Agricultural Fatalities and Hospitalizations in Ontario 1990-2004

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This report from *The Canadian Agricultural Injury Surveillance Program* describes the occurrence of fatal and hospitalized agricultural injuries in Ontario from 1990 to 2004.

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Acknowledgements

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The Canadian Agricultural Safety Association

CASA (formerly called the Canadian Coalition for Agricultural Safety and Rural Health) was established in 1993 by a coalition of agencies from across Canada. These agencies joined together to address problems of illness, injury, and accidental death in farmers and ranchers and their families, agricultural workers and other issues related to rural health. For more information, please visit www.casa-acsa.ca

Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada (AAFC) is pleased to participate in the production of this publication. AAFC is committed to working with our partners in the agricultural industry to increase public awareness of the importance of the agriculture and agri-food industry to Canada. Opinions expressed in this document are those of CAISP and not necessarily the Department's.

The Farm Safety Association

The Farm Safety Association (FSA) is a not-for-profit corporation established in 1973. It is a "designated entity" under the Workplace Safety and Insurance Act (WSIA). As the Ontario agricultural industry's primary source of occupational health and safety education and awareness, FSA's vision is the elimination of all workplace injuries and illnesses in the province's agricultural industrial sector. FSA supports industry and government in developing standards, procedures and regulations to improve health and safety. FSA's goals are to help its companies build productive and effective workplace relationships so that the Internal Responsibility System in their workplace operates to its highest potential, and to act as a resource through its services and products which will enable member workplaces to improve their safety performance.

Participants

Project Directors	Rob Brison MD, MPH, FRCPC Kathy Belton MEd
Report Writer	Catherine Isaacs MSc
Data Manager and Editor	Catherine Isaacs MSc

Contact Information

Canadian Agricultural Injury Surveillance Program
Department of Emergency Medicine
Kingston General Hospital
76 Stuart Street
Kingston, Ontario K7L 2V7
Tel. (613) 548-3232
Fax (613) 548-1381
E-mail: caisp@kgh.kari.net

Foreword and Executive Summary

Agricultural Fatalities and Hospitalizations in Ontario For 1990-2004 includes an analysis of fifteen years of Canadian Agricultural Surveillance Program (CAISP) 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 CAISP 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, CAISP is able to monitor the effectiveness of prevention programs and to quickly identify patterns of injury arising from new equipment and new farming techniques. CAISP data show that agricultural injuries are not random or isolated "accidents". There are many recurrent patterns of injury.

Agricultural Fatalities

In the fifteen years from 1990-2004, 453 people were killed in agricultural injury events in Ontario. 92.5% of those fatally injured were male. The percentage of males killed was highest for adults aged sixty-five and over (80.8%) and lowest for children under age five (73.7%). From 1990 to 2004, Ontario's average agricultural fatality rate was 13.7 per 100,000 agricultural population, per year (including non-workers). Fatality rates were highest for adults aged fifty and over and extraordinarily high for adults aged 80 and over. Children under age five had an extremely high age specific fatality rate (19.4/100,000/year). The fatality rate was even higher if only male children were considered (29.3/100,000/year). Fatality rates were lowest for adults of normal working age.

Agricultural machines were involved in 72.8% of all fatal agricultural injury events in Ontario. Over half of all fatalities were due to three 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 (24.5%), machine runovers (21.9%), machine entanglements (8.6%), animal-related incidents (5.7%), and being struck by a non-machine object or being pinned/struck by a machine (both 5.5%).

The most common causes of fatalities varied greatly among age groups. For children aged sixteen and under, machine runovers were the predominant cause of fatal injuries (45.7%), followed by drownings (14.3%), machine rollovers (11.4%), being struck by a non-machine object (7.1%), and being entangled or pinned/struck by a machine (both 5.7%). In children, three mechanisms of injury (machine runovers, drownings and machine rollovers) were associated with two thirds of all deaths. Runovers and drownings were most common among very young children. Older children and teenagers were more frequently killed in machine rollovers and runovers. In adults aged 16 to 64, the top five causes of death were machine rollovers (25.2%), machine runovers (11.0%), machine entanglements (10.2%), being struck by a non-machine object (6.3%), and animal-related events or toxic substance exposure (both 4.7%). In adults aged 65 and over, 60.4% of the deaths were due to only two mechanisms of injury, machine runovers and machine rollovers, each causing an equal number of deaths. The next most frequent mechanisms of fatal injury in older adults were being struck by an animal (10.1%) and being entangled in a machine (7.0%).

The most frequent types of machine runovers and rollovers also varied among age groups. Overall, operator runovers were most common (30.3%), followed by unmanned machine runovers (29.3%), bystander runovers (26.3%), and extra rider runovers (14.1%). Most adults aged 16 to 64, were runover by unmanned machines (39.3%). In 35.7% of the runovers for that age group, the victim was struck by a machine he/she had just fallen from. Bystander (14.3%) and extra rider runovers (10.7%) were the least frequent fatal runover mechanisms in younger adults. In contrast, 59.4% of all runover deaths in children were due to bystander runovers. Another 28.1% of child victims fell from a machine where they had been an extra rider and were then runover by it. In 12.5% of the cases, children were runover by machines that they had been operating themselves. In adults aged 65 and over, most runovers involved unmanned machines (46.2%). The next most frequent runover mechanisms in older farmers were operator runovers (41.0%), bystander runovers (7.7%) and extra rider runovers (5.1%). This

pattern was similar to that seen in younger adults, but older adults were involved in higher proportions of both operator and unmanned runovers. The most frequent types of machine rollovers also differed between younger and older adults. In adults aged 16 to 64, 67.2% of the machine rollovers were sideways in direction and 23.4% were backwards. In adults aged 65 and over, 56.4% of the rollovers were sideways and 38.5% were backwards. Most backwards rollovers occurred in woodlots.

Hospitalized Agricultural Injuries

In the fourteen fiscal years from April 1, 1990 to March 31, 2004, 3,682 people were admitted to hospital for at least one day as a result of agricultural injuries in Ontario. The average length of hospital stay was 6.8 days and the longest stay was 366 days. 83.8% of those admitted to hospital were male. This was 8.7% less than the percentage of males who died from agricultural injuries. As was the case for fatal injuries, the percentage of males who were hospitalized was highest for adults aged sixty-five and over (88.8%) and lowest for children under age sixteen (75.2%).

Agricultural machines were involved in 54.4% of all hospitalized agricultural injury events in Ontario. The percentage of machine-related injuries was 18.4% lower for hospitalizations than for fatalities. Unlike the pattern seen for fatal injuries, adults aged 16 to 64 had the highest percentage of machine-related hospitalized injuries (55.2%), whereas adults aged 65 and over had the lowest percentage of injuries involving agricultural machines (52.5%).

Over all age groups, the top five causes of hospitalized agricultural injuries in Ontario were machine entanglements (18.5%), animal-related events and falls from height (both 13.8%), machine runovers (10.8%), being pinned or struck by a machine (6.1%), and falls on the same level (5.8%). Machine rollovers were the leading cause of fatal injuries, and ranked eighth as a cause of hospitalized injuries. Conversely, falls from height ranked eighth as a cause of fatalities, but second as a cause of hospitalized injuries. Falls on the same level were an important mechanism for hospitalized injuries, but did not result in any fatal injuries. Machine entanglements and machine runovers were among the top three causes of both fatal and hospitalized injuries.

The most common types of agricultural injury events resulting in hospitalization differed among age groups. For children aged sixteen and under, machine entanglements and falls from height were the most frequent cause of hospitalized injuries (both 19.6%). The predominance of machine entanglement injuries among children and young teenagers is of special concern, because children under sixteen should not be exposed to any machinery that poses an entanglement hazard (North American Guidelines for Children's Agricultural tasks). These machine entanglements often result in permanently disabling amputations. Machine runovers were also an important reason for hospitalization in children and youth (15.5%), followed by animal-related events (12.0%), being struck by a non-machine object (5.9%), and falls from moving machines (4.3%). Two of the top five causes of fatal injuries in children, machine rollovers and drownings, were not leading causes of hospitalized injuries because they usually result in death. Machine runovers and machine entanglements were important causes of both fatal and hospitalized injuries in children and youth. Falls from height tied with machine entanglements as the most frequent reason for hospitalizations in children. 88% of the falls from height among children and youth originated in a barn loft. In adults aged 16 to 64, the top five causes of hospitalized injuries were machine entanglements (20.7%), animal-related events (14.2%), falls from height (13.0%), machine runovers (9.1%), and being pinned or struck by a machine (7.2%). Three of the five leading causes of hospitalized injuries were also among the leading causes of fatalities (entanglements, runovers, and animal events). In adults aged 65 and over, a fall on the same level (14.1%) was the most frequent cause of hospitalized injuries followed by animal-related events (14.0%), machine runovers (12.7%), falls from height (11.9%) and machine entanglements (10.4%). In all, 26% of all hospitalized injuries in older adults were due to falls.

Highlights: all age groups combined

	Fatalities	*Hospitalizations*
Surveillance period	1990-2004	April 1, 1990-March 31, 2004
Age range	1-93	<1-94
Average age	46.5	43.1
Number injured	453	3,682
Percentage of machine injuries	72.8	54.4
Percentage of non-machine injuries	27.2	45.6
Number/percentage of male victims	419 (92.5%)	3,082 (83.8%)
Number/percentage of female victims	34 (7.5%)	597 (16.2%)
Average length of hospital stay	-	6.8 days
Length of stay range	-	1 to 366 days
Top ten causes of injury:		
	1. Machine rollover (24.5%)	1. Machine entanglement (18.5%)
	2. Machine runover (21.9%)	2. Animal-related (13.8%)
	3. Machine entanglement (8.6%)	2. Fall from height (13.8%)
	4. Animal-related event (5.7%)	3. Machine runover (10.8%)
	5. Struck by a non-machine object (5.5%) or being pinned/struck by a machine (5.5%)	4. Pinned/struck by a machine (6.1%)
	6. Traffic collision (4.0%)	5. Fall on the same level (5.8%)
	7. Exposure to toxic substance (2.9%) or non-machine drowning (2.9%)	6. Struck by a non-machine object (5.3%)
	8. Fall from height (2.4%)	7. Struck by an object from a machine (3.6%)
	9. Struck by a machine-related object (2.2%)	8. Machine rollover (3.3%)
	10. Non-machine electrocution (1.8%)	9. Operator fell from machine (2.8%)
		10. Fall from a machine, unspecified (2.4%)

Highlights: children under 16

	Fatalities	*Hospitalizations*
Surveillance period	**1990-2004**	**April 1, 1990-March 31, 2004**
Age range	**1-15**	**<1-15**
Average age	**6.2**	**8.2**
Number injured	**70**	**560**
Percentage of all injuries for all ages	**15.5**	**15.2**
Percentage of machine injuries	**71.4**	**53.4**
Percentage of non-machine injuries	**28.6**	**46.6**
Number/percentage of male victims	**55 (78.6%)**	**421 (75.2%)**
Number/percentage of female victims	**15 (21.4%)**	**139 (24.8%)**
Average length of hospital stay	**--**	**4.7 days**
Length of stay range	**--**	**1 to 113 days**
Top five causes of injury:		
	1. Machine runover (45.7%)	**1. Machine entanglement (19.6%)**
	2. Drowning (14.3%)	**1. Fall from height (19.6%)**
	3. Machine rollover (11.4%)	**2. Machine runover (15.5%)**
	4. Struck by a non-machine object (7.1%)	**3. Animal-related event (12.0%)**
	5. Machine entanglement (5.7%) or being pinned/struck by a machine (5.7%)	**4. Struck by a non-machine object (5.9%)**
		5. Fall from a machine, not runover (4.3%)

Highlights: adults aged 16 to 64

	Fatalities	*Hospitalizations*
Surveillance period	**1990-2004**	**April 1, 1990-March 31, 2004**
Age range	**16-64**	**16-64**
Average age	**43.3**	**42.2**
Number injured	**254**	**2400**
Percentage of all injuries for all ages	**56.1**	**65.2**
Percentage of machine injuries	**69.3**	**55.2**
Percentage of non-machine injuries	**30.7**	**44.8**
Number/percentage of male victims	**241 (94.5%)**	**2021 (84.3%)**
Number/percentage of female victims	**14 (5.5%)**	**377 (15.7%)**
Average length of hospital stay	**-**	**6.5 days**
Length of stay range	**-**	**1 to 182 days**
Top five causes of injury:		
	1. Machine rollover (25.2%)	**1. Machine entanglement (20.7%)**
	2. Machine runover (11.0%)	**2. Animal-related event (14.2%)**
	3. Machine entanglement (10.2%)	**3. Fall from height (13.0%)**
	4. Struck by a non-machine object (6.3%)	**4. Machine runover (9.1%)**
	5. Animal-related event (4.7%) or exposure to toxic substance (4.7%)	**5. Pinned or struck by a machine (7.2%)**

Highlights: adults aged 65 and over

	Fatalities	*Hospitalizations*
Surveillance period	**1990-2004**	**April 1, 1990-March 31, 2004**
Age range	**65-93**	**65-94**
Average age	**74.6**	**73.6**
Number injured	**129**	**722**
Percentage of all injuries for all ages	**28.5**	**19.6**
Percentage of machine injuries	**80.6**	**52.5**
Percentage of non-machine injuries	**19.4**	**47.5**
Number/percentage of male victims	**123 (96.1%)**	**640 (88.8%)**
Number/percentage of female victims	**5 (3.9%)**	**81 (11.2%)**
Average length of hospital stay	**-**	**9.5 days**
Length of stay range	**-**	**1 to 366 days**
Top five causes of injury:		
	1. Machine rollover (30.2%) or machine runover (30.2%)	**1. Fall on same level (14.1%)**
	2. Animal-related event (10.1%)	**2. Animal-related event (14.0%)**
	3. Machine entanglement (7.0%)	**3. Machine runover (12.7%)**
	4. Fall from machine or being struck by a non-machine object (3.1%)	**4. Fall from height (11.9%)**
	5. Struck by a machine-related object (2.3%), or being pinned/struck by a machine (2.3%), or traffic collision (2.3%)	**5. Machine entanglement (10.4%)**

Age-specific recommendations

Ages 1-4:

- Preschool children should not be permitted in agricultural work sites, which includes the farm yard and driveway where most bystander runovers occur.
- Children of any age should not be taken as extra riders on tractors or other farm machines.
- Preschool children should be supervised closely and constantly by an adult whenever they are outside of the farm home, or they should be provided with a safe, fenced-in play area.
- Drowning hazards, such as manure pits, should be fenced off.
- Heavy objects such as machine parts, large tires, fence panels, gates and steel dividers should be stored securely or left lying flat on the ground.

Ages 5-9:

- Children of any age should not be taken as extra riders on tractors or other farm machines.
- Young school children should not be permitted in areas of the farm or ranch work site where machinery is kept or used.
- Barn lofts should be recognized as hazardous areas where many falls from height occur, causing serious injury or death.
- According to the North American Guidelines for Children's Agricultural tasks (NAGCAT^), 5 to 7 year old children should not be assigned work tasks.
- 8 and 9 year old children can be assigned age-appropriate work tasks, as defined by NAGCAT. Adequate training and close, continuous supervision should be provided.
- Tasks involving machinery are not appropriate for children in this age group.

^http://www.nagcat.org/nagcat/pages/default.aspx

Ages 10-15:

- Work tasks assigned to children aged 10 to 15 should be in accordance with the North American Guidelines for Children's Agricultural tasks (NAGCAT^). Adequate training and close, continuous supervision should be provided.
- According to NAGCAT, children under 12 should not operate tractors of any size, including lawn tractors.
- Tractors over 70HP should not be operated by children under 15.
- Tractors should be equipped with seatbelts and rollover protection structures.
- Children should not be permitted to ride in the cargo areas of trucks, on bumpers or on running boards.
- CSA-approved helmets should be worn when riding horses and when operating any off road vehicle.
- Off road vehicles, such as ATVs, should not be operated by children under sixteen years of age.

^http://www.nagcat.org/nagcat/pages/default.aspx

Age 16 and over:

All Rollovers

- The use of Roll Over Protection Structures (ROPS) and seatbelts by all operators would reduce the number of rollover fatalities.
- ROPs and seat belts should be retrofitted on older tractors. In Victoria Province Australia, the retrofitting of ROPs (only) on tractors was estimated to have lowered the rate of tractor rollover fatalities by 67.5% (Day and Rechnitzer 2006).
- Most farm machines are not designed to seat passengers. Extra riders should not be taken on farm machines as they are very likely to be killed or seriously injured in a rollover event.

Sideways Rollovers

- Machine operators should stay well away from ditches bordering fields and at the sides of roads.
- Operating machines on steep slopes should be avoided, if possible.
- When required to work in the vicinity of slopes or embankments, operators should use machines that are equipped with ROPs and seat belts.
- Operators should always assess their work areas to determine the slopes that may be encountered as well as the stability of their equipment.
- Operators should not corner at excessive speeds.

Backwards Rollovers

- Operators should adhere to manufacturers' recommendations concerning maximum towing capacity and appropriate hitching points. Failure to follow these recommendations may alter a tractor's centre of gravity causing it to overturn suddenly.
- A tow rope or chain should never be attached anywhere above the level of the draw pin.
- Poor terrain conditions such as thick mud, ice, and steep slopes adversely affect a tractor's normal towing capacity and could lead to a backwards rollover.
- Dragging a tree, log, or other object can lead to a backwards rollover if the object becomes caught while the tractor continues to drive forward.

Unmanned Machine Runovers

- Tractors and other farm machines should not be parked on slopes. If parking on a slope is absolutely necessary, operators should not work in the potential path of the tractor.
- If an unmanned tractor's engine must be left running, the tractor and any attached equipment should be immobilized to prevent unintentional movement.
- Before commencing repairs to a vehicle or machine, operators should ensure that the transmission is in neutral or park and that the engine is turned off. Blocking can also be used on smaller tractors/machines.
- Children should never be allowed to play in or around a vehicle or machine as they may inadvertently activate controls.
- Brakes and electrical systems on tractors, farm trucks and other vehicles should be maintained properly.
- The practice of bypass starting a tractor by short circuiting its ignition system is associated with a very high incidence of fatal unmanned machine runovers.

Fallen Operator Events

- Seat belts should be worn when operating a tractor or other farm machine.
- Tractor operators should remain seated at all times. It is a dangerous practice to stand while operating a tractor or other farm machine.

Machine Entanglements

- Operators should wear tight fitting clothing, such as overalls, whenever working with or near machinery.

