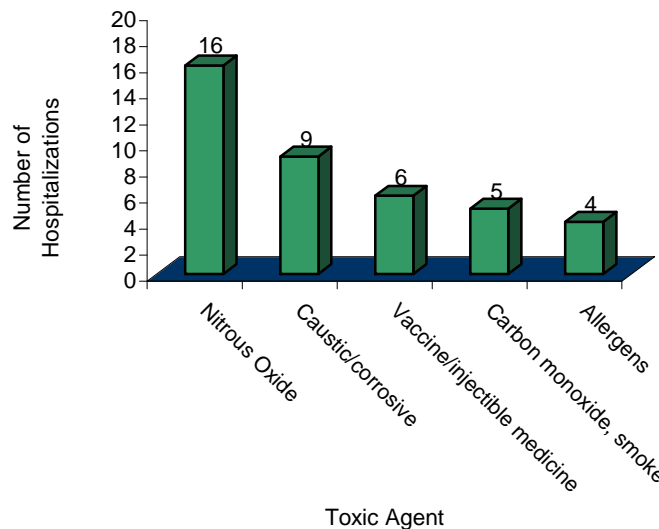
### 9.10 Hospitalized agricultural rollovers in adults aged 15 to 59 by rollover type, 1990-2008

Of the 86 rollovers, in the majority the direction could not be determined due to insufficient circumstance text (57 hospitalizations). From the remaining where a direction was documented, 15 hospitalizations were as a result of a sideways rollover and the remaining 14 were backwards.



### 9.11 Hospitalized agricultural toxic exposure injuries in adults aged 15 to 59 by type of substance, 1990-2008

Of the 51 hospitalizations due to contact with a toxic substance, the leading cause of injury was exposure to nitrous oxide from silo gases with 16 admissions. This was followed by exposure to caustic or acidic chemicals with 9 hospitalizations, inadvertent injection of vaccines or medications with 6 hospitalizations and inhalation of carbon monoxide or smoke with 5 hospitalizations.



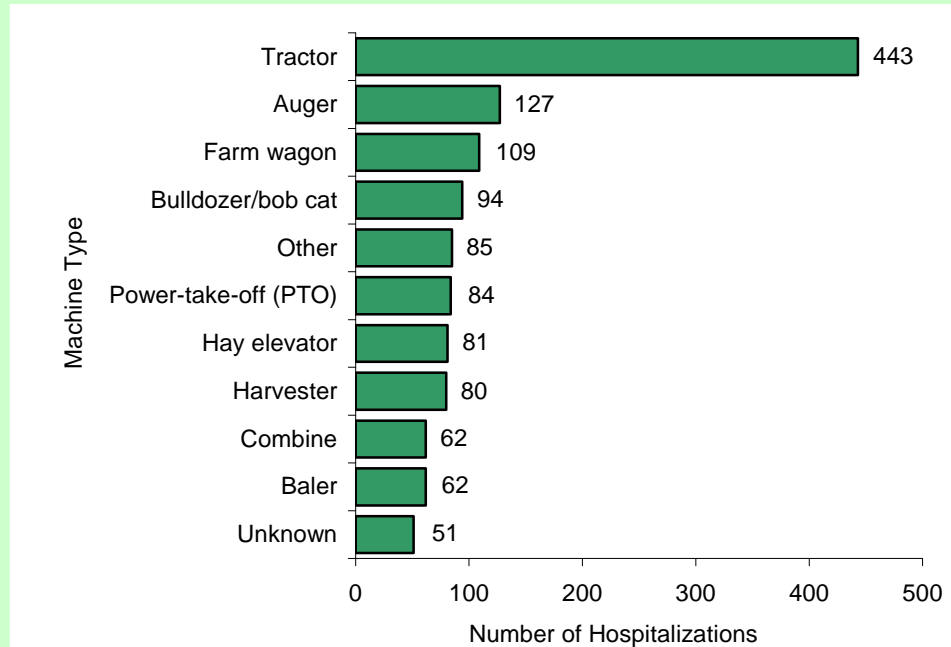
There were 6 toxic agents not illustrated above accounting for an additional 11 admissions.

Toxic substance exposure injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system

### 9.12 Hospitalized agricultural injuries in adults aged 15 to 59 by machine type, 1990-2008

Of the 1,468 machine-related hospitalizations, the machine most frequently involved in agricultural hospital admissions among younger adults were tractors (30%), although a far higher proportion of tractors were associated with fatal injuries (54%).

Augers were involved in the next highest percentage of hospitalized machine-related injuries (9%), followed by wagons/trailers with 7%.



There were 12 machines not illustrated above accounting for an additional 190 admissions.

### 9.13 Hospitalized agricultural injuries in adults aged 15 to 59 by location, 1990-2008

Of the 2,805 hospitalizations, 1,773 had documentation of the location of the injury. Of those with the location documented, injuries in the barn accounted for 31%, woodlot/orchard accounted for 23%, field accounted for 17%, and farm yard another 13%.



\*These locations include adjacent ditches.

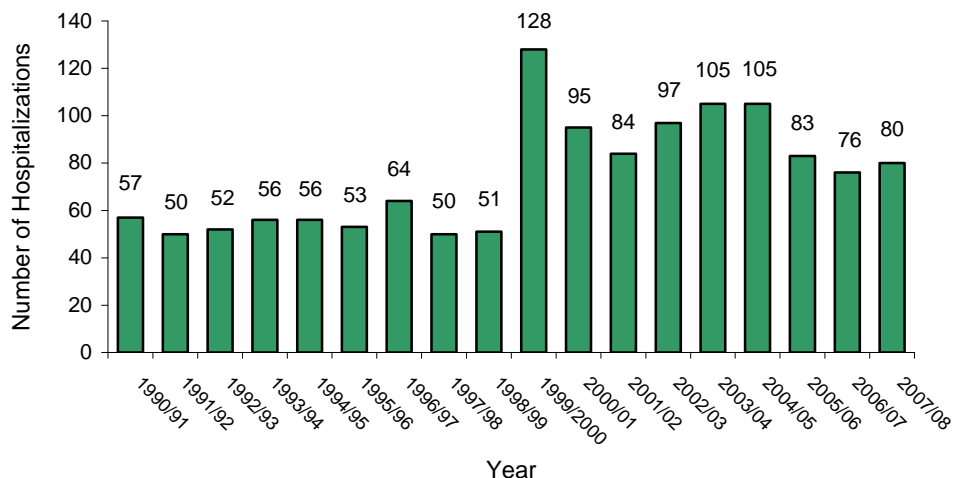
There were 7 locations not illustrated above accounting for an additional 135 admissions. There were 1,032 records in which the location was unknown.