- Operators should avoid wearing any items that could easily become entangled, such as long coats or scarves.
- Before operating any machine or power tool, operators should ensure that all guards are in place and in good condition.
- Maintenance should not be performed on any machine while the machine is still running. Machines should be shut off completely before any attempts are made to clear obstructions.
- Before activating a machine, operators must ensure that co-workers and bystanders are a safe distance from any moving parts.
- Operators should never step over a PTO shaft or conveyor belt.
- When assigning work to youth, follow the North American Guidelines for Children's Agricultural Tasks. These can be downloaded from: http://www.nagcat.org/nagcat/pages/default.aspx?page=nagcat_guidelines.
- Youth under 18 should not work with any machinery that poses an entanglement hazard.
- Operators should ensure that persons of any age working with augers, PTOs and other extremely hazardous machinery receives appropriate safety instructions and adequate supervision.

Pinned or Struck by Machine

- When conducting maintenance on a vehicle or machine, operators should ensure that the engine is turned off, the brakes are set and that appropriate blocking is in place which would support the vehicle, machine, or machine part in the event of a jack, hoist, pin or hydraulic failure.
- Hydraulic systems should be well maintained and bucket pins should be inspected regularly.
- If an operator must place any part of his/her body under a heavy machine component that is supported by a hydraulic system or by pins, such as a truck box, FEL arms, or a bucket attachment, appropriate blocking should always be used.
- Hydraulic failure and the failure of pins holding buckets and other large components may cause the sudden collapse or release of heavy objects. Ideally, hard hats should be worn when working with heavy machinery.
- Bystanders should stay well away from vehicles or machines that are being operated on ramps or steep inclines.
- Many hospitalized 'pinned by machine' injuries result when an operator's hand is crushed because of improper hitching procedures. Hitching should be carried out on a level surface. Adequate blocking should also be used.

Animal-Related Events

- Where possible, handlers of large animals should not work on foot inside an animal holding pen or chute system unless they are protected by secure panels or gates which would prevent them from being crushed.
- Escape routes should be planned and farmers should avoid being trapped in small areas with large animals.
- Most injuries involving bulls were sudden and unprovoked. Farmers should avoid working near an untethered bull.
- Most horse-related injuries occurred when bystanders were kicked while standing behind a horse or when riders were thrown from a horse.

Struck by Object

- Many deaths and serious head injuries could be prevented if operators wore CSA-approved helmets during woodcutting activities and when working with power tools and other machinery.
- Large bales should be transported using a bale spike. It is unsafe to carry large bales on top of FEL arms due to the danger of bale roll back injuries.

Age 65 and over:

- Older farmers tend to operate older machinery. The much higher fatal rollover rate in this age group may, in part, reflect a relatively lower availability of ROPs and seat belts due to the age of the tractors used.
- As individuals age, physiological and cognitive changes can occur that may affect their ability to perform some tasks. It is therefore important that an older farmer and his/her fellow workers assess the skills required to perform particular tasks and determine whether he/she can safely perform the tasks.
- The types of agricultural tasks attempted and the methods used to accomplish the tasks should be adjusted to fit the changing abilities and limitations of older farmers.
- Older farmers should not work alone around unpredictable large animals, especially bulls and horses.
- In situations where an older farmer must work alone, a geographic positioning system should be used to ensure that the farmer's exact location can easily be established. An effective two-way communications system should also be available.
- Communication devices should be kept securely attached to clothing.
- For farmers of any age, long hours spent operating machinery should be avoided.
- Falls are a problem for all older persons. Care should be taken when completing any tasks where dynamic balance or static strength is required. Heavy objects should not be carried when climbing ladders or working at elevated heights. Appropriate footwear should be worn to reduce the risk of slipping on uneven, icy or wet surfaces.
- More research is required to determine older farmers' levels of exposure to machine and non-machine hazards. It is not known how older farmers' work tasks differ in type and in quantity from those of younger farmers.
- Prevention programs should be targeted at older males, since older females are at relatively low risk for fatal injuries.

1 INTRODUCTION

1.1 GENERAL INTRODUCTION

The Canadian Agricultural Injury Surveillance Program (CAISP) was established in 1995 in response to the need for better information about fatal and hospitalized agricultural injuries in Canada. CAISP is a national program with collaborators in each of the ten provinces of Canada. ***Agricultural Fatalities and Hospitalizations in Ontario 1990-2004*** examines Ontario agricultural fatality data for the fifteen calendar years from 1990-2004, and Ontario hospitalized agricultural injury data for the fourteen fiscal years from April 1, 1990 to March 31, 2004. This report includes data for all persons who were part of the Ontario farm population or who were otherwise exposed to agricultural hazards in Ontario during the surveillance period. From 1990 to 2004, there were 453 agricultural fatalities in Ontario. From April 1, 1990 to March 31, 2004, a further 3,682 persons were admitted to hospital for at least one day for the treatment of agricultural injuries. This report does not include agricultural injuries treated at emergency departments or clinics.

Following this introduction, there is a description of the methods used in CAISP's surveillance program. Agricultural fatalities in Ontario are then reviewed comprehensively in an overview chapter. After the overview, important trends and patterns in agricultural fatalities are presented for children under sixteen, adults aged 16 to 64 and adults aged 65 and over. The executive summary of this report highlights its major findings and makes recommendations for injury prevention and further research.

1.2 HISTORY OF AGRICULTURAL INJURY SURVEILLANCE IN CANADA

Agricultural injuries have been recognized 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 third 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 (Pickett et al., 1999). Economic costs associated with agricultural injuries are also substantial. In the United States, when one factors in the costs of treatment, rehabilitation and losses in productivity, agricultural injuries are responsible for over $10 billion in economic losses annually (Leigh et al., 2001). Canadian estimates of economic burden are in the hundreds of millions of dollars annually (Locker et al., 2003).

Until the establishment of CAISP, 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.

1.3 THE CANADIAN AGRICULTURAL INJURY SURVEILLANCE PROGRAM

The Canadian Agricultural Injury Surveillance Program (CAISP) is a national program that is funded by the Canadian Agricultural Safety Association (CASA). CAISP is a collaborative program run by organizations from across Canada. It is coordinated from a national office at Queen's University in Kingston, Ontario. The people and organizations that contribute to CAISP include researchers, government agencies and the agricultural industry.

The main purpose of CAISP is to collect and interpret information on agricultural injuries from across Canada. During the pilot phase of CAISP, national standards were developed for this process and representatives from each of the ten provinces were recruited. The CAISP fatality and hospitalization databases include data from all ten Canadian provinces.

1.4 OBJECTIVES OF CAISP

The objectives of CAISP are:

1. **To develop a coordinated system for the assembly of national agricultural injury surveillance data**. CAISP'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 CAISP 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.caisp.ca, and press releases.

1.5 USES OF CAISP DATA

CAISP 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, CAISP 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. CAISP 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. CAISP 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.

CAISP 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.

1.6 THE CHALLENGES OF INJURY CONTROL IN AGRICULTURE

In other industries, victims of occupational injuries are usually workers aged 18 to 65. Agricultural injuries are unique in that children under 16 and adults over 65 sustain significant numbers of severe work-related injuries. This is partly because farms and ranches are not only 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 and to operate tractors and other heavy equipment 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 is also geographically diverse. This diversity adds to the difficulty in enforcement of safety standards. Also, there has traditionally been reliance upon voluntary rather than regulatory safety standards; however, 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 CAISP's data collection and analysis methods is available in CAISP's national report *Agricultural Injuries in Canada for 1990-2000*. 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 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 CAISP's fatality data are 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 RCMP or OPP 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 fatality: *1) Any unintentional injury resulting in death that occurs during activities related to the operation of a farm or ranch in Ontario and/or 2) Any unintentional injury resulting in death that involves any hazard of a farm or ranch environment in Ontario (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; farm animals roaming on public highways. Deaths where victims are killed because a third party is engaged in agricultural work are also included.*

Other inclusion/exclusion criteria are provided in Appendix A.

2.2 Hospitalized Agricultural Injuries

2.2.1 CAISP's Selection Criteria for Hospitalized Agricultural Injuries in Ontario

In Ontario, a new version of the International Classification of Diseases, 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 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), as long as the injury did not involve a machine or vehicle.*

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, Table 1).

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

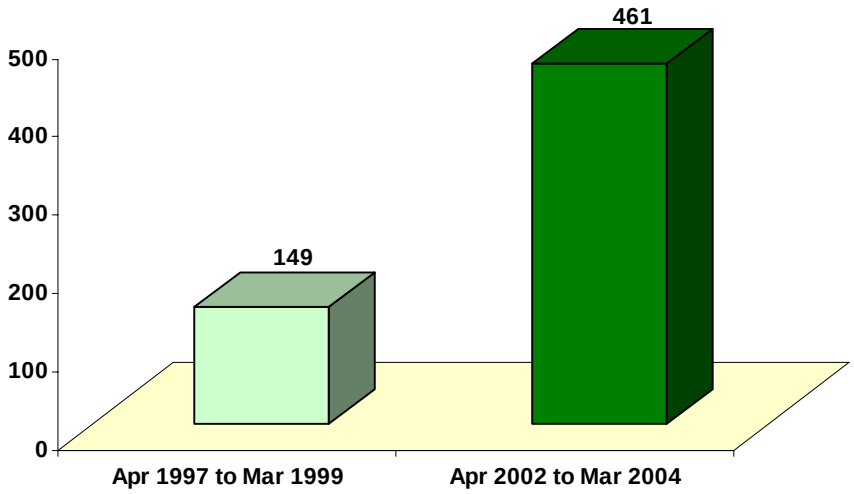
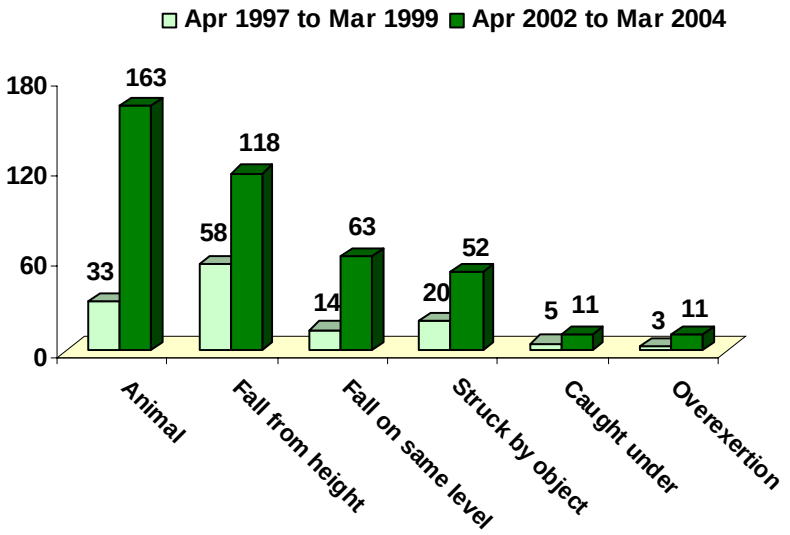


Figure 2. The number of non-machine agricultural injuries identified in Ontario under ICD 9 compared with ICD 10 CA, by injury mechanism.



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 CAISP collaborators through an agreement with the Ontario Ministry of Health. Agricultural machinery-related injuries are identified using a systematic computer search of the hospital separation database. Cases are considered for inclusion if they meet CAISP'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 his/her 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.

2.2.4 Issues and Challenges

For hospitalized injuries, the enhanced data abstraction is completed by many 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.

2.2.5 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 CAISP on a fiscal year basis.

2.2.6 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 CAISP 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 CAISP 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 CAISP 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 co-directors.

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

1. CAISP provincial collaborators assigned the task of producing special technical reports.
2. CAISP collaborators who have permission from the entire CAISP group to conduct special analyses for the purpose of producing scientific reports for submission to peer-reviewed journals.
3. The national program coordinator and program co-directors for the purpose of maintaining the database and producing periodic comprehensive reports for Ontario and for Canada.
4. 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 in Ontario; 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.

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.

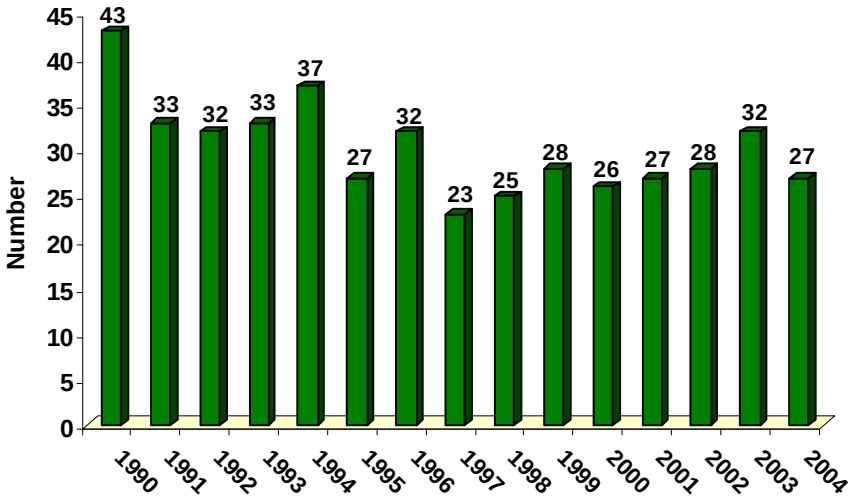
Selected rates of fatal agricultural injuries are presented in this report. The numerators used in calculating these rates are the numbers of fatal or hospitalized agricultural injuries for particular age categories. These include injuries to farm residents, hired agricultural workers, contractors, persons traveling on public highways and a small number of visitors to farms. Denominators for these rates are taken from the Ontario farm population data in the1996 Canada Census of Agriculture. The 1996 census data were used in the denominators for rate calculations because they were collected roughly halfway through the surveillance period. Possible contributors to any observed trends may therefore include a reduction in the number of farms and a reduction in the farm population with time. The number of operating farms in Ontario has declined over the 1990s.

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 whom 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.

3 AGRICULTURAL FATALITIES IN ONTARIO 1990-2004: OVERVIEW

3.1 Fatal agricultural injuries by calendar year, 1990-2004

From 1990 to 2004, there were 453 agricultural fatalities in Ontario. (An average of about 30 deaths per year). The peak year for fatalities was 1990, with 43 cases (9.5% of the total number of cases). During the first seven years of the surveillance period, there were six years with a higher than average number of cases, whereas in the last seven years of the surveillance period there was only one year with a higher than average number of cases (2003).

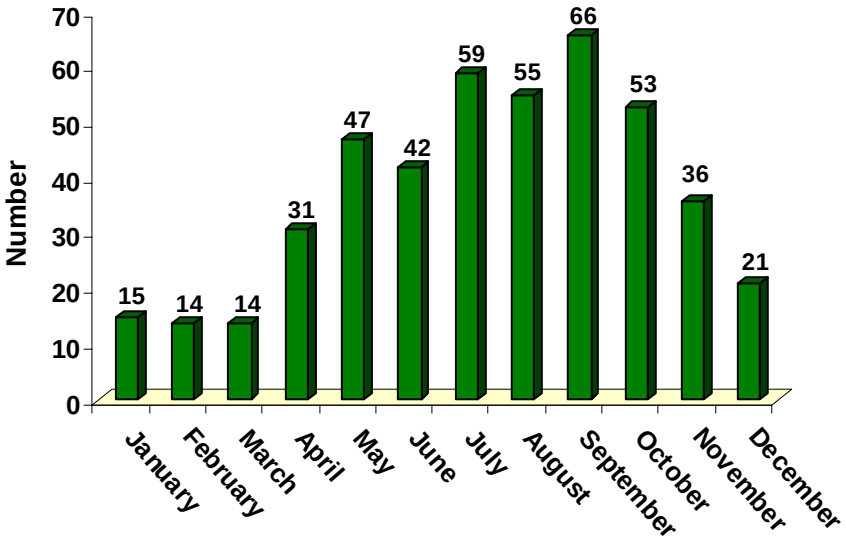


3.2 Fatal agricultural injuries by month,1990-2004

71.1% of all agricultural fatalities in Ontario occurred from May to October.

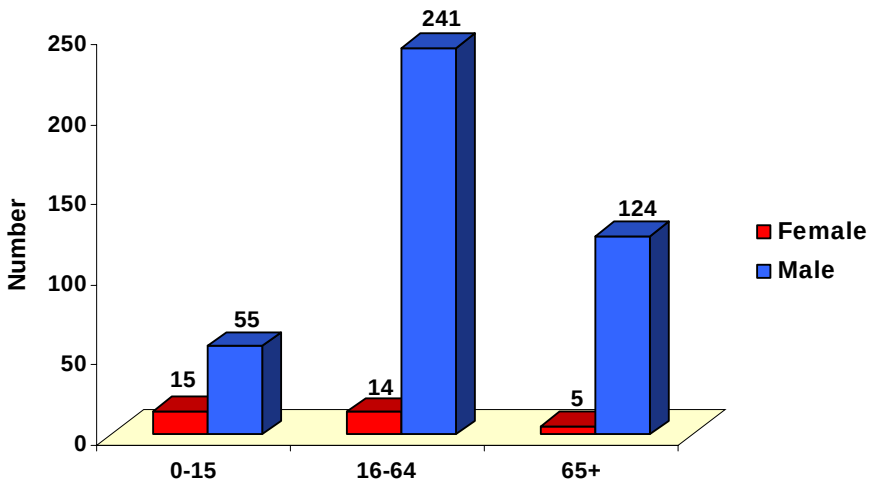
The highest proportion of fatalities took place in September (14.6%). 13.0% of the deaths were in the month of July and 12.1% in the month of August.

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



3.3 Fatal agricultural injuries by age group and gender

92.5% of the persons killed in agricultural injury events were male. The ratio of males to females was highest for the 65+ age group (24.6:1), and lowest for the 0-15 year age group (3.7:1).

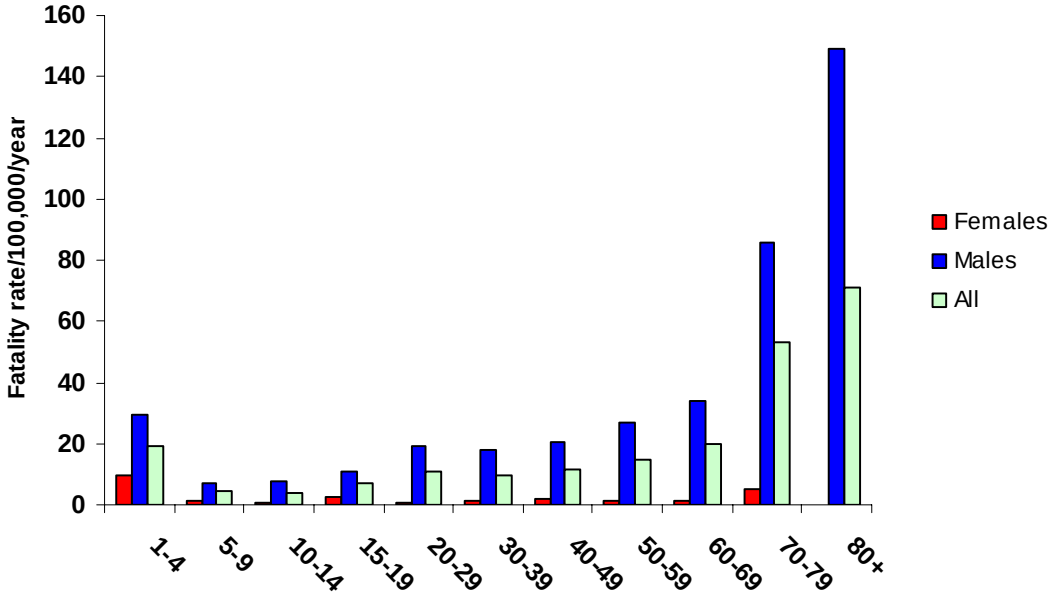


The majority of those fatally injured were in the 16 to 64 age group. Larger numbers of children and older adults were killed than would have been expected given their representation in the farm population.

Fatalities by age group and gender

Age group	0-15	16-64	65+	
Males	55	241	123	**419**
Females	15	14	5	**34**
Total	**70**	**255**	**128**	**453**
Percent	**15.4**	**56.3**	**28.3**	

3.4 Agricultural fatality rates by gender and age group



For both genders combined as well as males only, fatal agricultural injuries were most frequent for children aged 0-4 and for adults aged 50 and over. Children aged 0-4 and adults in the older age groups (50-80+) were over-represented as victims of fatal agricultural injury events relative to their proportion of the farm population. This was especially true for older adults. The percentage of adults aged 80+ who were killed was five times the percentage of adults that age in the Ontario farm population. Considering males only, the percentage of adults 80+ who were killed during agricultural work was six times the percentage of male adults that age in the farm population. In females, the pattern was slightly different, children under five, adults aged 15 to 19, and adults aged 70 to 79, were all over-represented as victims of fatal agricultural injury events relative to their proportion of the female farm population. This was especially true for young girls. The percentage of young girls killed was 4.6 times the percentage of girls under five in the farm population. The higher death rate among female teenagers was due to horse-related injuries.

In males, fatality rates showed a marked bimodal distribution with age. There was a very high fatality rate for boys under five (29.3/100,000/year), and extraordinarily high rates for males aged 50 and over. Within every age group, the fatality rates for females were lower than for males, however the rate for girls under age five was higher than the rates for boys aged five to fourteen.

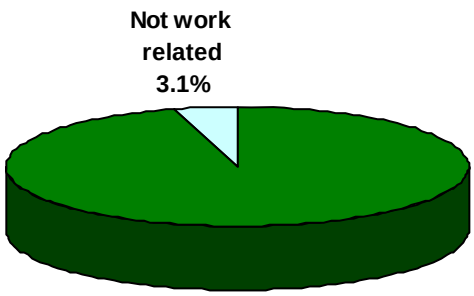
The high rates of deaths among very young children are likely due to their easy and often unsupervised access to very dangerous work areas where many bystander runovers occur. They are also heavily exposed to hazards of the farm environment such as manure pits, water sources and improperly secured heavy objects. Taking children as extra riders on machinery also results in many deaths.

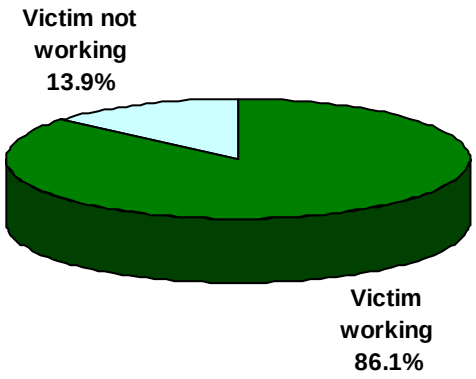
The extraordinarily high rates of death among elderly males reflect their active participation in difficult and dangerous machine-related farm work well into their eighties, in spite of increasing physical limitations. The incidence of unmanned machine runovers, operator runovers and machine rollovers is extremely high in this age group.

3.5 Fatal agricultural injuries: the relationship to agricultural work

96.9% of the agricultural fatalities in Ontario were work related. The few deaths that were not work related (3.1%) were due to hazards of the farm environment.

Most adults who died were engaged in agricultural work, whereas the majority of children who were killed in work-related injury events were not working themselves. Overall, only 86.1% of those killed in agricultural injury events were actually engaged in agricultural work.

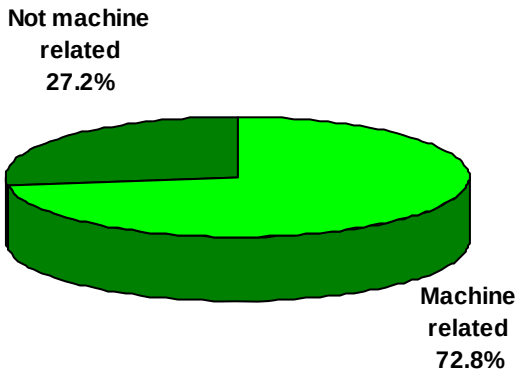




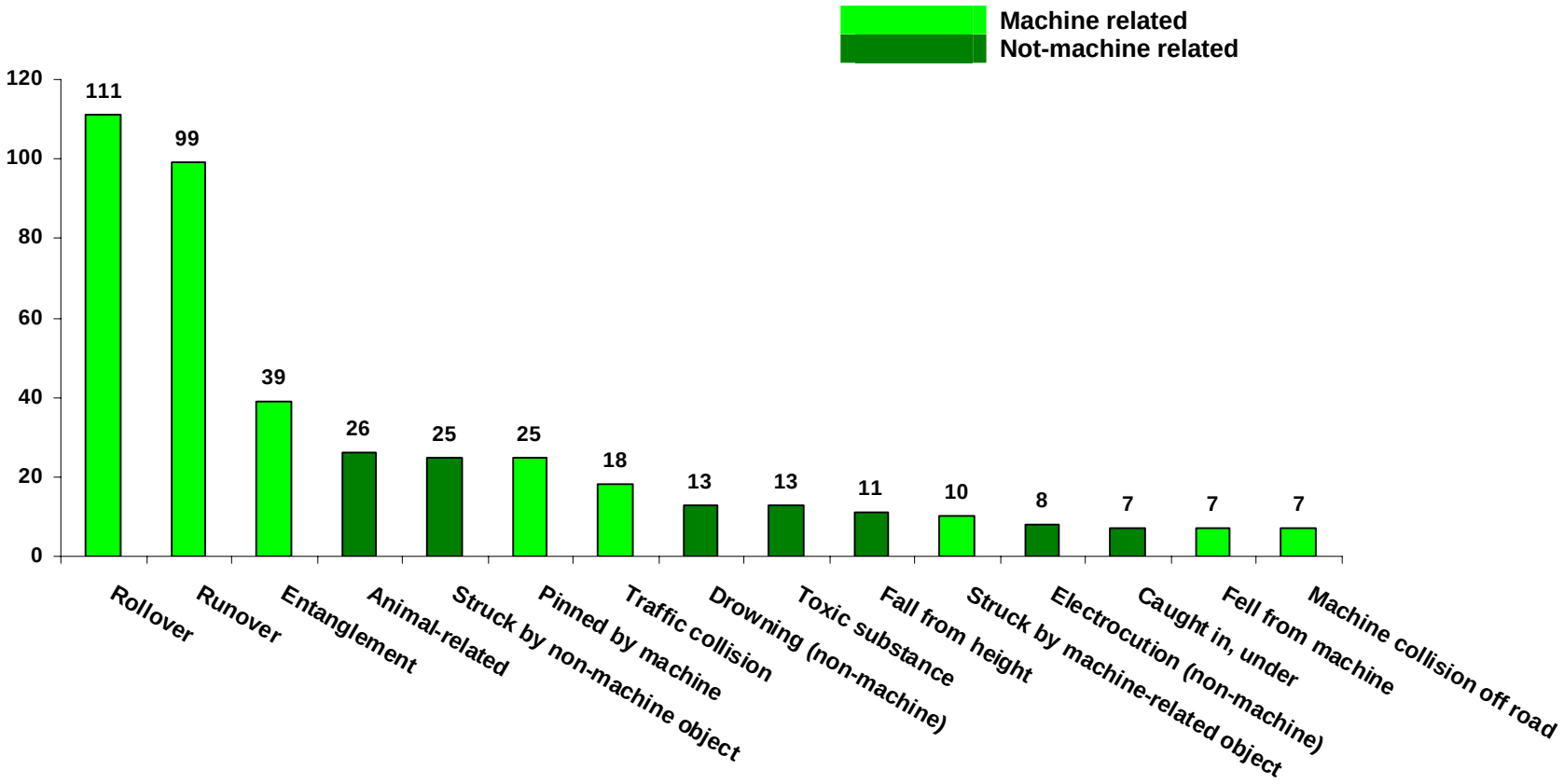
3.6 Fatal agricultural injuries by major cause

72.8% of agricultural fatalities were machine related. The leading machine-related mechanisms of injury were machine rollovers, machine runovers and machine entanglements.

The agricultural fatalities that were not machine related (27.2%) included drownings (mainly in children), falls from height, struck by and caught under object events, animal-related incidents and exposure to toxic substances.



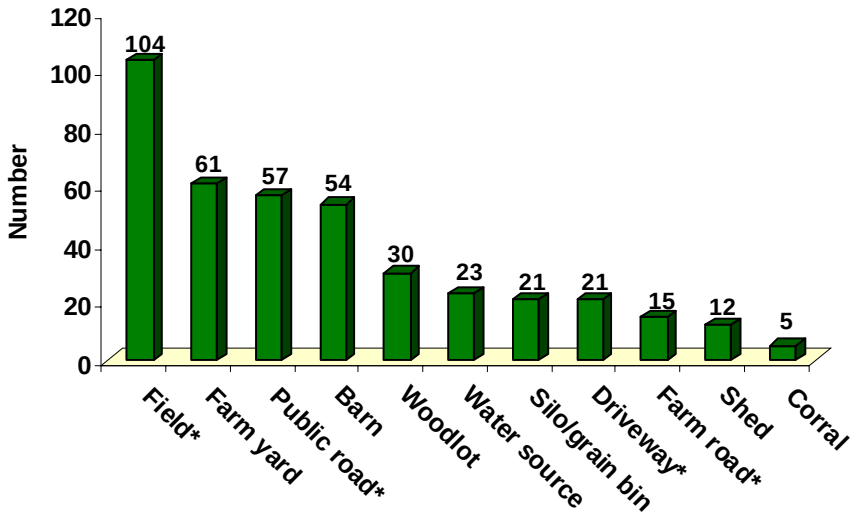
3.7 Fatal agricultural injuries by cause of injury



Over half of all agricultural fatalities in Ontario (55%) were due to three 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 (24.5%), machine runovers (21.9%), machine entanglements (8.6%), animal-related events (5.7%), and being struck by a non-machine object or being pinned/struck by a machine (both 5.5%). Other causes of agricultural fatalities not included in the above figure were five cases of 'electrocution (machine)', five cases of 'asphyxiation in grain or soil', four cases each of 'fire/explosion non-machine', 'fire/explosion (machine)', and 'firearm (accidental)', as well as five 'other non-machine' cases and seven 'other machine-related' cases.

3.8 Fatal agricultural injuries by location of injury

The most common locations of injury for agricultural fatalities in Ontario were fields and their adjacent ditches (23.0%), farm yards (13.5%), public roads and their adjacent ditches (12.6%), and barns (11.9%).

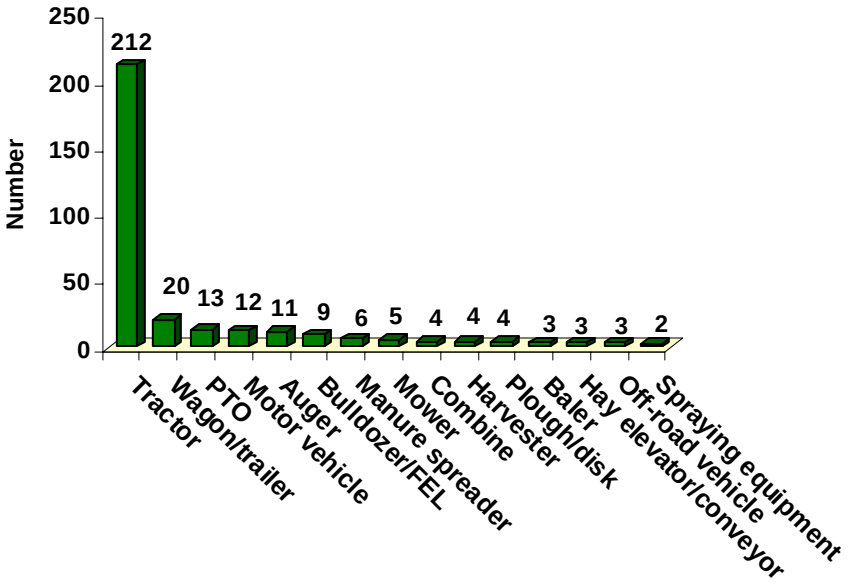


Location was not known in 50 cases.
*These locations include adjacent dry ditches.

3.9 Fatal machine-related agricultural injuries by machine type

The machine types most frequently involved in Ontario agricultural fatalities were tractors (64.2%), followed by wagons and trailers (6.1%), power take offs (3.9%), motor vehicles (3.6%) and augers (3.3%).

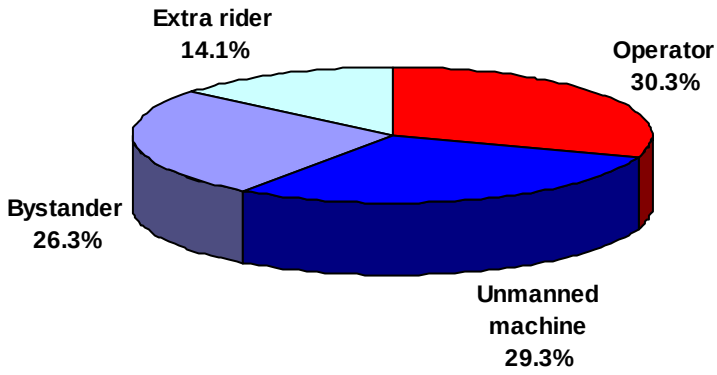
Tractors were associated with 46.8% of all agricultural deaths in Ontario.



There were 20 other machine types.

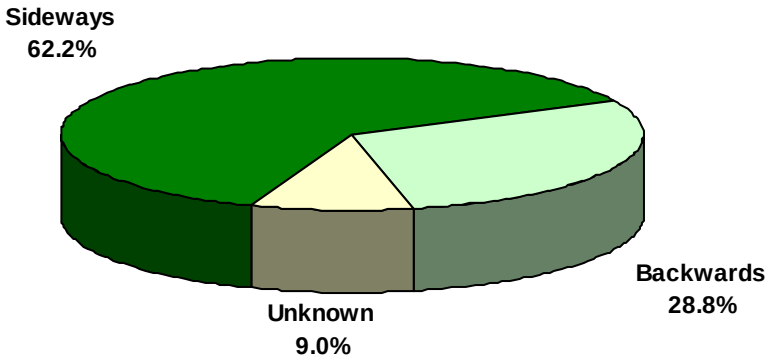
3.10 Fatal agricultural runovers by Runover type

Overall, operator runovers were the most common fatal runover type (30.3%). In an operator runover, the victim is struck subsequent to a fall from the machine he/she had been operating. Unmanned machine runovers (29.3%) were the next most frequent type of fatal runover. In this type of injury event, the victim is runover by a vehicle he/she had bypass started, left running, or left unblocked on a slope. Bystander runovers (26.3%) and extra rider runovers (14.1%) were the fatal runover types most commonly seen in children.



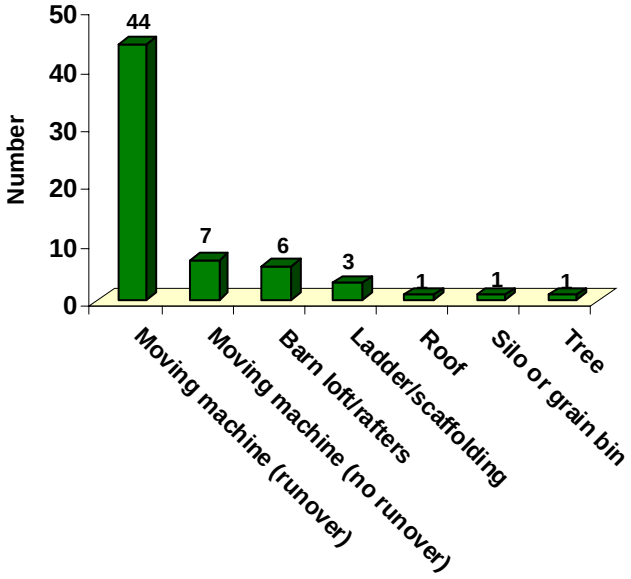
3.11 Fatal agricultural rollovers by Rollover type

Overall, 62.2% of the machine rollovers in Ontario were sideways in direction and 28.8% were backwards. In 9.0% of the cases, the direction of rollover could not be determined. Sideways rollovers were more frequent in younger adults while backwards rollovers were more frequent in adults aged 65 or over.