## 10 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: ADULTS AGED 60 AND OVER

### 10.1 Hospitalized agricultural injuries in adults aged 60 and over by fiscal year, 1990-2008

From April 1, 1990 to March 31, 2008, there were 1342 hospitalized agricultural injuries were identified for Ontario adults aged 60 and over. This is an average of 75 hospitalizations per year.

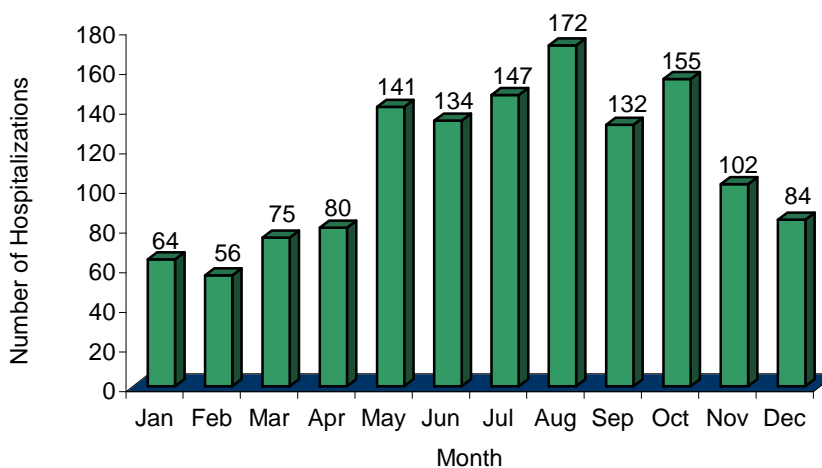
The ICD 10 CA coding system was implemented at most centres in Ontario during the 1999 to 2000 fiscal year, resulting in greater identification of non-machine-related agricultural injuries.



### 10.2 Hospitalized agricultural injuries in adults aged 60 and over by month 1990-2008

66% of all agricultural hospitalizations in adults aged 60 and over occurred from May to October (881 hospitalizations).

August was the peak month, with 13% of all hospitalizations. Over 11% of the injuries occurred in each of the months of May, July and October.

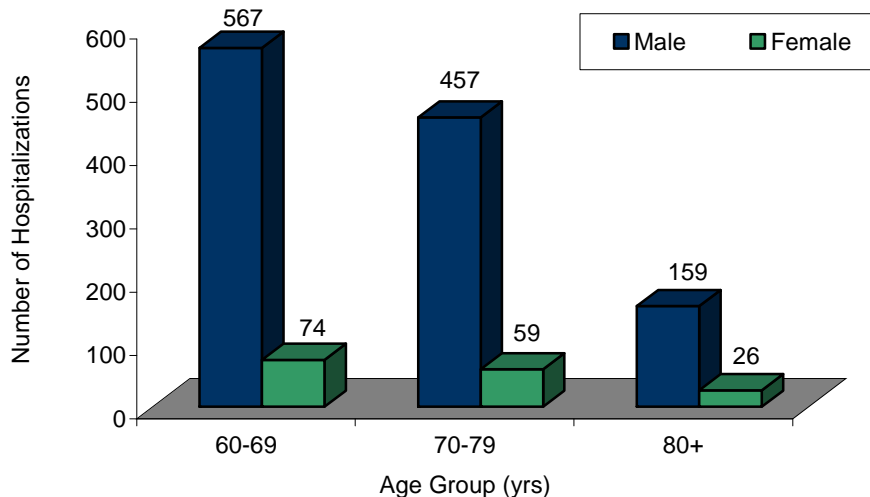




### 10.3 Hospitalized agricultural injuries in adults aged 60 and over by age group and gender, 1990-2008

88% of the older adults who sustained hospitalized agricultural injuries were male (1183 hospitalizations). The ratio of males to females was highest for the 60 to 69 age group and 70 to 79 age group (7.7:1).

Those 80 years of age and older had the highest hospitalization admission rate with 363.1 hospitalizations per 100,000 farm population (section 7.4).

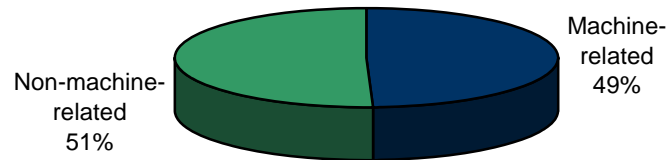


Sex	60-69 yrs	70-79 yrs	80+ yrs	Total	%
Male	567	457	159	1183	88
Female	74	59	26	159	12
Total	641	516	185	1342	100
Percent	48	38	14	100	

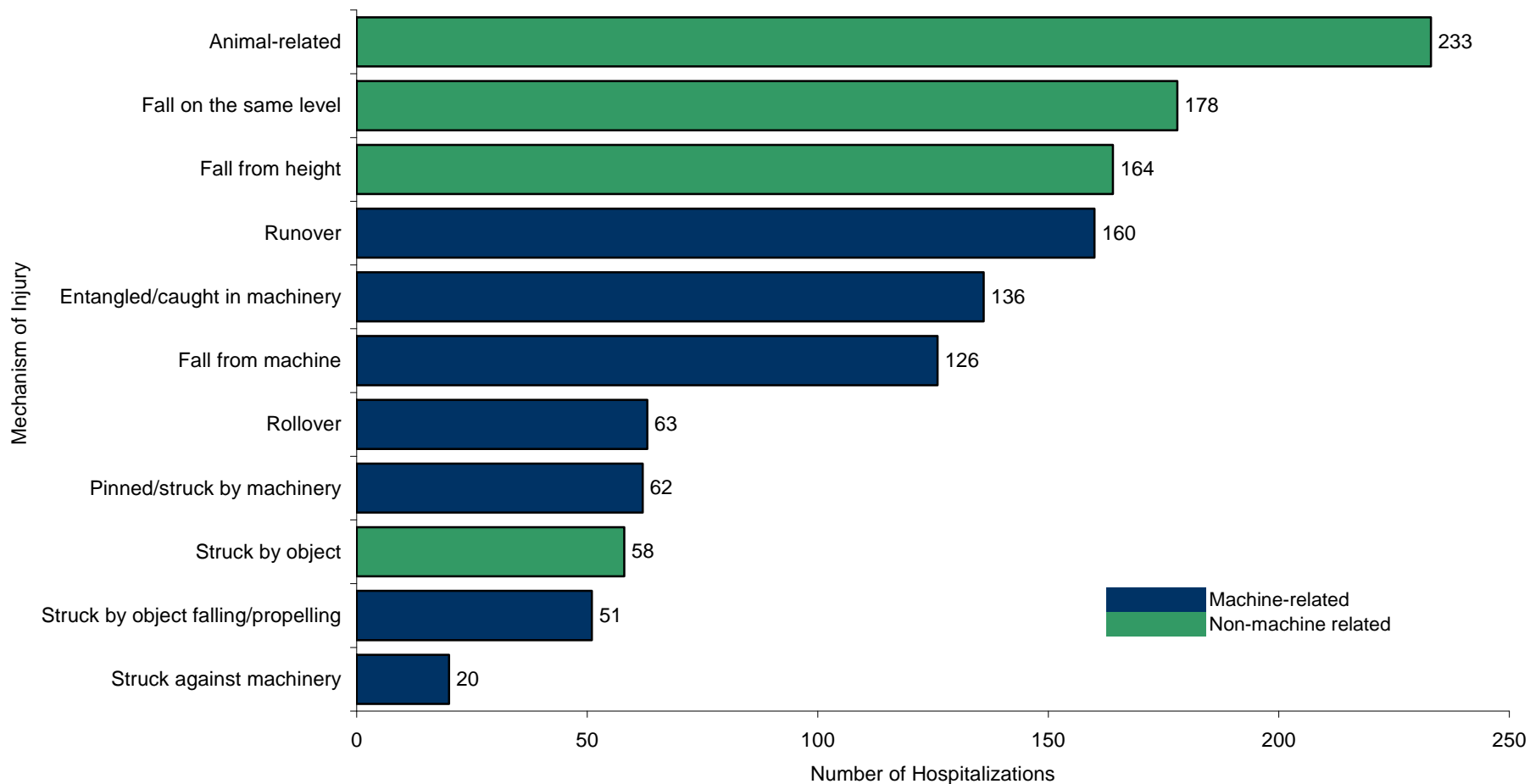
## 10.4 Hospitalized agricultural injuries in adults aged 60 and over by major cause, 1990-2008

Of the 1,342 hospitalizations, 663 of hospitalized injuries in older adults were machine-related, whereas 76% of fatalities were machine-related. The predominant machine-related mechanisms of hospitalized injury were machine runovers and machine entanglements.

Of the 679 non-machine-related hospitalizations the leading causes of injury included animal-related events and falls.



## 10.5 Hospitalized agricultural injuries in adults aged 60 and over by cause of injury, 1990-2008



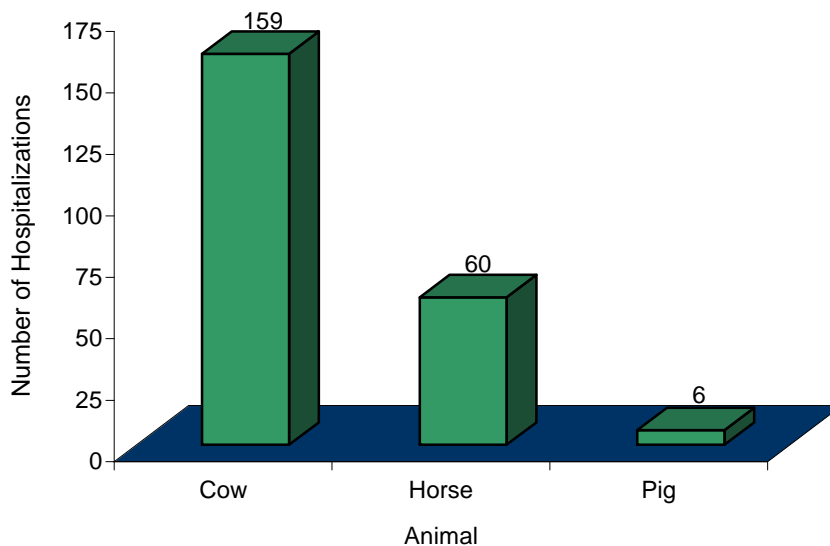
In adults aged 60 and over, the 3 leading causes of injury hospitalization were non-machine-related. The leading causes of agricultural hospitalizations in older adults were animal-related events (17%), followed by falls on the same level (13%), and falls from height (12%). Runovers accounted for 12% and entanglement in machinery accounted for 10%.

There were 16 mechanisms of injury not illustrated above accounting for an additional 91 hospitalizations.

Non-machine-related injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

## 10.6 Animal-related hospitalized agricultural injuries in adults aged 60 and over by type of animal, 1990-2008

Of the 233 animal-related hospitalizations, 68% involved cows/bulls/calves another 26% were due to horses/stallions/colts and 3% were caused by pigs.

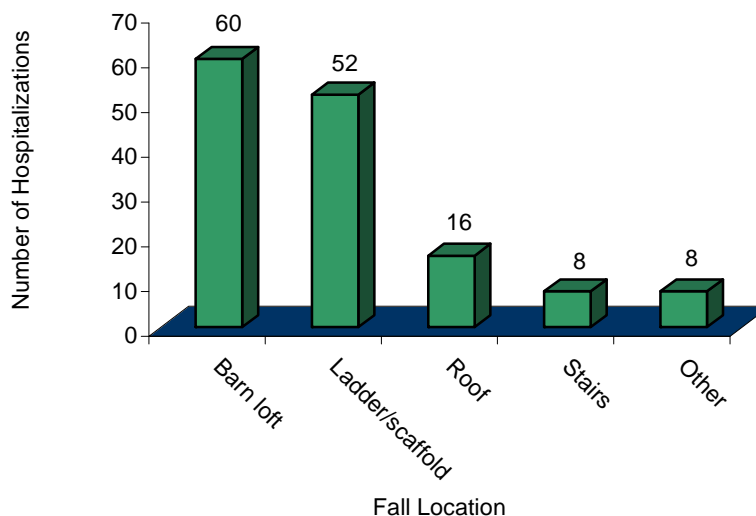


Animal-related injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

There were 6 other animals not illustrated above accounting for an additional 8 admissions.

## 10.7 Hospitalized agricultural non-machine falls from height in adults aged 60 and over by fall location, 1990-2008

Of the 164 fall from height hospitalizations, 37% were from a barn loft/rafters. Another 32% were from a ladder/scaffold, and 10% were from a roof.