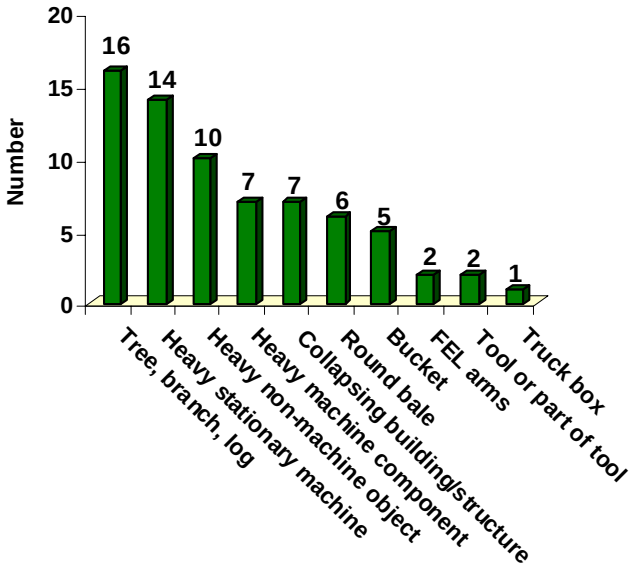
3.12 Fatal agricultural non-machine and machine falls from height, by fall location

In Ontario, 80.9% of all falls resulting in fatalities were from moving tractors and other machines. There were no fatal falls from stationary machines. Barn lofts and rafters were the location of occurrence for 9.5% of fatal falls. All falls from barn lofts occurred during recreational activities. A further 4.8% of fatal falls involved ladders or scaffolding.



3.13 Fatal struck by object and pinned or struck by machine injuries, by type of object or component, 1990-2004

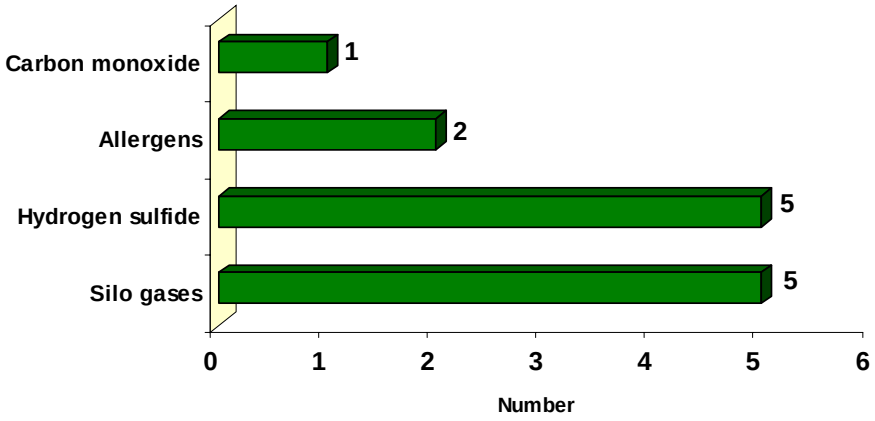
In 64% of all struck by non-machine object deaths, the victim was killed by a tree or tree branch during woodcutting activities. Even if machine objects and components are included, trees and branches still caused most (22.2%) of the struck or pinned by object, machine or component deaths. In a further 19.4% of the fatalities, victims were crushed by a machine because of jack or hydraulic lift failure. Other objects and components cited in CAISP's fatality circumstance descriptions include heavy non-machine objects such as gates and fence panels (9.7%), heavy machine components (9.7%), collapsing buildings (8.3%), large round bales (8.3%), and FEL/tractor buckets (6.9%).



3.14 Fatal agricultural toxic substance injuries by type of substance

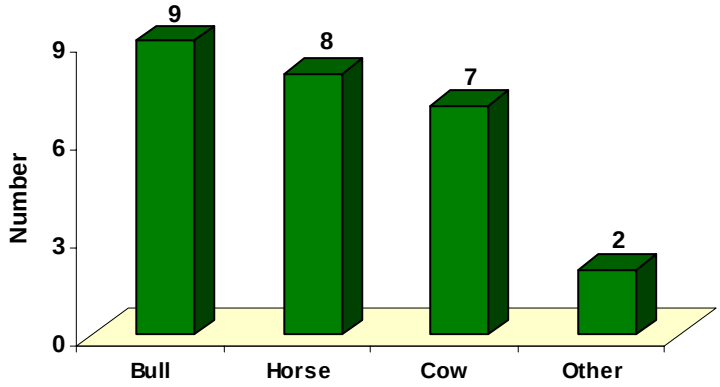
Silo gases and hydrogen sulfide were both cited as causes of death in five (38.5%) of the agricultural fatalities due to toxic substance exposure. There were also two instances of anaphylaxis due to allergens and one carbon monoxide poisoning inside a shed.

Hydrogen sulfide exposure occurs when workers enter a poorly ventilated area containing manure or sewage. Storage areas for hog manure are especially prone to hydrogen sulfide accumulation.



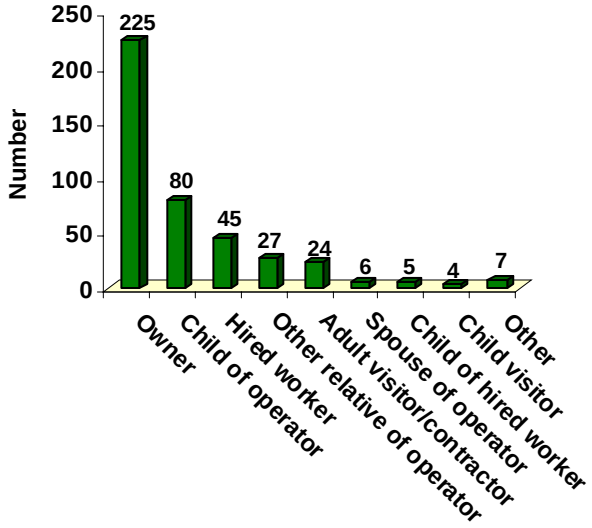
3.15 Fatal agricultural animal injuries by type of animal

There were only 26 animal-related deaths in Ontario from 1990-2004. Of these, 34.6% were caused by bulls, 30.8% involved horses and 26.9% were due to cows.



3.16 Fatal agricultural injuries by relationship to farm operator

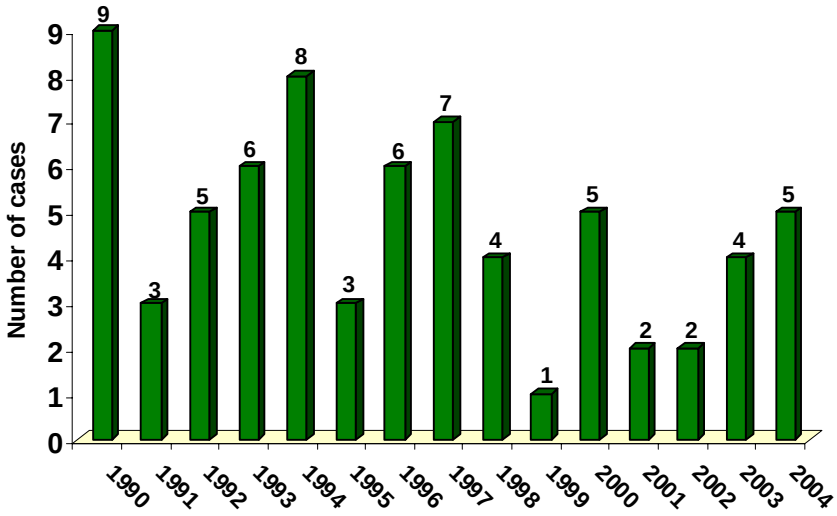
In Ontario, 49.7% of persons killed in agricultural injury events were farm operators. A further 17.7% of the victims were children of farm operators and 9.9% were hired workers. Only 6.2% of those fatally injured were visitors or contractors.



4 AGRICULTURAL FATALITIES IN ONTARIO: CHILDREN AND YOUTH UNDER AGE 16

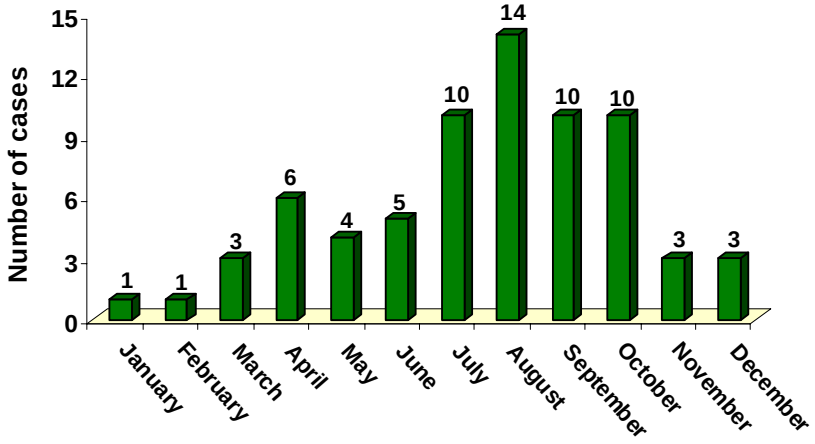
4.1 Fatal agricultural injuries in children and youth by calendar year, 1990-2004

From 1990 to 2004, there were 70 agricultural fatalities among Ontario children aged 15 and under. (An average of about 5 per year.) The peak year for fatalities was 1990, with 9 cases (12.9% of the total number of cases). The only other years with 10% or more of all child fatalities were 1994 (8 cases, 11.4%) and 1997 (7 cases, 10.0%). From 1998 to 2004, there were no more than 5 fatalities in any one year. This small decline in the annual number of fatalities may be due, in part, to better child safety practices



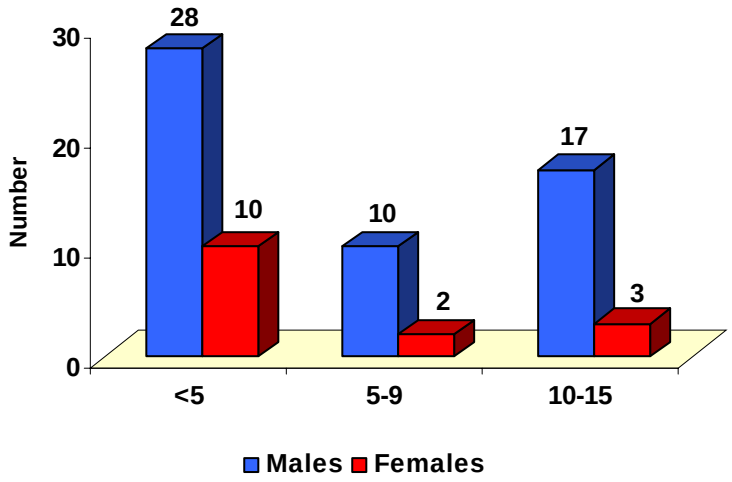
4.2 Fatal agricultural injuries in children and youth by month, 1990-2004

34.3% of all child agricultural fatalities occurred during the school holiday months of July and August. August had the highest proportion of fatalities (20.0%). 14.3% of the deaths occurred in each of July, September and October. 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

78.6% of the child victims of agricultural fatalities were male. The ratio of males to females was highest for the 10 to 15 year old age group (5:7), and lowest for the 1 to 4 year old age group (2.8:1). There was a higher proportion of female victims among children aged one to four than in any other age group, including adults.



54.3% of the children killed were less than five years old. Among the 38 agricultural fatality victims under age five were six one-year-old-infants and 26 two- and three-year old toddlers. 24 of the infants and toddlers were male.

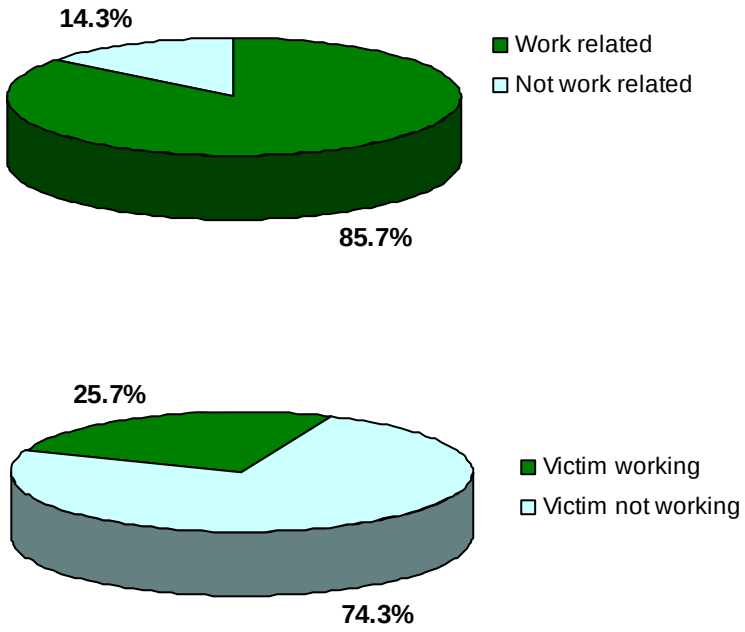
Fatalities by age group and gender

Age group	1-4	5-9	10-15	
Males	28	10	17	**55**
Females	10	2	3	**15**
Total	**38**	**12**	**20**	**70**
Percent	**54.3**	**17.1**	**28.6**	

4.4 Fatal agricultural injuries in children and youth: the relationship to agricultural work

Although 85.7% of the agricultural fatalities among children were work related, in most cases (74.3%) the victim was not performing the work. He or she was killed by someone else who was engaged in agricultural work.

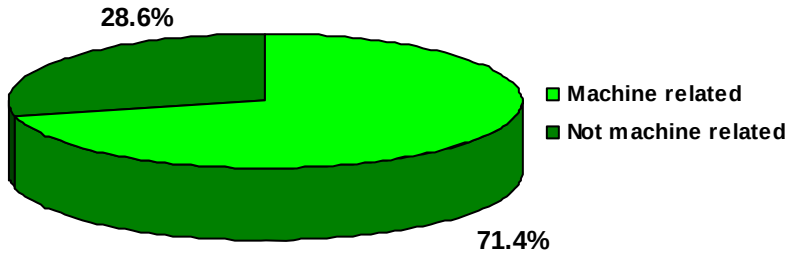
Non-work related agricultural deaths included those due to hazards of the farm environment such as large animals, stored equipment, barn lofts, dugouts and troughs.



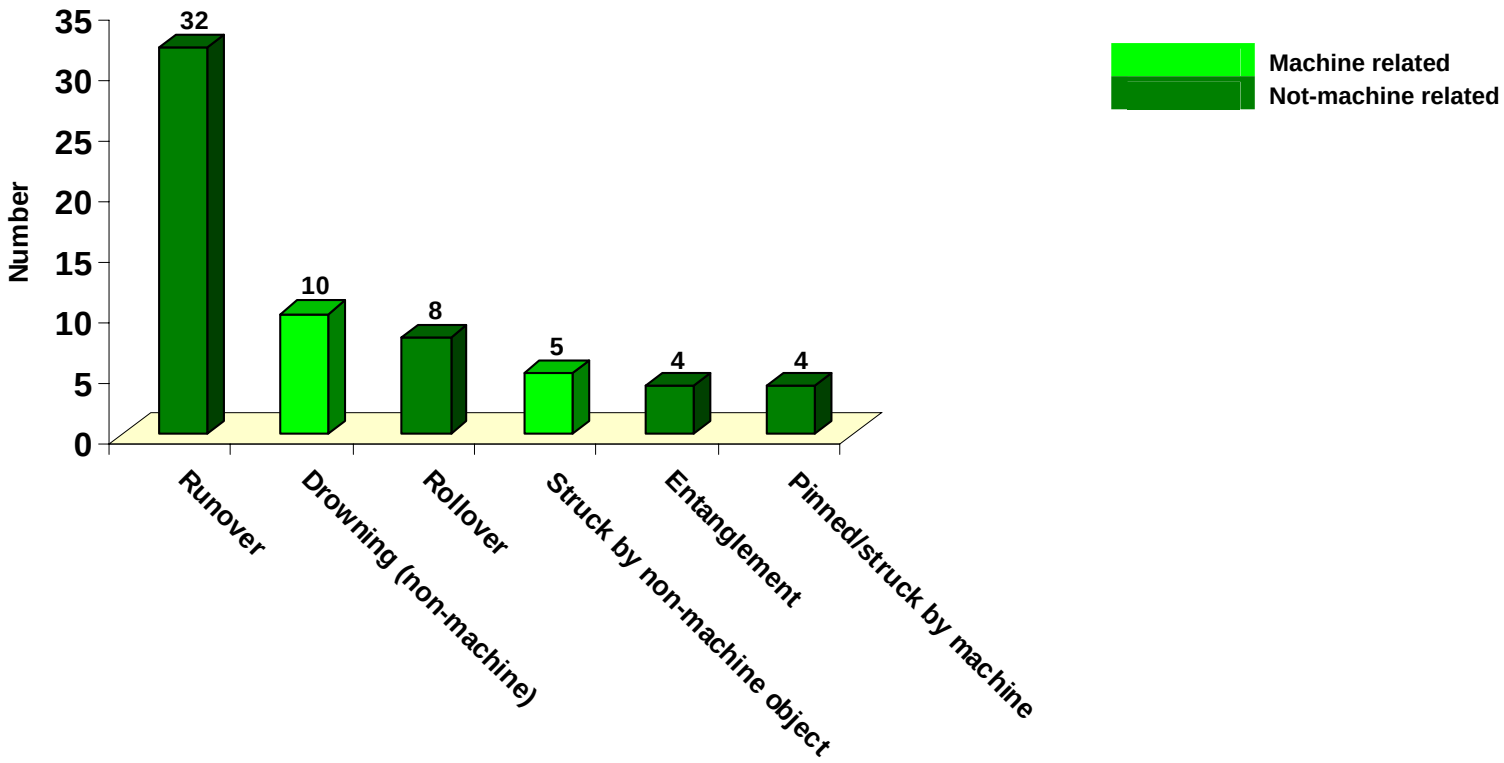
4.5 Fatal agricultural injuries in children and youth by major cause

71.4% of agricultural fatalities in children were machine related. These included machine runovers, machine rollovers and machine entanglements.

The 28.6% of agricultural fatalities that were not machine related included drownings, being struck by objects, being caught under heavy objects and falling from height.



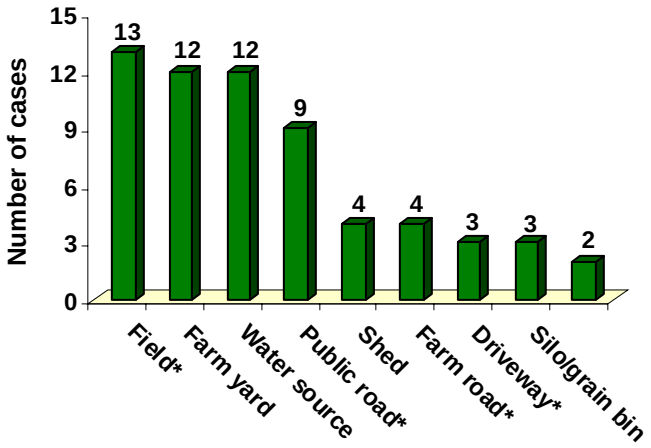
4.6 Fatal agricultural injuries in children and youth by cause of injury



For children aged sixteen and under, machine runovers caused the largest proportion of fatal injuries (45.7%), followed by drownings (14.3%), machine rollovers (11.4%), being struck by a non-machine object (7.1%), and being entangled or pinned/struck by a machine (both 5.7%). In children, just three mechanisms of injury (machine runovers, drownings and machine rollovers) were responsible for 71.4% all deaths. Runovers and drownings were most common among young children. Of the eight non-machine related drownings, four occurred in a lake or pond, two in a manure pit, and two in animal troughs. Older children and teenagers were more often killed in machine rollovers and runovers. There were also two cases each of caught in/under, 'other machine-related', and 'other non-machine related' deaths.

4.7 Fatal agricultural injuries in children and youth by location of injury

The most common locations for child agricultural fatalities were barns (18.6%), fields and farm yards (both 17.1%) and water sources (12.9%). At least 45.7% of the deaths occurred in locations close to the farm home such as the farm yard, farm driveway, barn and sheds. Leaving small children to play unsupervised near the farm home is a dangerous practice.

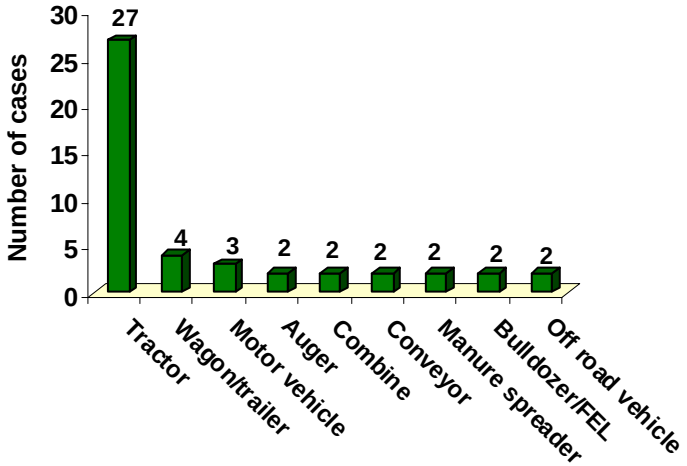


Location was not known in 8 cases.
*Includes adjacent dry ditches.

4.8 Fatal agricultural injuries in children and youth by machine type

The three machine types most frequently involved in agricultural fatalities among children were tractors (54.0%), followed by wagons and trailers (8.0%), and motor vehicles (6.0%).

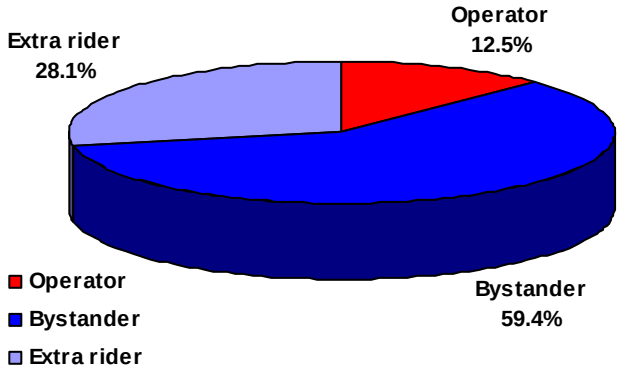
Tractors were associated with 38.6% of child deaths overall. The practice of taking a child as an extra rider on a tractor frequently results in serious injury or death.



Machine type was not known in 4 cases.

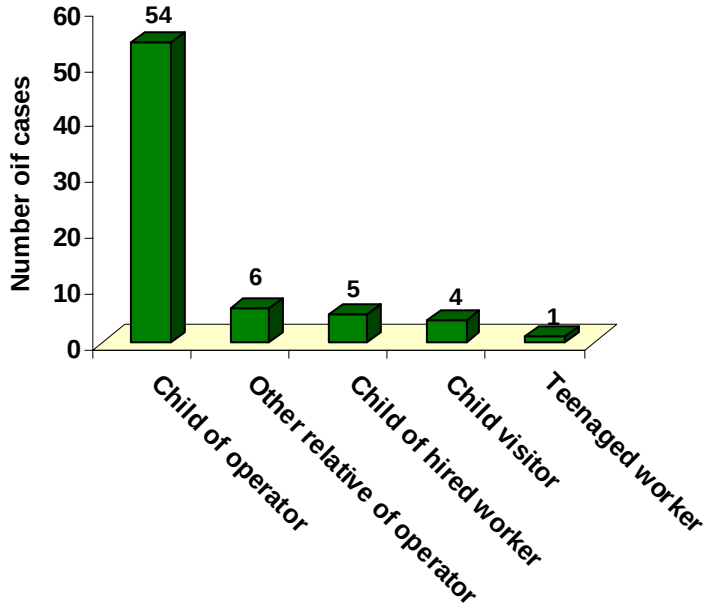
4.9 Fatal agricultural runovers in Ontario children and youth by runover type

Bystander runovers were the most frequent type of runover in children (59.4%). A further 28.1% of the child runover victims were killed when they fell from a machine that they had been riding as a passenger and were subsequently runover. 12.5% of the children were runover by machines that they had been operating themselves.



4.10 Fatal agricultural injuries in Ontario children and youth by relationship to farm operator

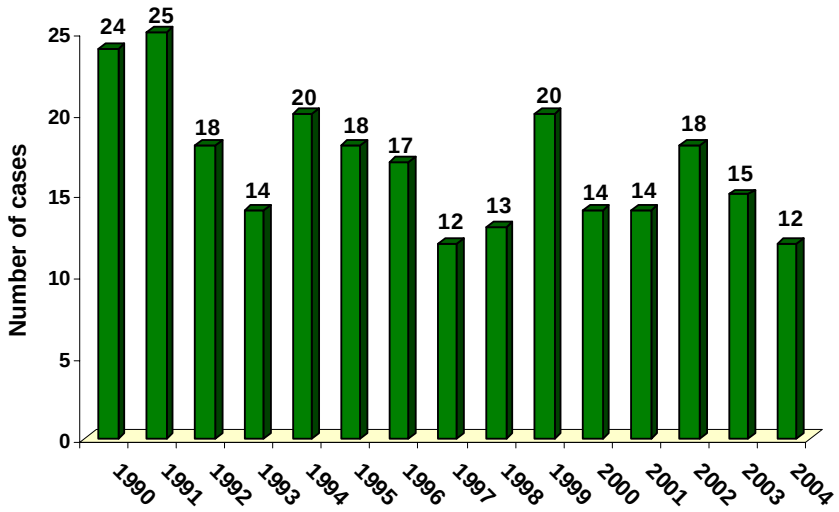
85.7% of the agricultural fatality victims under sixteen years old were children or other relatives of farm operators. 7.1% were children of hired workers. Only 5.7% were child visitors.



5 AGRICULTURAL FATALITIES IN ONTARIO: ADULTS AGED 16 TO 64

5.1 Fatal agricultural injuries in adults aged 16 to 64 by calendar year, 1990-2004

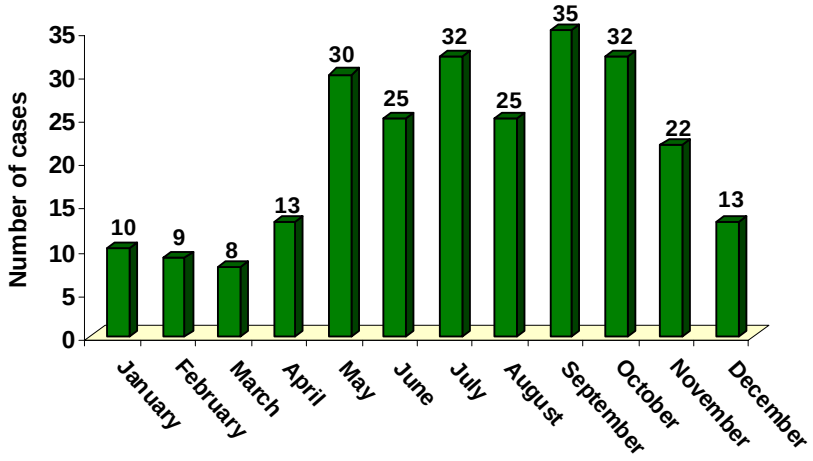
From 1990 to 2004, there were 254 agricultural fatalities among Ontario adults aged 16 to 64. (An average of about 17 per year.) The peak year for fatalities was 1991, with 25 cases (9.8% of the total number of cases). The only other year with 9.0% or more of the fatalities was 1990 (24 cases, 9.4%). During the first seven years of the surveillance period, there were six years with a higher than average number of cases, whereas in the last six years of the surveillance period there were only two years with a higher than average number of cases.



5.2 Fatal agricultural injuries in adults aged 16 to 64 by month 1990-2004

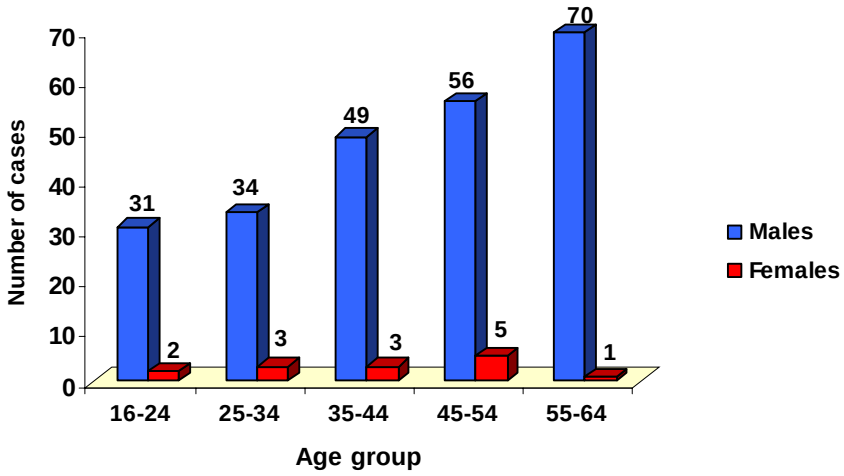
70.5% of all agricultural fatalities in adults aged 16 to 64 occurred from May to October.

September was the peak month, with 13.8% of all fatalities. 12.6% of the fatalities occurred in the months of July and October. Relatively few younger adults were killed from December to April.



5.3 Fatal agricultural injuries in adults aged 16 to 64 by age group and gender

94.5% of the younger adults killed in agricultural injury events were male. The proportion of males in the 16 to 64 year old age group was almost 16% higher than in children under sixteen due to the large number of young female children who were killed. The ratio of males to females was highest for the 55 to 64 year age group (70:1), and lowest for the 45 to 54 year age group (11.2:1).



Older members of the 16 to 64 year age group were more likely to be killed in an agricultural injury event than younger members were. Only 27.6% of the younger adults killed were aged 16 to 34, whereas 51.9% were 45 to 64 years old.

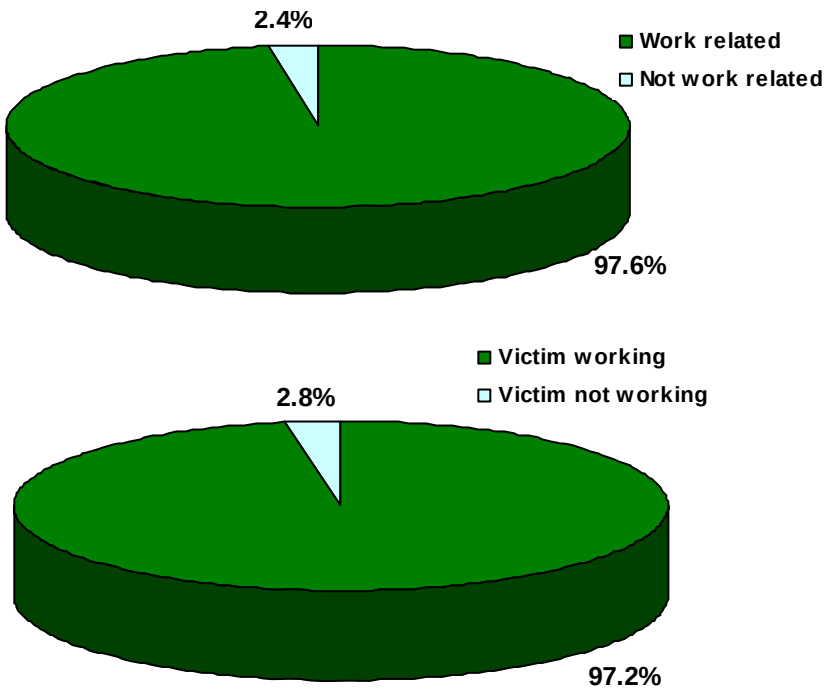
Fatalities by age group and gender

Age group	16-24	25-34	35-44	45-54	55-64	
Males	31	34	49	56	70	**240**
Females	2	3	3	5	1	**14**
Total	**33**	**37**	**52**	**61**	**71**	
Percent	**13.0**	**14.6**	**20.5**	**24.0**	**27.9**	

5.4 Fatal agricultural injuries in adults aged 16 to 64: the relationship to agricultural work

97.6% of the deaths in younger adults were work related. The few deaths that were not work related (2.4%) were due to hazards of the farm environment.

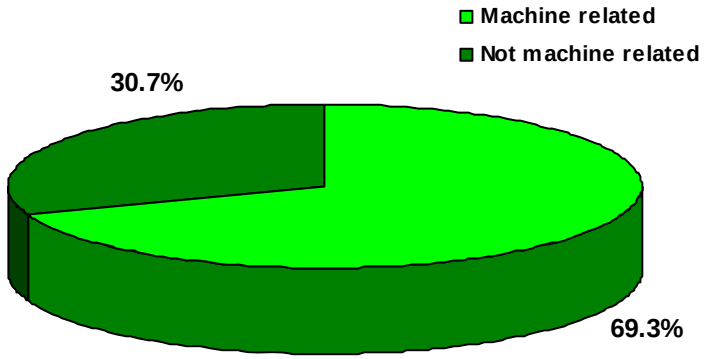
All but one of the younger adults who died were engaged in agricultural work (97.2%). In contrast, the majority of children who were killed in work-related injury events were not working themselves.



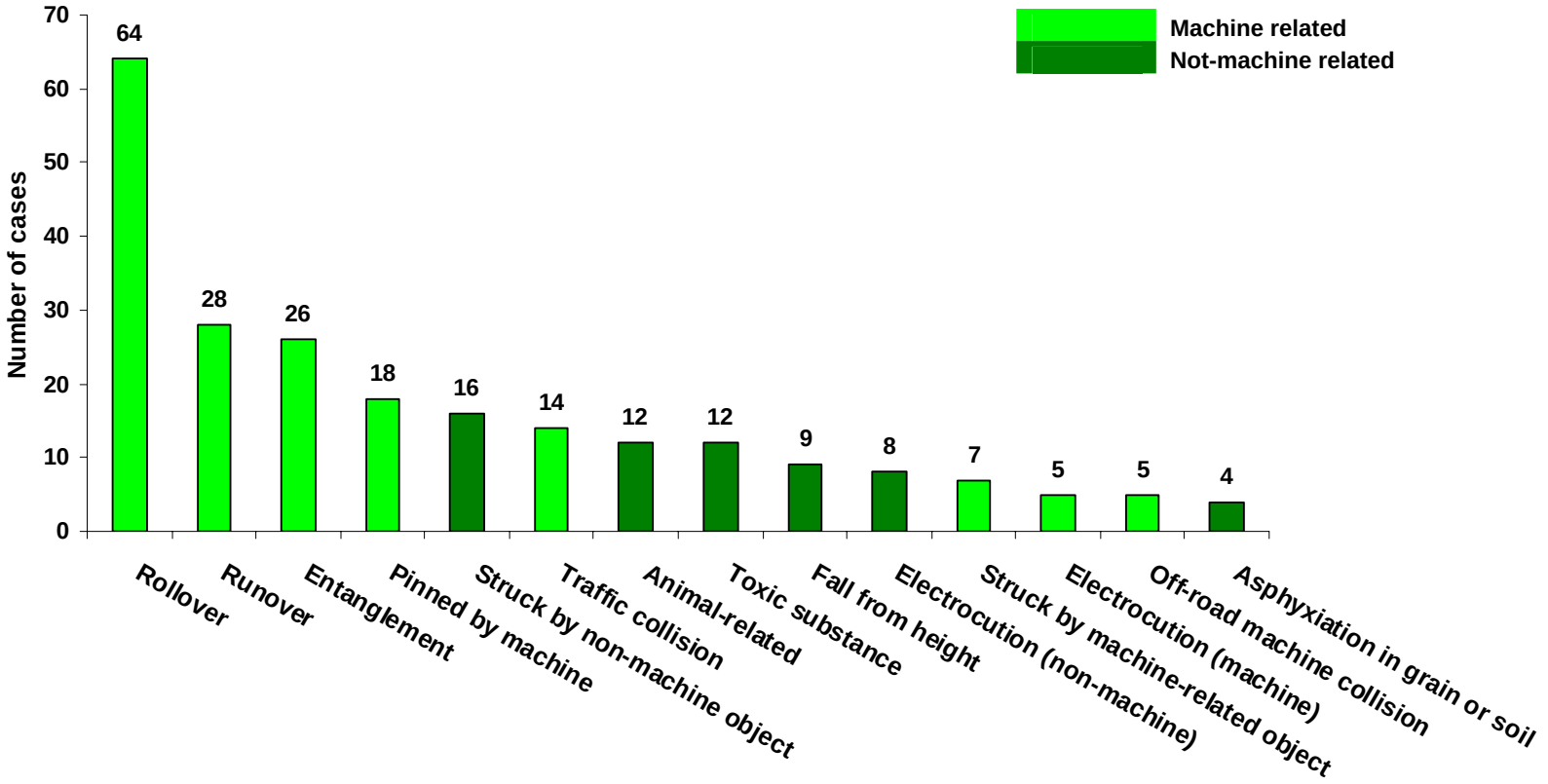
5.5 Fatal agricultural injuries in adults aged 16 to 64 by major cause

69.3% of agricultural fatalities in younger adults were machine related. The leading machine-related mechanisms of injury were machine rollovers, machine runovers and machine entanglements.

The agricultural fatalities that were not machine related (30.7%) included struck by object events, animal-related events, exposure to toxic substances, and falls from height.