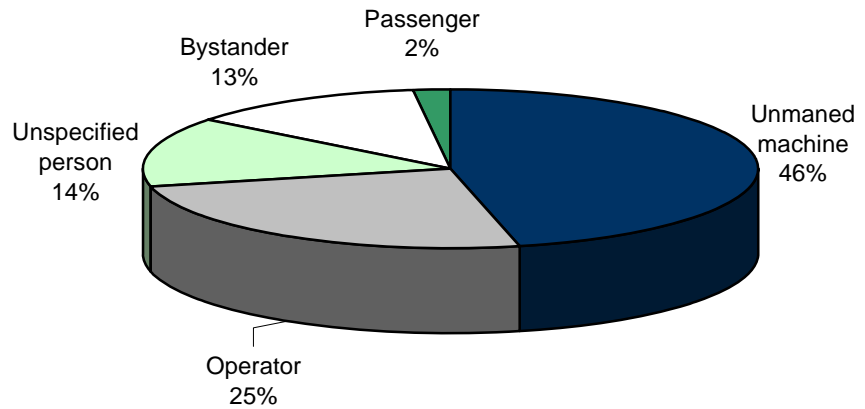


There were 5 locations not illustrated above accounting for an additional 20 admissions.

Non-machine-related falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

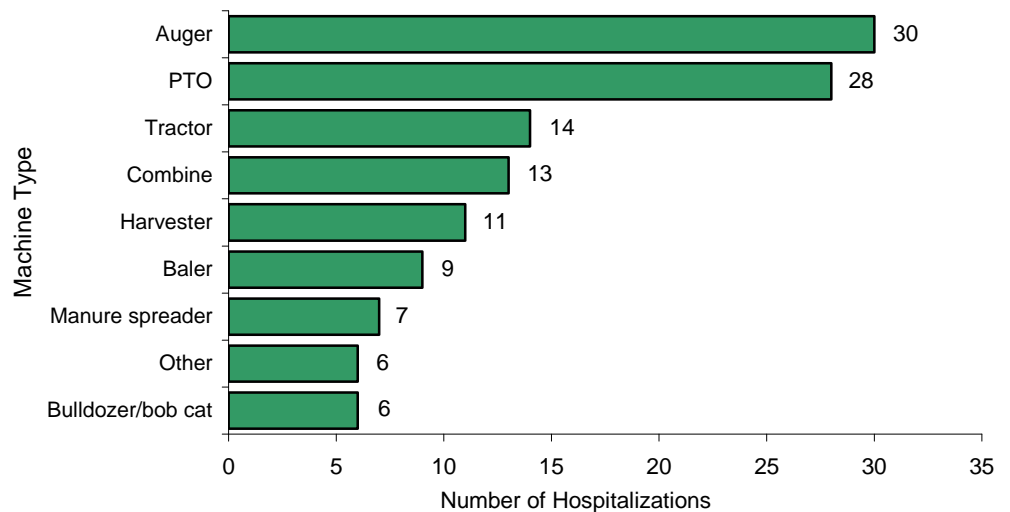
### 10.8 Hospitalized agricultural runovers in adults aged 60 and over, by runover type, 1990-2008

Of the 160 runovers, most hospitalized runovers (74) involved unmanned machines which had been bypass started, left running, or left unblocked on a slope. Operator runovers subsequent to falls from machines were the next most frequent runover mechanism with 40 hospitalizations, followed by 23 hospitalizations where the person's position was unspecified, bystander runovers with 20 hospitalizations. Passenger/extra rider runovers were not a common cause of hospitalized runover injuries among older adults with 3 admissions.



### 10.8 Hospitalized agricultural machine entanglement injuries in adults aged 60 and over by machine type, 1990-2008

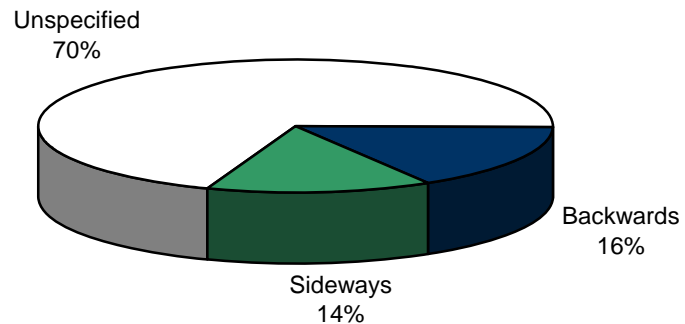
Of the 136 entanglements hospitalizations, the types of machines most frequently involved were augers with 22%, power take offs (PTO's) with 21%, tractors (10%) and combines (10%).



### 10.9 Hospitalized agricultural rollovers in adults aged 60 and over by rollover type, 1990-2008

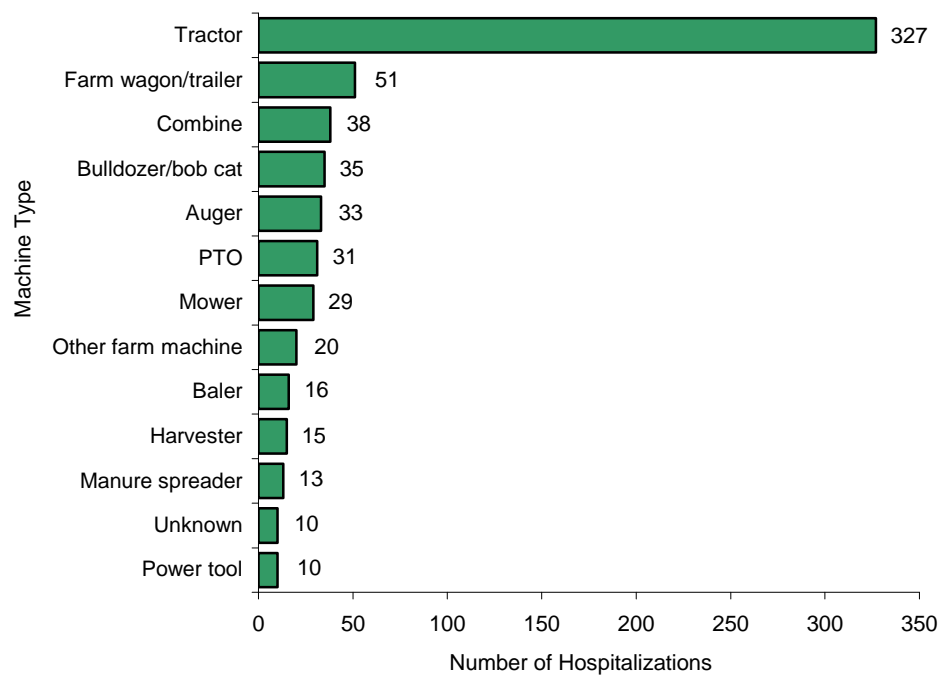
Machine rollovers ranked first as a cause of death, but seventh as a cause of hospitalized injuries.