5.6 Fatal agricultural injuries in adults aged 16 to 64 by cause of injury

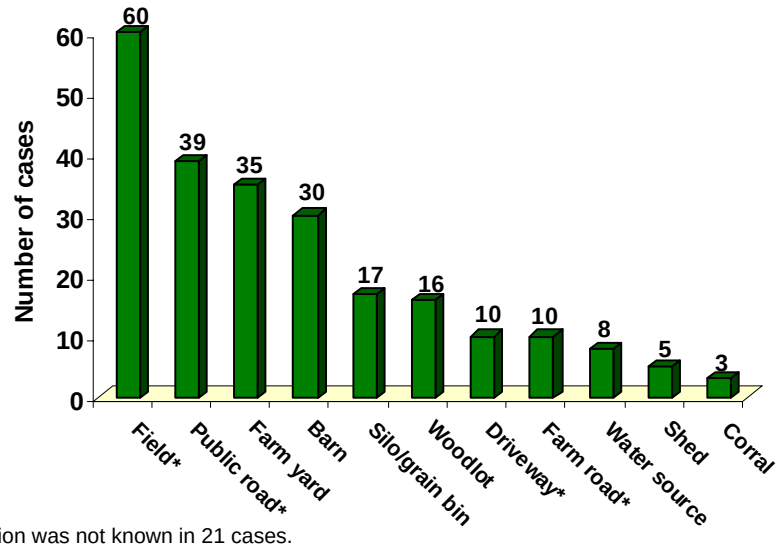


In adults aged 16 to 64, the top five causes of fatal injuries were machine rollovers (25.2%), machine runovers (11.0%), machine entanglements (10.2%), being struck by a non-machine object (6.3%), and animal-related events or exposure to toxic substances (both 4.7%).

Other causes of fatal injuries not illustrated above were ‘caught in/under’ (3), ‘fire/explosion non-machine’ (3), ‘fire explosion machine’ (3), ‘firearm (accidental)’ (3), ‘fell from machine (no runover)’ (2), ‘machine-related drowning’ (2), ‘overexertion’ (2), ‘other machine related’ (2), and ‘other non-machine’ (6).

5.7 Fatal agricultural injuries in adults aged 16 to 64 by location of injury

The most common locations of injury for agricultural fatalities in younger adults were fields and their adjacent ditches (23.6%), public roads and their adjacent ditches (15.4%), farm yards (13.8%), and barns (11.8%).

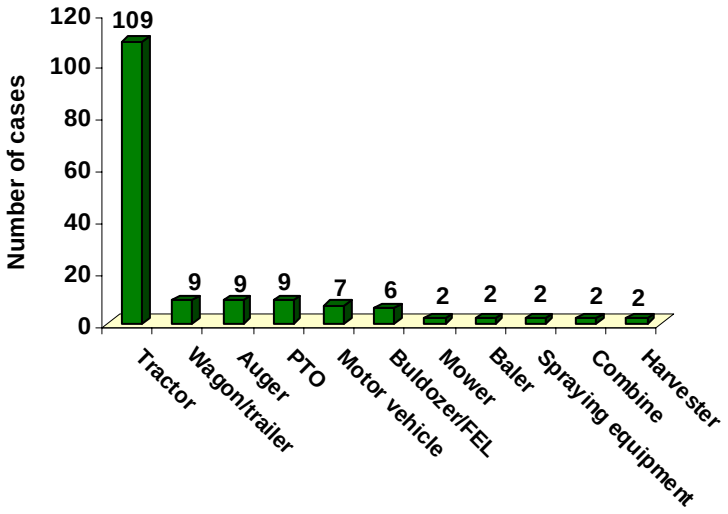


Location was not known in 21 cases.
*Includes adjacent dry ditches.

5.8 Fatal agricultural injuries in adults aged 16 to 64 by machine type

The machine types most frequently involved in agricultural fatalities among younger adults were tractors (61.2%), followed by wagons and trailers, augers and power take offs (all 5.1%).

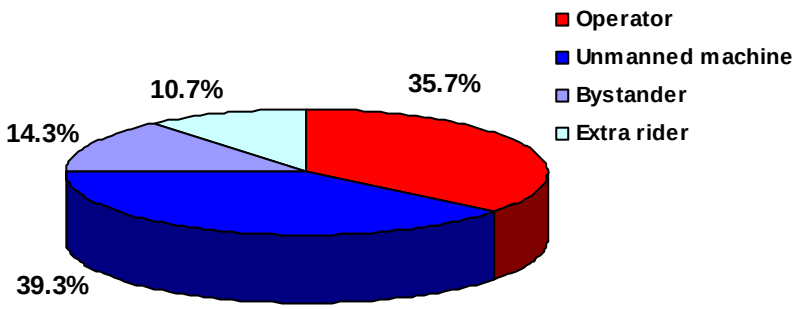
Tractors were associated with 42.9% of all agricultural deaths among younger adults.



Machine type was not known in 19 cases.

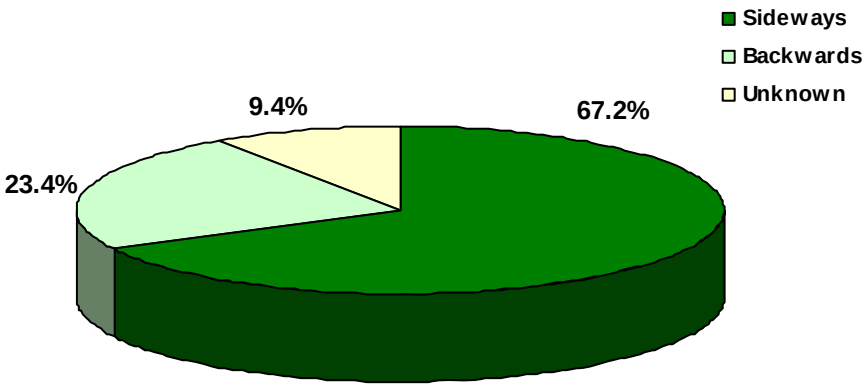
5.9 Fatal agricultural Runovers in adults aged 16 to 64 by Runover type

Most adults aged 16 to 64, were runover by unmanned machines (39.3%) which had been bypass started, left running or left unblocked on a slope. In a further 35.7% of the runovers, an operator was struck by a moving machine subsequent to falling from it. Bystander (14.3%) and extra rider runovers (10.7%) were not common causes of runover deaths in younger adults.



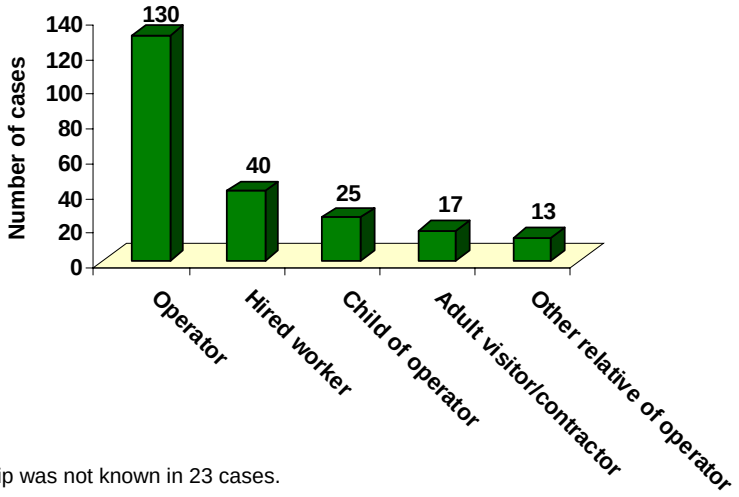
5.10 Fatal agricultural Rollovers in adults aged 16 to 64 by Rollover type

In adults aged 16 to 64, 67.2% of the machine rollovers were sideways in direction and 23.4% were backwards. In 9.4% of the cases, the direction of rollover could not be determined. Sideways rollovers were more frequent in younger adults while backwards rollovers were more frequent in adults aged 65 or over.



5.11 Fatal agricultural injuries in adults aged 16 to 64 by relationship to farm operator

51.2% of younger adults killed in agricultural injury events were farm operators. A further 15.7% of the victims were hired workers and 14.6% were children or other relatives of operators. Only 6.7% of those killed were visitors or contractors.

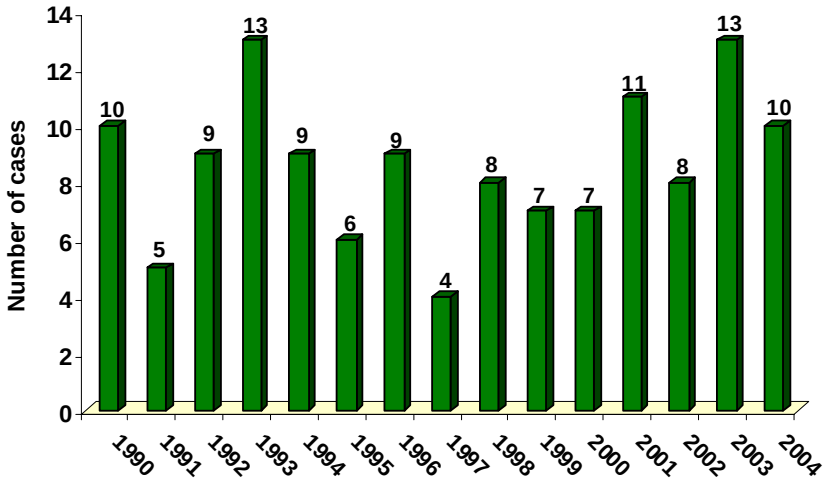


Relationship was not known in 23 cases.

6 AGRICULTURAL FATALITIES IN ONTARIO: ADULTS AGED 65 AND OVER

6.1 Fatal agricultural injuries in adults aged 65 and over by calendar year, 1990-2004

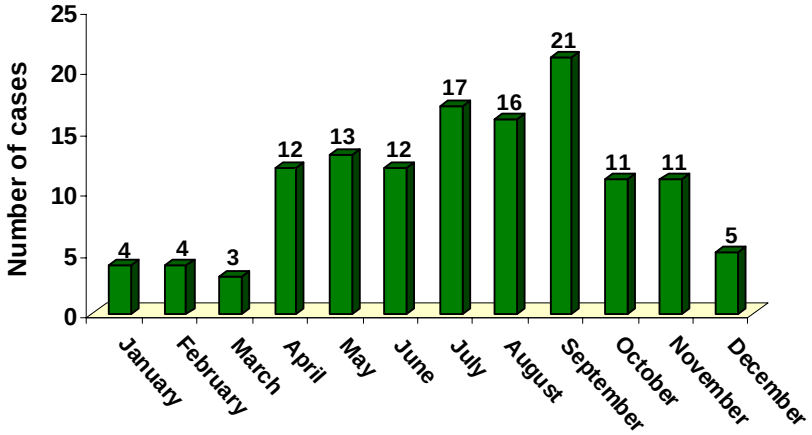
From 1990 to 2004, there were 129 agricultural fatalities among Ontario adults aged 65 and over. (An average of 8.6 per year.) The peak years for fatalities were 1993 and 2003, with 13 cases (10.1% of the total number of cases). During the first seven years of the surveillance period, there were five years with a higher than average number of cases, whereas in the last seven years of the surveillance period there were only three years with a higher than average number of cases (2001, 2003 and 2004).



6.2 Fatal agricultural injuries in adults aged 65 and over by month 1990-2004

70.6% of all agricultural fatalities in adults aged 65+ occurred from April to September.

September was the peak month, with 16.3% of all fatalities. 13.2% of the fatalities occurred in the month of July and 12.4% in August. Very few older adults were killed from December to March.

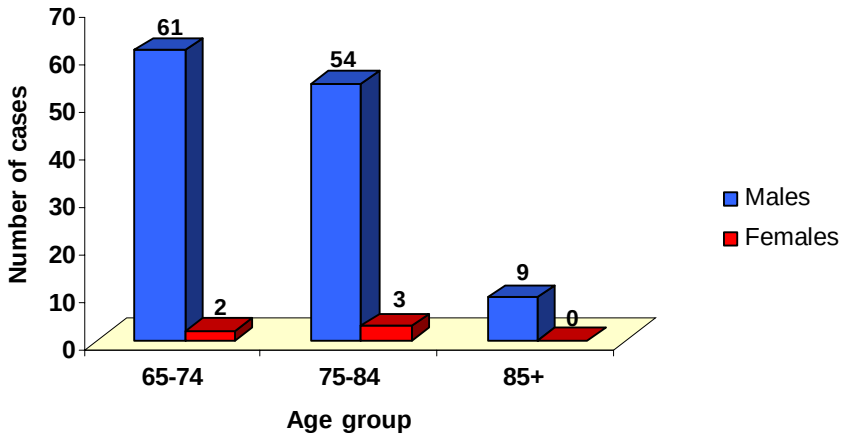


6.3 Fatal agricultural injuries in adults aged 65 and over by age group and gender

96.1% of the older adults killed in agricultural injury events were male. The ratio of males to females was highest for the 85+ age group (9:0), and lowest for the 75 to 84 year age group (18:1).

19.4% (25) of all older adults killed during agricultural work were males aged 80 or over. This accounts for the extraordinarily high fatality rate in the very elderly male farm population. Of these deaths, three were due to being struck by a cow, one was attributed to carbon monoxide poisoning, eighteen involved farm work with tractors and three occurred during farm work with other machines.

The lower number of deaths recorded for the higher age ranges reflects the steady decline in the farm population with age (section 3.4).



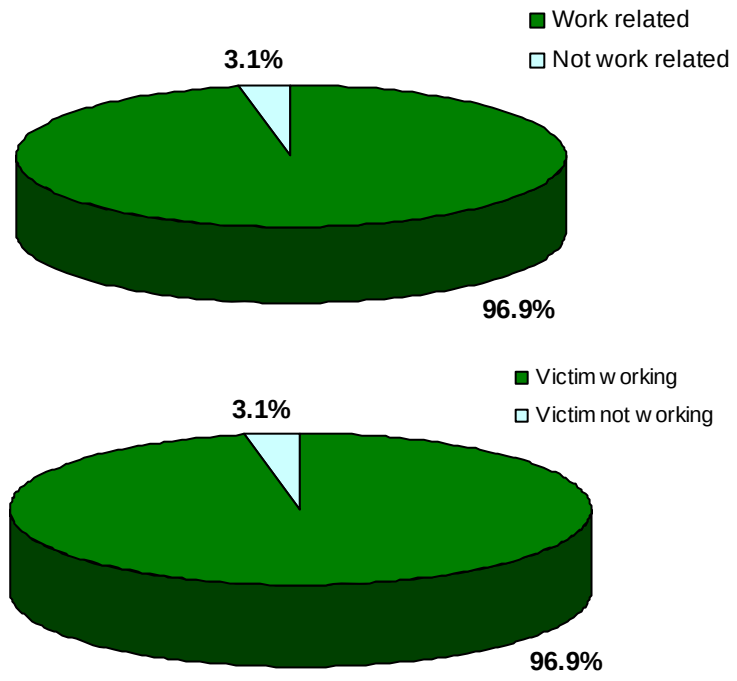
Fatalities by age group and gender

Age group	65-74	75-84	85+	65+
Males	61	54	9	**124**
Females	2	3	0	**5**
Total	**63**	**57**	**9**	**129**
Percent	**48.8**	**44.2**	**7.0**	

6.4 Fatal agricultural injuries in adults aged 65 and over: the relationship to agricultural work

96.9% of the deaths in older adults were related to agricultural work. Of the four deaths that were not work related, three were due to hazards of the farm environment. One tractor rollover occurred in a farmhouse garden, so it was not classified as work-related.

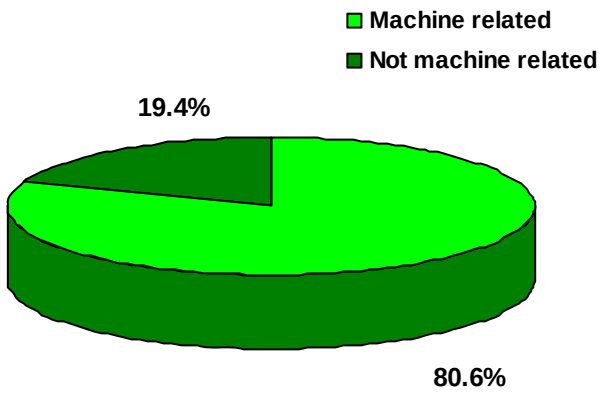
All but four of the older adults who died were engaged in agricultural work (96.9%). The very high proportion of work related deaths where the victims themselves were working was similar to the pattern seen in younger adults.



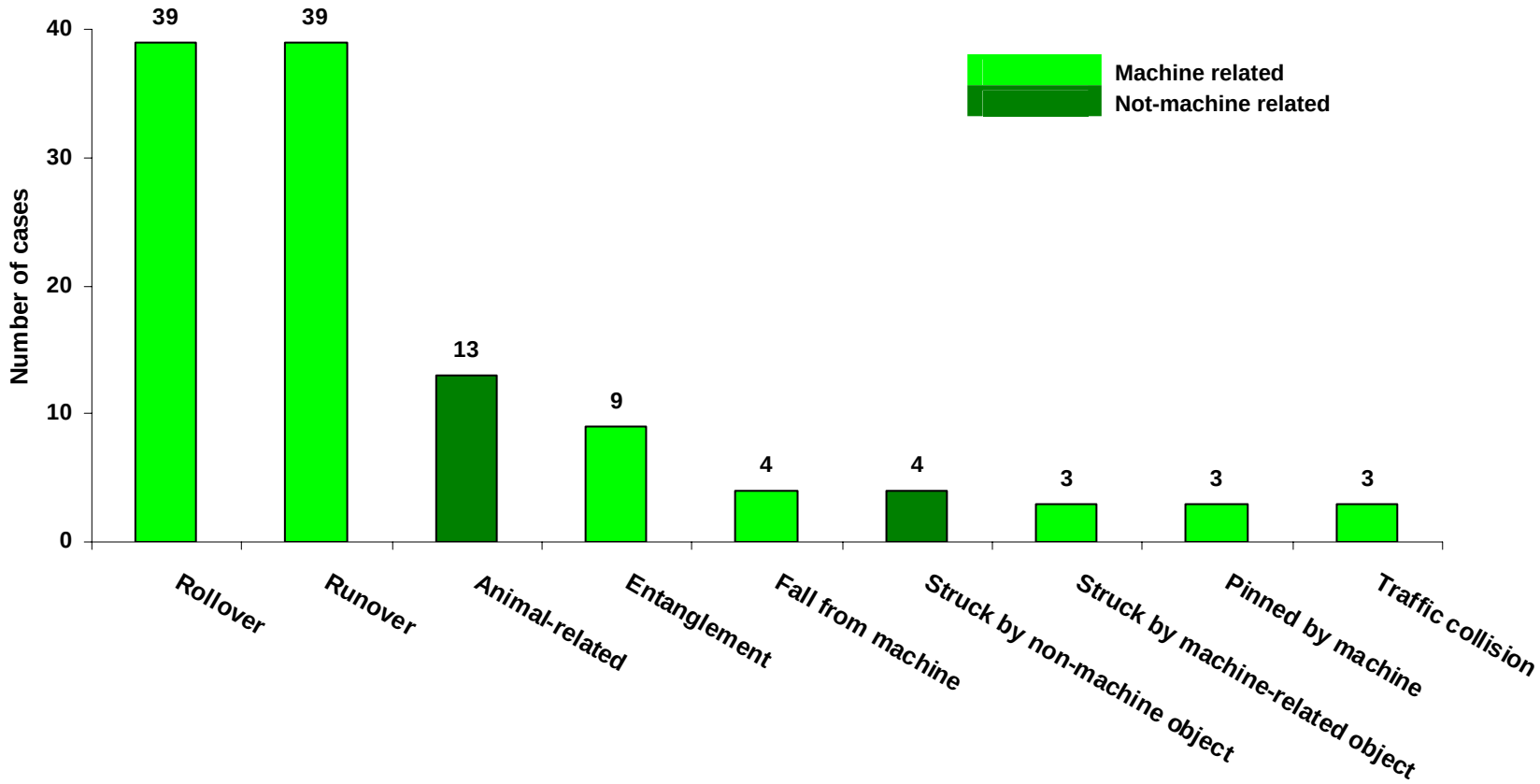
6.5 Fatal agricultural injuries in Ontario aged 65 and over by major cause

80.6% of agricultural fatalities in older adults were machine related. That proportion is 11.3% higher than in younger adults.

The leading machine-related mechanisms of injury were machine rollovers and machine runovers. Non-machine agricultural fatalities (19.4%) included animal-related and struck by object events.



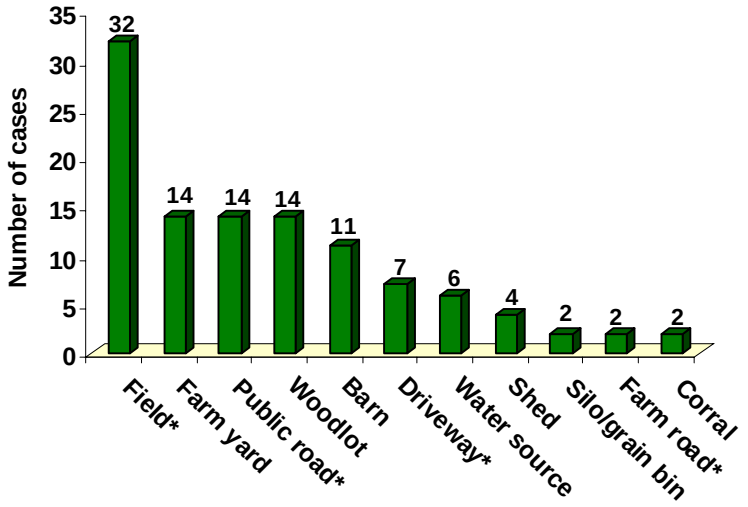
6.6 Fatal agricultural injuries in adults aged 65 and over by cause of injury



In adults aged 65 and over, 60.4% of all deaths were due to only two main mechanisms of injury, machine runovers and machine rollovers. Runovers and rollovers caused an equal number of deaths (30.2%). The next most common mechanisms of fatal injury in older adults were being struck by an animal (10.1%) and being entangled in a machine (7.0%). Falling from a machine or being struck by a non-machine object both caused 3.1% of the deaths in this age group. Causes of fatal injuries not included in the figure include two instances each of 'non-machine drowning', 'caught in/under', and 'off-road machine collision'. There were also two 'other machine related' and four 'machine-related' causes of fatal injuries.

6.7 Fatal agricultural injuries in adults aged 65 and over by location of injury

The most common locations of fatal injury for older adults were fields and their adjacent ditches (24.8%), public roads and their adjacent ditches (10.9%), farm yards (10.9%), and woodlots (10.9%). Barns were a less common location of injury in older adults (8.5%) than in younger adults (11.8%), whereas woodlots were a far more frequent location of injury for older adults than for younger adults (10.9% versus 6.3%).

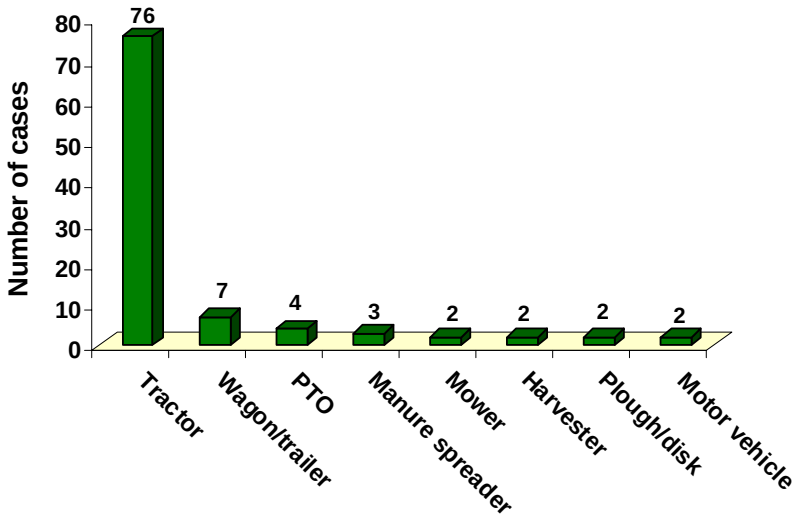


Location was not known in 21 cases.
*These locations include adjacent dry ditches.

6.8 Fatal agricultural injuries in adults aged 65 and over by machine type

The types of machines most frequently involved in agricultural fatalities among older adults were tractors (73.8%), followed by wagons and trailers (6.8%), and power take offs (3.9%). The proportion of tractor-related deaths in adults aged 65 and over was 12.6% greater than for younger adults.

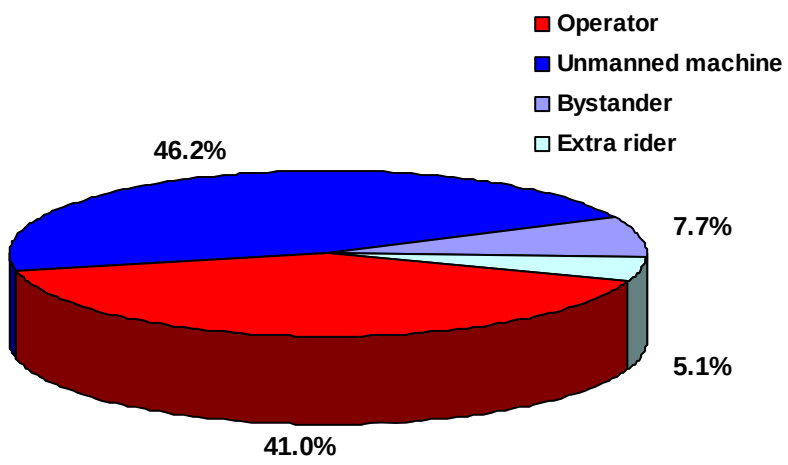
Tractors were associated with 58.9% of all agricultural deaths among older adults, which is 16% greater than the proportion for younger adults.



Machine type was not known in 5 cases.

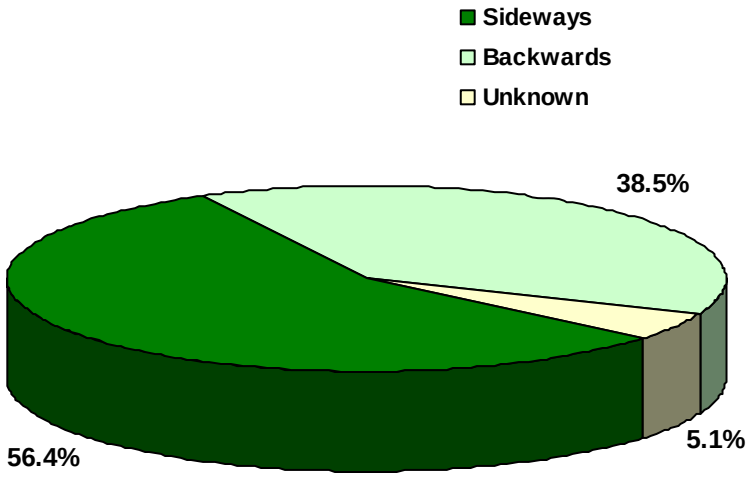
6.9 Fatal agricultural runovers in adults aged 65 and over by Runover type

In adults aged 65 and over, most runovers involved unmanned machines which had been bypass started, left running, or left unblocked on a slope (46.2%). Operator runovers subsequent to falls from machines (41.0%) were the next most frequent runover mechanism. Bystander runovers (7.7%) and extra rider runovers (5.1%) 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.



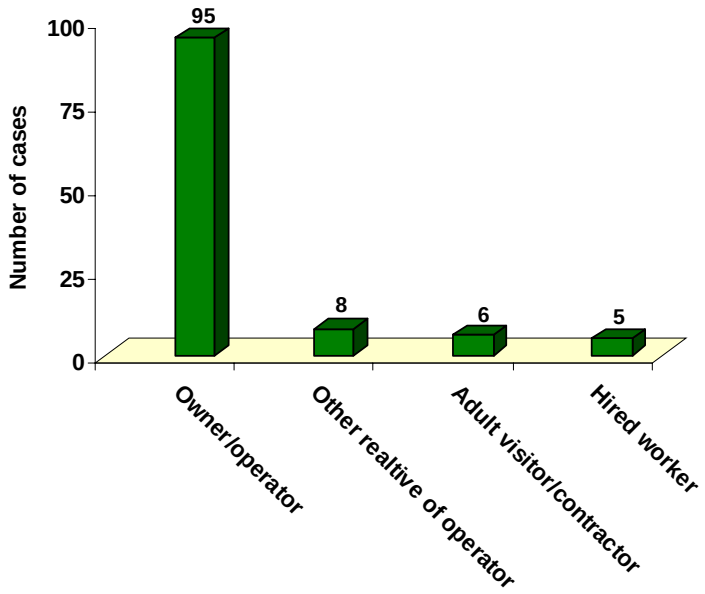
6.10 Fatal agricultural rollovers in adults aged 65 and over by Rollover type

In adults aged 65 and over, 56.4% of the rollovers were sideways and 38.5% were backwards. Rollover direction could not be determined in 5.1% of the cases. Sideways rollovers were more frequent in younger adults (67.2%) than in older adults, whereas backwards rollovers were less frequent in younger adults (23.4%). Most backwards rollovers occurred in woodlots.



6.11 Fatal agricultural injuries in adults aged 65 and over by relationship to farm operator

73.6% of older adults killed in agricultural injury events were farm operators. A further 6.2% of the victims were relatives of farm operators and 4.7% were adult visitors or contractors. Only 3.9% were hired workers.



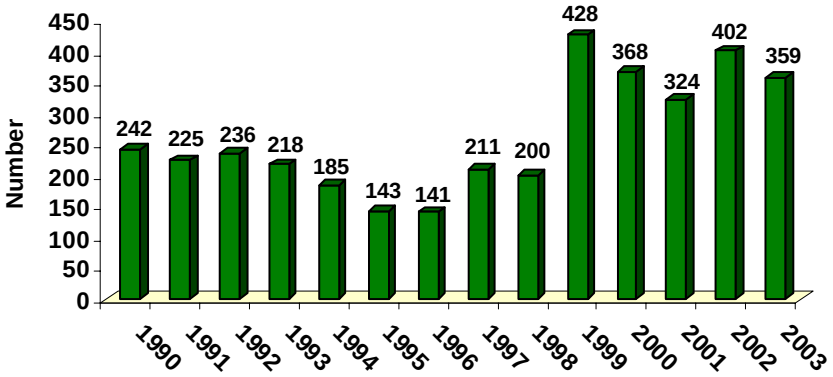
Relationship was not known in 15 cases.

7 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO 1990-2003: OVERVIEW

7.1 Hospitalized agricultural injuries, by fiscal year, 1990-2003

In the fourteen fiscal years from April 1, 1990 to March 31, 2004, there were 3,682 agricultural hospitalizations identified in Ontario. (An average of 263 per year).

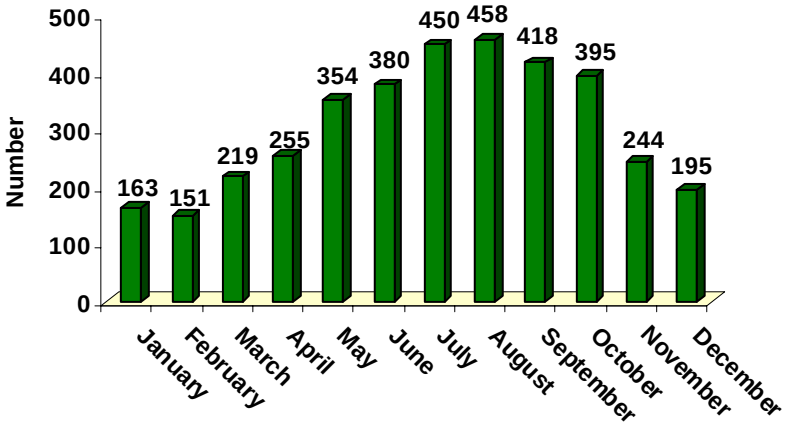
The ICD 10 CA coding system was implemented by most centers in fiscal year 1999-2000, resulting in greatly increased identification of non-machine agricultural injuries such as falls and animal-related events.



7.2 Hospitalized agricultural injuries, by month,1990-2003

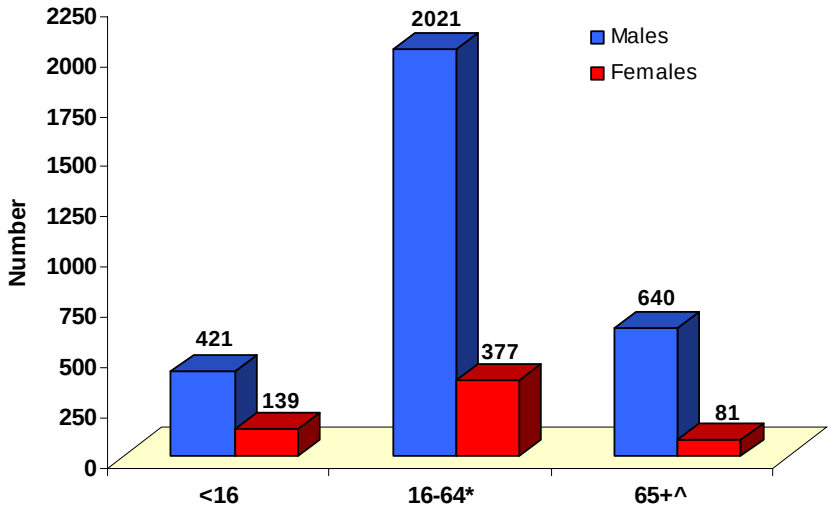
66.6% of the agricultural hospitalizations in Ontario occurred from May to October.

The highest proportions of hospitalizations took place in July (12.2%) and August (12.4%).



7.3 Hospitalized agricultural injuries, by age group and gender

Overall, 83.8% of the persons injured were male and 16.2% were female. The lowest ratio of males to females was in children (3:1), whereas the highest ratio was in older adults (7.9:1).



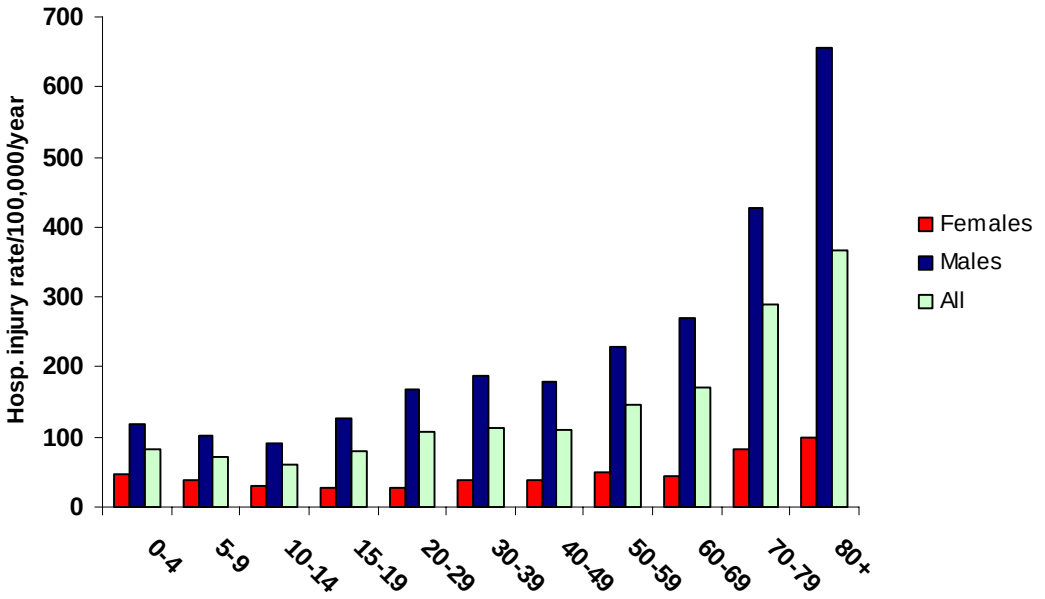
The majority of those injured were in the 16 to 64 age group. Although children should have considerably lower exposure to the hazards of agricultural work than adults, they still sustained 15.2% of the hospitalized agricultural injuries.

Agricultural hospitalizations 1990-2003, by age group and gender

	Males	Females	Total	Percent
<16	421	139	**560**	**15.2**
16-64*	2,021	377	**2,400**	**65.2**
65+^	640	81	**722**	**19.6**
Total:	**3,082**	**597**		**100**
Percent:	**83.8**	**16.2**		

*Two genders were missing for this age group.
^One gender was missing for this age group.