Of the 63 rollover hospitalizations, a large proportion (70%) were unclassified because of the limited circumstances descriptions. Of the 19 rollovers with more details, 10 hospitalizations were identified as being backwards rollovers and 9 hospitalizations were sideways rollovers.



### 10.10 Hospitalized agricultural injuries in adults aged 60 and over by machine type, 1990-2008

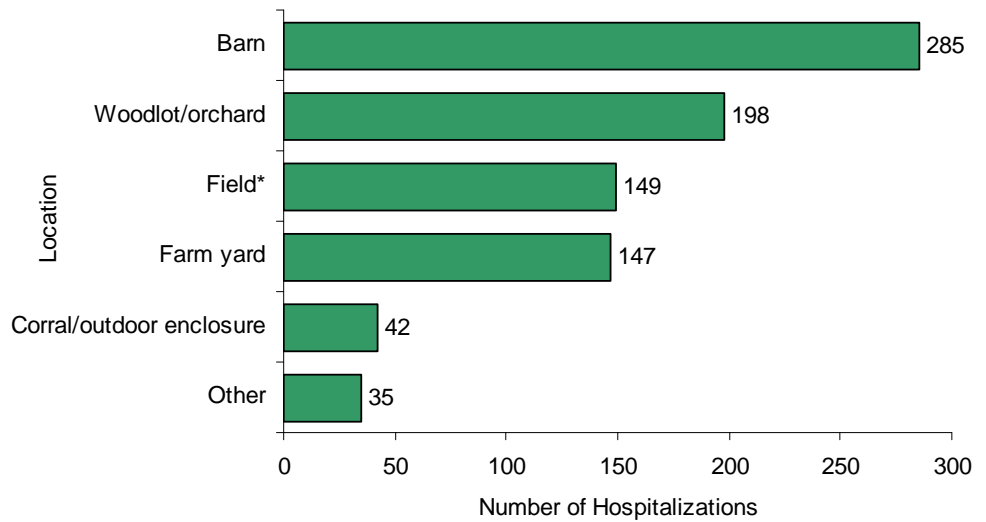
Of the 663 machine-related hospitalizations, the types of machines most frequently involved were tractors (49%), followed by wagons/trailers (8%), combines (6%), bulldozers (5%), augers (5%) and power take offs (PTOs) (5%).



There were 7 machine types not illustrated above accounting for an additional 35 admissions.

### 10.11 Hospitalized agricultural injuries in adults aged 60 and over by location, 1990-2008

Of the 1,342 hospitalizations, 911 had documentation of the location of the injury. Of those with the location documented, injuries in the barn accounted for 31%, woodlot/orchard accounted for 22%, field accounted for 16%, and farm yard another 16%.



\*These locations include adjacent ditches.  
There were 7 locations not illustrated above accounting for an additional 55 admissions.  
There were 431 records in which the location was unknown.

# ***Appendices***



## ***Appendix A: Decision Rules***

### **Inclusion of deaths and injuries in the CAIR databases**

#### **Alcohol Involvement**

Fatal or hospitalized injuries where the victim was under the influence of alcohol were included in the databases if they involved agricultural work or an agricultural hazard.

#### **Deaths on Highways**

Fatal or hospitalized injuries on public highways that involved agricultural vehicles, agricultural machinery, farm workers or farm animals were included in the databases.

#### **Off-Road Vehicles**

Fatal or hospitalized injuries involving off-road vehicles such as ATVs, dirt bikes and dune buggies were included in the databases if they occurred on a farm or ranch and/or were involved agricultural work.

#### **Children at Play**

Fatal or hospitalized injuries in children who were playing in the agricultural workplace were included e.g., cases where a person engaged in agricultural work was unable to supervise a child whom he/she had taken to the agricultural workplace; cases where a child was killed or injured as a direct result of someone engaged in an agricultural work activity cases where a child was killed or injured due to a hazard of the farm or ranch environment such as a farm animal, dugout, manure pit, off-road vehicle etc.

#### **Assault and Deliberate Self-Injury**

Cases of assault and deliberate self-injury were excluded from the databases.

#### **Medical Conditions**

Deaths attributed to pre-existing medical conditions (e.g., previous seizure or heart attack) were excluded from the fatality database. Deaths where an agricultural injury (such as a fall from a machine) was immediately preceded by a significant medical event such as a stroke, seizure or heart attack, were also excluded. Deaths from a heart attack where the victim was engaged in strenuous agricultural work at the time of or immediately before the heart attack are included in the fatality database as "overexertion".

#### **Secondary Complications**

Deaths that occurred in hospital from secondary complications of agricultural injuries (e.g., embolism, respiratory distress) were included in the fatality database.

## ***Appendix B: Glossary and Definitions***

### ***Agricultural fatalities***

CAIR defines an agricultural fatality as 1) Any unintentional injury resulting in death that occurs during activities related to the operation of a farm or ranch in Canada and/or 2) Any unintentional injury resulting in death that involves any hazard of a farm or ranch environment in Canada (excluding fatal non-work-related injuries that take place in the farm residence). This includes deaths that occur away from agricultural work locations if agricultural work is being done e.g., transporting livestock, supplies or harvested crops on public highways. It also includes collisions with farm animals on public highways. Deaths where victims are killed because a third party is engaged in agricultural work are also included.

### ***Denominator data***

Data used as denominator values in rate calculations. If presented as a fraction, the lower half of an injury rate refers to the population exposed over a given period of time.

### ***Farm***

In the Census of Agriculture, Statistics Canada defined a farm as “any farm, ranch or other agricultural holding that produces at least one of the following agricultural products intended for sale: crops, livestock, poultry, animal products, greenhouse or nursery products, mushrooms, sod, honey, or maple syrup products.” (Canada Census of Agriculture, 1996, Statistics Canada).

### ***Hospitalized agricultural injuries:***

#### ***Machine-related agricultural injury (ICD 9)***

Agricultural machine-related injuries include cases admitted to an Ontario hospital, where the ICD 9 external cause of injury code on the hospital discharge record was E919.0, ‘Injuries caused by agricultural machinery’. Cases with the location of injury ‘farm’ (ICD 9 CM place of occurrence code = E849.1 or ICD 9 CA 5th digit sub-classification “place of occurrence” code =1) are also included if the incident involved a machine or a motorized vehicle.

#### ***Non-machine-related agricultural injury (ICD 9)***

Non-machine-related agricultural injuries include cases admitted to Ontario hospitals, where the injury occurred on a farm (ICD 9 CM place of occurrence code = E849.1 or ICD 9 CA 5th digit sub-classification “place of occurrence” code =1), as long as the injury did not involve a machine or vehicle.

#### ***Machine-related agricultural injury (ICD 10)***

Agricultural machine-related injuries include cases admitted to an Ontario hospital, where the ICD 10 CA external cause of injury on the hospital discharge record was W30 ‘Contact with agricultural machinery’ or V84X ‘Transport accident – special vehicle mainly used in agriculture’. Cases coded with the location of injury ‘farm’ (ICD 10 CA place of occurrence code U98.7) are also included if the incident involved a machine or a motorized vehicle.

#### ***Non-machine-related agricultural injury (ICD 10)***

Non-machine-related agricultural injuries include cases admitted to Ontario hospitals, where the injury occurred on a farm (ICD 10 CA place of occurrence code = U98.7), as long as the injury did not involve a machine or vehicle.

### ***Numerator data***

Data used as numerator values in rate calculations. If presented as a fraction, the top half of an injury rate refers to the number of cases (events) for a particular mechanism of injury and/or age group.

## **Runover types:**

### ***Bystander runover***

A bystander is runover, pinned or struck by a manned machine, or by a machine or implement towed by it; this includes being runover while attempting to board a moving manned machine.

### ***Extra rider runover***

A passenger falls from a machine and is then runover, pinned or struck by the machine, or by a machine or implement towed by it.

### ***Operator runover***

An operator falls from a machine and is then runover, pinned or struck by the machine, or by a machine or implement towed by it.

### ***Unmanned runover***

A person is runover, pinned or struck by an unmanned machine, or by a machine or implement towed by it; this includes being runover while attempting to board a moving unmanned machine.

## **Study population**

All persons who live, work on, or visit an Ontario farm or ranch (as defined above), as well as all persons who are injured in other locations (such as public highways) as a result of agricultural activity.

## **Surveillance**

The ongoing systematic collection, analysis, interpretation and dissemination of health data.

## ***Unintentional Injury.***

Unintentional injuries consist of that subset of injuries for which there is no evidence of predetermined intent.

To further identify the activities or circumstances surrounding the leading causes of the fatalities, additional analysis was done based on the documentation in the circumstances text field of the abstract.

## **Activity prior to rollover**

- Included transportation of goods/livestock
- towing
- field work
- forestry
- working in the farm yard
- recreation, moving
- road maintenance
- extra rider
- unknown

## **Cause of Rollover**

- Travelling too close to the edge
- travelling on an incline, cornering
- falling from a ramp
- carrying a heavy lead in a buck
- dragging logs/implements
- pulling stumps/trees
- towing
- collision with an object
- rough terrain
- tractor arms/bucket caught on ground
- pulling heavy machine/trailer
- unknown

**Activity prior to entanglement**

- Maintenance/repairs/cleaning of equipment
- checking on machine or contents
- removing blockage from machinery
- retrieving an item (not blocked)
- fall into machine
- stepping/reaching over entanglement hazard
- starting machine
- bystander
- other activity near entanglement hazard,
- unknown.

**Objects involved from injuries as a result of being pinned or struck by a machine or non-machine**

- bale (large round)
- bale other
- tree, branch, log
- collapsing building or structure
- other heavy non-machine object example: gate or door
- heavy machine (not under power)
- truck box
- bucket
- Front end lower arms
- Other heavy machine component
- Knife or blade
- Baling or barbed wire
- Tool or part of tool (includes power tools)
- Hook, tow rope or chain
- Hitch or tongue
- Jacks or hydraulic lifts
- Other non-machine object
- Unknown
- Other machine-related object

## Appendix C: CAIR's Agricultural Fatality Data Abstraction Form



### CAIR FATAL FARM INJURIES – DATA ABSTRACTION FORM

Coroner's File #: \_\_\_\_\_ - \_\_\_\_\_  
 year no.

CAIR ID: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_  
 prov. year no.

**An Agricultural Fatality is:** 1) Any unintentional injury resulting in death that occurred during activities related to the operation of a farm or ranch and/or 2) Any unintentional injury resulting in death that involved any hazard of a farm or ranch environment in Canada (excluding fatal non work-related injuries that took place in the farm residence). This includes deaths that occurred away from agricultural work locations if agricultural work was being done; e.g., transporting livestock, supplies, workers or harvested crops on public highways. Deaths where victims were killed because a third party was engaged in agricultural work are also included.

Age: \_\_\_\_\_ Birth Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ Birth date missing (circle)? Yes No  
 mm dd yyyy

Gender (circle): M F Province: \_\_\_\_\_ County/Regional Municipality: \_\_\_\_\_

Region: \_\_\_\_\_ Date of Injury: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ Weekday of Injury (circle): S M T W T F S  
 mm dd yyyy

Time of Injury \_\_\_\_\_ (24:00) Date of Death: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
 mm dd yyyy

Source of data for case identification (circle all that apply):

- |                 |                     |         |
|-----------------|---------------------|---------|
| 1 Coroner       | 2 Medical Examiner  | 3 Media |
| 4 RCMP / police | 5 Registrar General | 6 Other |

#### A. DESCRIPTION OF INJURY EVENT

Please include as many details as possible about the decedent's activity, task and location at the time of the incident. For falls and drownings, please describe exact location. For struck or pinned by object injuries, please specify object or machine component. For entanglements, please state whether clothing was involved. For tractor rollovers, please indicate whether the tractor had ROPS. For machine injuries, please describe the machine in as much detail as possible.

If the injury was not machinery or vehicle related, complete Section B and then proceed to Section E.

If the injury was machinery or vehicle related, begin with Section C and continue.

<p><b>B. CAUSE OF INJURY NOT MACHINERY OR VEHICLE RELATED</b></p> <p>1 crushed or struck by animal. Specify animal: _____</p> <p>2 other type of animal injury. Specify animal: _____</p> <p>3 fall from animal. Specify animal: _____</p> <p>4 struck by non-machine object</p> <p>5 struck against non-machine object</p> <p>6 caught inside, under or between non-machine objects</p> <p>If 4 or 6, specify object: _____</p> <p>7 fall from height. Give specific fall location: _____</p> <p>8 fall on same level</p> <p>9 jumped to lower level</p> <p>10 overexertion</p> <p>11 drowning</p> <p>12 exposure to fire/explosion</p> <p>13 contact with temperature extremes</p> <p>14 contact with electric current</p> <p>16 contact with radiation, caustic, toxic or noxious substance by (circle): inhalation ingestion absorption injection</p> <p>Specify agent: _____</p> <p>18 asphyxiation by grain or soil. Specify: _____</p> <p>19 firearm</p> <p>77 other non machine related. Specify: _____</p> <p>88 unknown non machine related</p> <p>99 not applicable</p>	<p><b>C. CAUSE OF INJURY MACHINERY OR VEHICLE RELATED</b></p> <p>1 sideways rollover</p> <p>2 backwards rollover</p> <p>3 unspecified rollover</p> <p>4 entangled/caught in machinery</p> <p>5 pinned or struck by machine component or collapsing machine (specify) _____</p> <p>6 traffic collision on road or highway</p> <p>7 operator fell from moving machine, not runover, pinned, or struck by it</p> <p>8 operator fell from moving machine, then runover, pinned, or struck by it</p> <p>9 passenger fell from moving machine, not runover, pinned, or struck by it</p> <p>10 passenger fell from moving machine, then runover, pinned, or struck by it</p> <p>11 alighted operator/other person runover, pinned, or struck by unmanned machine</p> <p>12 alighted passenger runover, pinned, or struck by moving machine</p> <p>13 bystander runover, pinned, or struck by moving machine</p> <p>14 machine-related contact with electrical current</p> <p>15 machine related fire, explosion or burn</p> <p>16 machine collision off-road</p> <p>17 machine-related drowning</p> <p>18 struck by object falling or propelled from machine (specify) _____</p> <p>20 runover, pinned, or struck by moving machine - unspecified</p> <p>77 other machine related. Specify: _____</p> <p>88 unknown machine related</p> <p>99 not applicable</p> <p>If 5 or 18, specify object/component: _____</p>	<p><b>D. TYPE OF MACHINERY</b></p> <p>(Circle appropriate number if the injury event was machinery or vehicle related)</p> <p>1 tractor</p> <p>2 auger. Specify whether freestanding, attached to machine, or unknown (circle)</p> <p>3 mower</p> <p>4 power take off, specify machine PTO attached to: _____</p> <p>5 baler</p> <p>6 farm wagon/trailer</p> <p>7 combine</p> <p>8 power tool (not chainsaw)</p> <p>9 chainsaw</p> <p>10 welder</p> <p>11 harvester</p> <p>12 plough/disk</p> <p>13 hay elevator</p> <p>14 manure spreader</p> <p>15 bulldozer, bob cat, skid steer</p> <p>16 motor vehicle. Specify: _____</p> <p>17 off-road vehicle. Specify: _____</p> <p>19 fencing equipment</p> <p>20 spraying equipment</p> <p>22 garden equipment</p> <p>24 planting equipment</p> <p>25 swather</p> <p>26 rock picker</p> <p>27 snow blower</p> <p>28 airplane</p> <p>77 other farm implement/machine. Specify: _____</p> <p>88 unknown</p> <p>99 not applicable</p>
<p><b>E. IMMEDIATE LOCATION OF INJURY</b></p> <p>1 Field (includes dry ditches next to field)</p> <p>2 Barn</p> <p>3 Silo/grain bin, (circle)</p> <p>4 Shed</p> <p>5 Farmyard</p> <p>6 Road/highway (includes dry ditches)</p> <p>7 Driveway (includes dry ditches)</p> <p>8 Farm house</p> <p>9 Farm road (includes dry ditches)</p> <p>10 Woods, orchard</p> <p>11 Water source; includes water-filled ditch, dugout, manure lagoon, sewage pit, etc. Specify: _____</p> <p>12 Corral/outdoor animal enclosure</p> <p>13..Other unspecified ditch/embankment/dyke</p> <p>14 Trench</p> <p>77 Other location. Specify: _____</p> <p>88 Unknown</p> <p><b>F. LOCATION OF DEATH</b></p> <p>1 Found dead</p> <p>2 Died <i>en route</i></p> <p>3 Died in hospital</p> <p>77 Other location of death. Specify: _____</p> <p>88 Unknown</p>	<p><b>G. RELATIONSHIP OF INJURED PERSON TO FARM OWNER/OPERATOR</b></p> <p>1 Operator</p> <p>2 Spouse of farm operator</p> <p>3 Child of farm operator</p> <p>4 Other relative of farm operator. Specify: _____</p> <p>5 Hired worker</p> <p>6 Spouse of hired worker</p> <p>7 Child of hired worker</p> <p>8 Other relative of hired worker. Specify: _____</p> <p>9 Other non-visiting child</p> <p>10 Other non-visiting adult</p> <p>11 Adult visitor or contractor</p> <p>12 Child visitor</p> <p>77 Other relationship. Specify: _____</p> <p>88 Unknown</p>	<p><b>H. METHOD OF DISCOVERY</b></p> <p>Who found the deceased? (i.e. relationship to deceased) _____</p> <p>Was the injury event witnessed? (circle) Y N (Indicate if the information is not available)</p> <p><b>I. NATURE OF INJURY BY BODY PART</b> e.g., NI1 crush injury, BP1 chest. (List from most to least serious injury, where the most serious injury was the cause of death.)</p> <p><b>Nature of injury 1:</b> _____</p> <p><b>Body part 1:</b> _____</p> <p><b>Nature of injury 2:</b> _____</p> <p><b>Body part 2:</b> _____</p> <p><b>Nature of injury 3:</b> _____</p> <p><b>Body part 3:</b> _____</p>

**J. REVIEW FOR CONSENSUS?** (Circle) Yes No If yes, please explain the points needing consensus of opinion.

**CAIR HOSPITALIZED FARM INJURIES – DATA ABSTRACTION FORM**

**ID: XX-XX-XXXX**

Prov yr number

**Instructions:**

The <respective provincial agency> has provided us with the hospital separation record for the following patient treated in your hospital for an agricultural injury. Please confirm the information below and provide us with the additional information requested on the back of this form. Thank you for your help.

**Hospital Information**

Chart number:

Year:

Institution code:

**Patient Information**

Date of birth:

Sex:

**Services**

Date of admission:

Date of discharge:

Length of stay:

Admission category:

Ambulance required:

**Injury Information**

Main diagnostic code:

Other diagnostic codes:

External cause of injury code:

**Is the above information correct? (circle number)**

1 YES

2 NO Please comment on any corrections:

**Was this patient transferred from another hospital? (circle number)**

1 YES Please tell us which hospital: \_\_\_\_\_

2 NO

**Was this a readmission for a previous injury? (circle number)**

1 YES If yes, date of original admission: \_\_\_\_/\_\_\_\_/\_\_\_\_ (dd/mm/yyyy)

2 NO

**If this was not a farm-related injury, please describe with as much detail as possible what type of injury this was:**

\_\_\_\_\_

**1. Please describe in detail the circumstances of the injury event, including its location, and what the injured person was doing at the time of the injury:**

\_\_\_\_\_

\_\_\_\_\_

**2. Did the injury event involve a machine or vehicle?**

No complete section 1.

Yes complete section 2, parts A and B.

SECTION 1 – NON-MACHINE	SECTION 2 – MACHINE/VEHICLE RELATED	
Cause of injury	Part A Cause of injury	Part B Machine type
<b>Animal-related</b> Specify animal: _____ 1 crushed or struck by animal 2 other type of animal injury 3 fall from animal  <b>Struck/caught by non-machine object(s)</b> Specify object: _____ 4 struck by object 5 struck against object 6 caught inside/under/between objects  <b>Fall/Jump</b> Specify fall from where: _____ 7 fall from height 8 fall on same level 9 jumped to lower level  10 <b>Overexertion</b>  11 <b>Near drowning</b> Specify where: _____  12 <b>Exposure to fire</b> 13 <b>Exposure to temperature Extremes</b> 14 <b>Exposure to electric current</b> 16 <b>Exposure to toxic substances or allergens</b> Specify substance: _____ Contact by: (circle) inhalation ingestion absorption injection 19 <b>firearm-related injury</b> 77 <b>other non-machine cause, specify:</b> _____  88 <b>Unknown, not machine related</b> 99 <b>Does not apply (machine-related)</b>	<b>Machine/vehicle rollover</b> 1 sideways rollover 2 backwards rollover 3 unspecified rollover 4 <b>Entangled in machine</b> <b>Struck by, against or pinned by</b> Specify: _____ 5 pinned or struck by machine component or collapsing machine 18 struck by object propelled or falling from machine 23 struck against machine/machine component 6 <b>Traffic collision (farm road or highway)</b> 14 <b>Off-road collision with an object, building or machine</b> <b>Fall from moving machine, not run over, pinned, or struck</b> 7 operator 9 passenger <b>Fall from machine, unspecified</b> 15 unspecified whether the machine was moving and/or whether the victim was the operator. (Assume age 10 or less are extra riders). <b>Fall from moving machine, then run over, pinned, or struck</b> 8 operator 10 passenger 16 person unspecified over age 10 <b>Run over, pinned, or struck by moving machine (no fall involved)</b> 11 alighted operator 12 alighted passenger 13 bystander 17 person unspecified 20 <b>Fall from stationary machine</b> 21 <b>Machine-related overexertion</b> 22 <b>Jumped from machine</b> 24 <b>Machine-related electrocution</b> 25 <b>Machine-related fire/explosion</b> 77 <b>Other machine cause, specify:</b> _____  88 <b>Unknown machine-related</b> 99 <b>Does not apply (no machine)</b>	1 Tractor 2 Auger Specify whether freestanding, attached to machine or unknown 3 Mower 4 Power take off. Specify machine PTO attached to: _____  5 Baler 6 Farm wagon/trailer 7 Combine 8 Power tool (except chainsaw) 9 Chainsaw 10 Welder 11 Harvester 12 Plough/disk 13 Hay elevators/conveyors 14 Manure spreader 15 Bulldozer, bobcat, skid steer, FEL 16 Motor vehicle, Specify type: _____  17 Off-road vehicle, Specify type: _____  19 Fencing equipment 20 Spraying equipment 21 Lawn mower 22 Garden equipment 24 Planting equipment 25 Swather 77 Other type, specify: _____  88 Unknown machine 99 Does not apply (no machine)

**Location**

1 Field (includes dry ditches)	8 Farm house
2 Barn	9 Farm road (includes dry ditches)
3 Silo/grain bin	10 Woodlot, orchard
4 Shed	11 Water source (any kind), manure lagoon, sewage pit etc. (specify)
5 Farm yard	12 Corral/outdoor animal enclosure
6 Road/highway (includes dry ditches)	77 Other (specify)
7 Driveway (includes dry ditches)	88 Unknown

**REVIEW FOR CONSENSUS?** (circle) Yes No If yes, please explain points needing consensus of opinion.



## Appendix D: Denominator Data

### Ontario Farm Populations by Age Group and Year Including Temporary Foreign Workers

Age Group	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1-4	16593	16012	15427	14844	14263	13680	13095	12512	11929	11346
5-9	21601	20922	20239	19558	18877	18196	17515	16834	16153	15472
10-14	25680	24930	24180	23432	22680	21930	21180	20430	19680	18930
15-19	23348	22865	22372	21899	21415	20937	20465	19987	19514	19036
20-29	33492	31860	30103	28881	27704	26397	25055	23943	23336	22699
30-39	44374	42445	40756	39227	37873	36399	34965	33751	32467	31283
40-49	41181	40480	39794	39148	38797	38101	37775	37524	36893	36177
50-59	31950	31495	31095	30685	30365	29980	29705	29440	29010	28580
60-69	24376	23769	23157	22555	21943	21336	20724	20132	19521	18903
70-79	9891	9834	9769	9708	9647	9586	9525	9464	9403	9346
>80	2058	2105	2152	2199	2248	2293	2340	2387	2434	2481
blank	0	0	0	0	0	0	0	0	0	0
Total	274,544	266,717	259,044	252,136	245,812	238,835	232,344	226,404	220,340	214,253

Age Group	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
1-4	10763	10180	9834	9488	9142	8796	8450	8104	7758	222216
5-9	14791	14110	13516	12922	12328	11734	11140	10546	9952	296406
10-14	18180	17430	16943	16454	15963	15474	14985	14496	14007	366984
15-19	18563	18075	17970	17850	17745	17635	17525	17415	17315	371931
20-29	22067	21245	21221	21352	21423	21624	21785	22046	22212	468445
30-39	29864	28570	27109	25558	24147	22911	21410	20089	18813	592011
40-49	35871	35690	35600	35635	35740	35895	35940	36185	36145	708571
50-59	28180	27840	28361	28927	29518	30044	30630	31241	31827	568873
60-69	18307	17700	18089	18503	18907	19331	19720	20134	20558	387665
70-79	9287	9222	9383	9540	9695	9852	10009	10167	10326	183654
>80	2528	2575	2759	2942	3124	3307	3490	3673	3856	50951
blank	0	0	0	0	0	0	0	0	0	0
Total	208,401	202,637	200,785	199,171	197,732	196,603	195,084	194,096	192,769	4,217,707

Denominators for these rate calculations are taken from the 1996, 2001 and 2006 Canada Census of Agriculture and extrapolated for the years in which the census was not performed. In addition to the Canada Census of Agriculture population, temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada were including.

Note: Statistics Canada randomly rounds category totals up or down by a factor of five.

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## Appendix E: CAIR Collaborators as of August, 2011

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