7.4 Hospitalized agricultural injury rates, by gender and age group



For both genders combined as well as males and females separately, hospitalized agricultural injuries were most frequent for adults aged 50 and over. Males aged 30 to 39 and female children under age five also had a very high incidence of hospitalized injuries. Females under five and all adults in the older age groups (50-80+) were over-represented in hospitalizations relative to their proportion of the farm population. The percentage of hospitalized injuries involving male adults 80+ was 3.3 times the percentage of male adults that age in the farm population. The percentage of hospitalized injuries involving females aged 80+ was 2.3 times the percentage of females that age in the farm population.

There were extremely high rates of hospitalized injuries for males aged 50 and over, ranging from 229.4/100,000/year for males aged 50 to 59, to 656.9/100,000/year for males aged 80 and over. Within every age group, the injury rates for females were lower than for males. Female children aged 0-4 had a higher rate of injury than any other age group of females under 50.

The higher than expected incidence of hospitalized injuries among very young female children is likely due to inadequate supervision and easy access to dangerous machinery, large animals and other hazards of the farm environment.

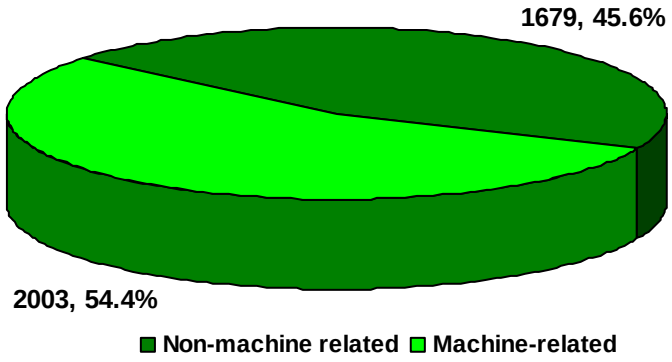
The extraordinarily high rates of hospitalized injuries among elderly males reflect their continued participation in demanding physical tasks with large animals and heavy machinery in spite of increasing physical limitations. Falls on the same level and being struck by an animal were the most common causes of hospitalized injuries for this age group.

7.5 Hospitalized agricultural injuries, by major cause

72.8% of agricultural fatalities were machine-related, whereas only 54.4% of identified hospitalized injuries were machine related.

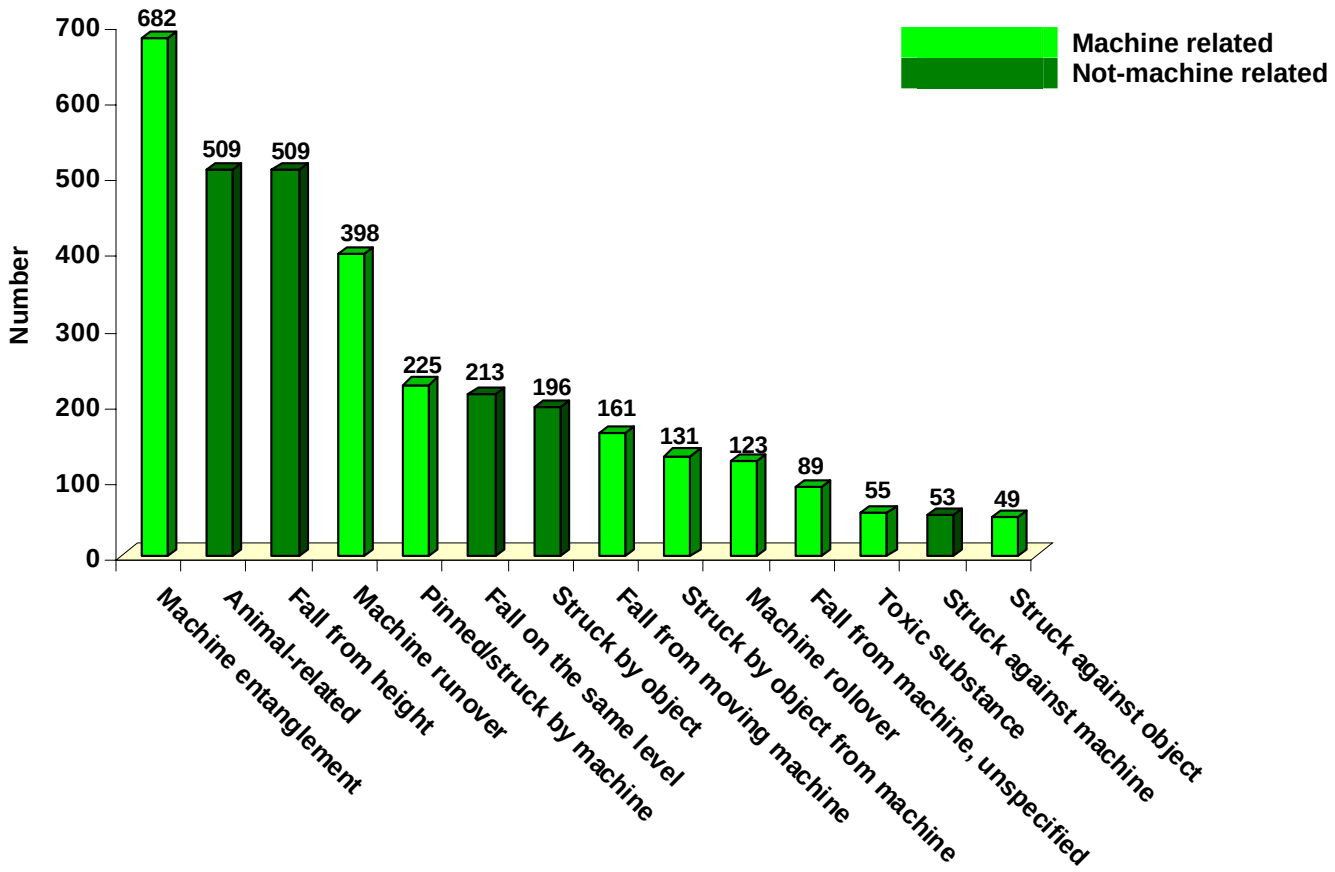
The leading machine-related mechanisms of injury were machine entanglements, machine runovers, and being pinned or struck by a machine.

Non-machine causes of hospitalized agricultural injuries included animal-related events, falls from height, 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 prior to April 1999.

7.6 Hospitalized agricultural injuries, by cause of injury

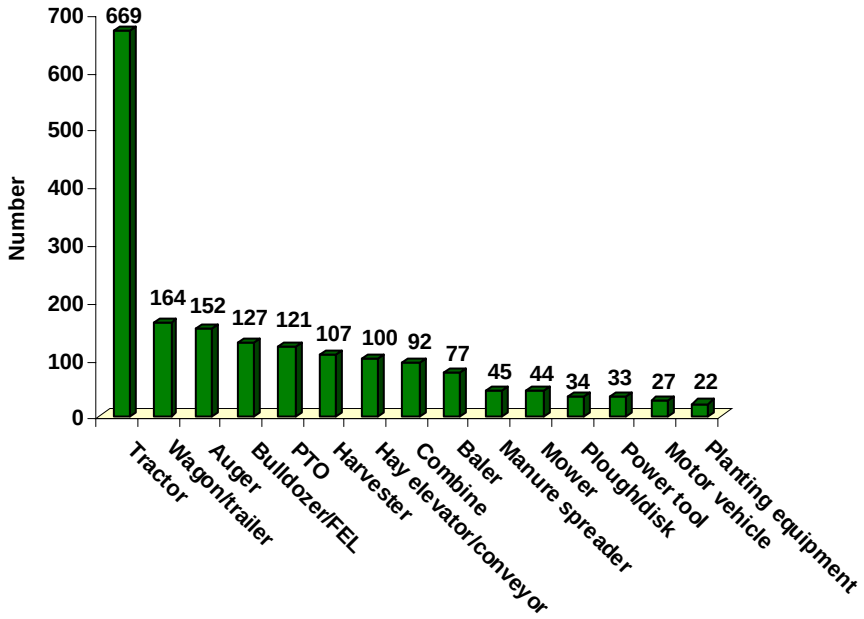


Overall, the leading causes of hospitalized agricultural injuries in Ontario were machine entanglements (18.5%), animal-related events (13.8%), falls from height (13.8%), machine runovers (10.8%), and being pinned or struck by a machine (6.1%).

- Non-machine causes of injury are underestimated due to case identification problems with the ICD 9 coding system prior to April 1999. Other causes of injury not included in the above figure are: overexertion (39), caught in/under (37), fire/explosion (27), off-road machine collision (25), traffic collision (16), fall from stationary machine (15), and jump from machine (15). There were also 45 other/unknown non-machine cases and 70 other/unknown machine cases.

7.7 Hospitalized agricultural machine-related injuries, by machine type

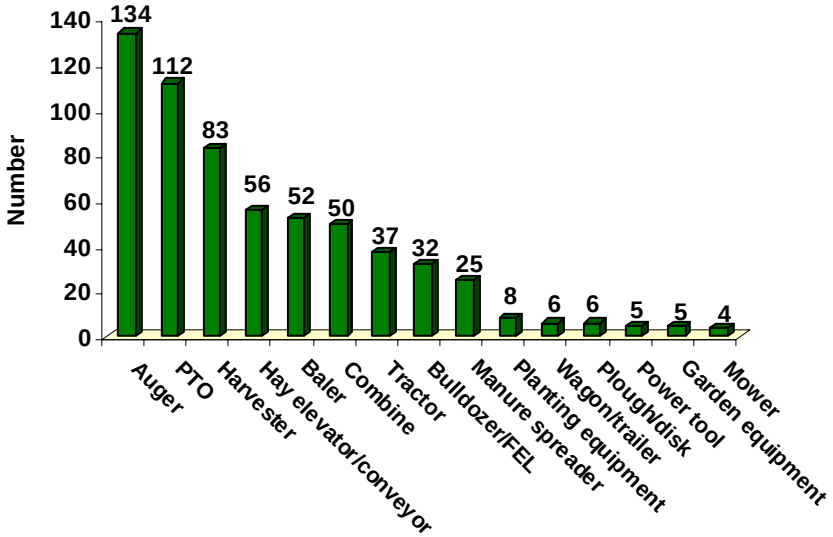
33.4% of all hospitalized machine-related injuries involved tractors. The next most common machine type was wagons/trailers (8.2%), followed by augers (7.6%), bulldozers/FELs (6.3%) and PTOs (6.0%).



- There were also injuries involving chain saws (13), off-road vehicles (12), rototillers and other cultivators (9), post pounders (4), sprayers (3), swathers (2), as well as 102 unclassified machines and 44 unknown machines.

7.8 Hospitalized agricultural machine entanglement injuries, by machine type

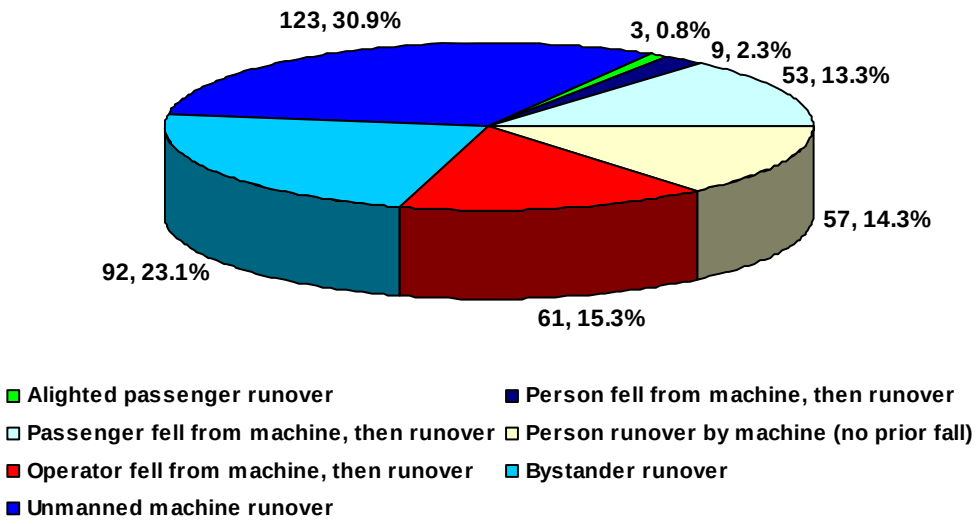
Augers were the machine type most frequently associated with hospitalized entanglement injuries (19.6%), followed by PTOs (16.4%), harvesters (12.2%), balers (7.6%) and combines (7.3%).



- There were also injuries involving fencing equipment (2), spraying equipment (2) and one motor vehicle, as well as 44 other machines and 18 unknown machines.

7.9 Hospitalized agricultural runovers, by runover type

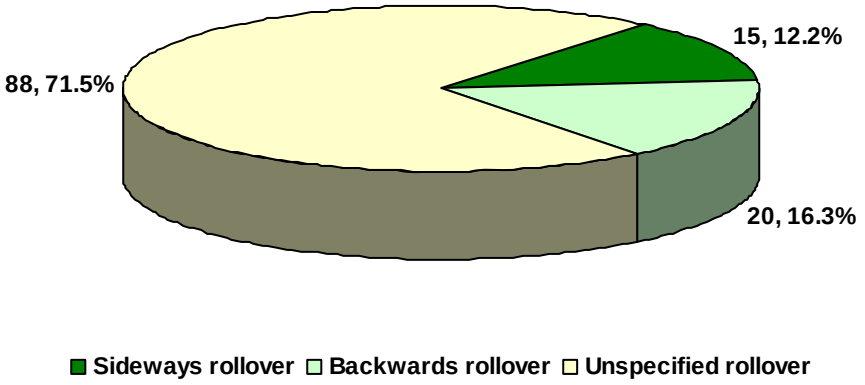
Runovers were ranked third as a cause of injury. Overall, unmanned machine runovers were the most common hospitalized runover type (30.9%). In this type of injury event, the victim is runover by a vehicle/machine that had been bypass started, left running, or left unblocked on a slope. Bystander runovers (23.1%) were the next most frequent type of hospitalized runover, followed by operator runovers (15.3%). In operator runovers, the victim is runover subsequent to a fall from the machine he/she had been operating. Extra rider runovers (14.3%) were most often seen in children. They appear in the legend as "passenger fell from machine, then runover."



- 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.

7.10 Hospitalized agricultural rollovers, by rollover type

Machine rollovers ranked first as a cause of death, but only eighth as a cause of hospitalized injuries because they are usually lethal. There was a large proportion of unclassified rollovers because of the limited circumstance descriptions available.

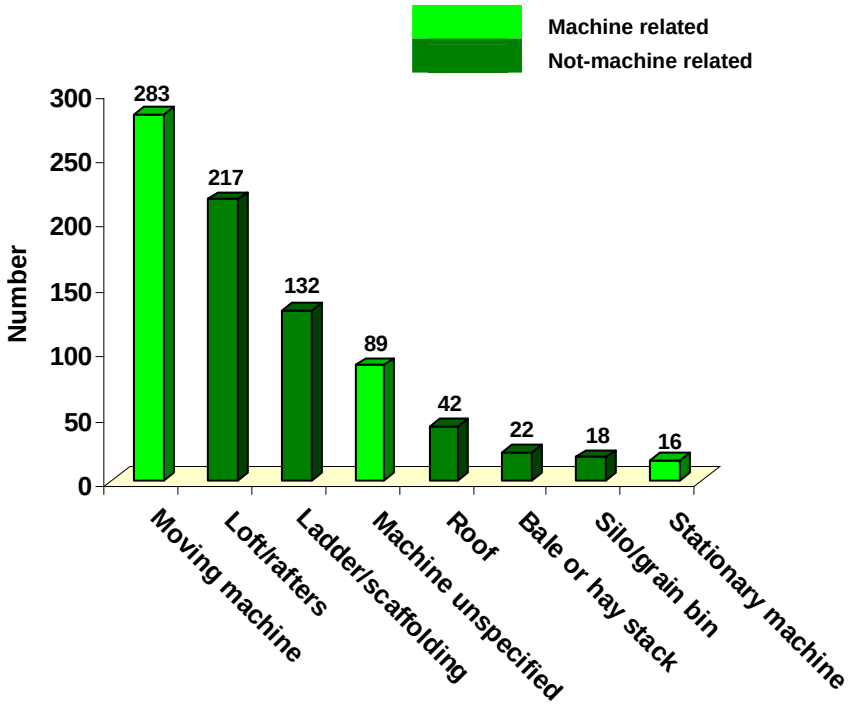


7.11 Hospitalized agricultural non-machine and machine falls from height, by fall location

Non-machine falls from height were ranked second overall as a cause of hospitalized injuries. Taken together, non-machine and machine falls from height were the leading cause of hospitalized injuries (912 cases).

Over all age groups, of the 217 falls from lofts or rafters, 152 (70%) occurred in a barn. In all, 49.1% (250) of all non-machine falls from height (509) occurred within barns.

A further 132 (14.5%) of all falls from height were from ladders or scaffolding and 42 (4.6%) were from roofs.

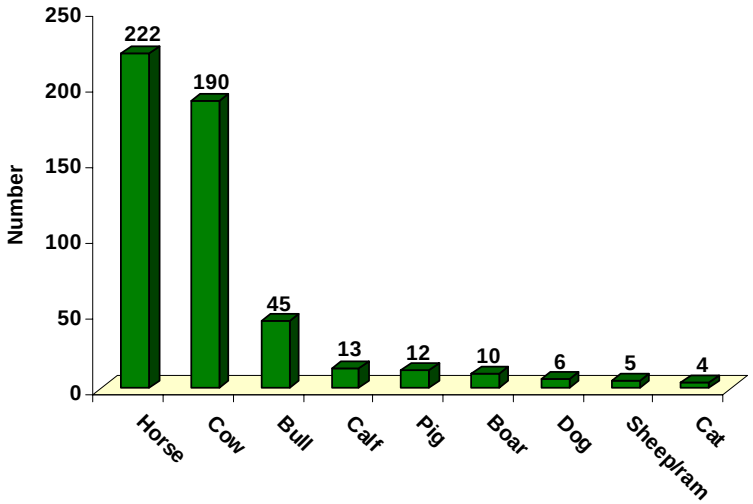


- The 'moving machine' fall location includes some falls where the injured person was subsequently runover.
- In cases coded as 'unspecified fall from machine', it is unclear from the circumstance description whether the machine was moving or stationary.
- Non-machine falls are underestimated due to case identification problems with the ICD 9 coding system prior to April 1999.

7.12 Hospitalized agricultural animal injuries, by type of animal

Animal injuries ranked second as a cause of hospitalized injuries. Of the 512 identified animal injuries, 80.5% were caused by either horses or cows. Bulls were cited in another 8.8% of hospitalized animal injury cases.

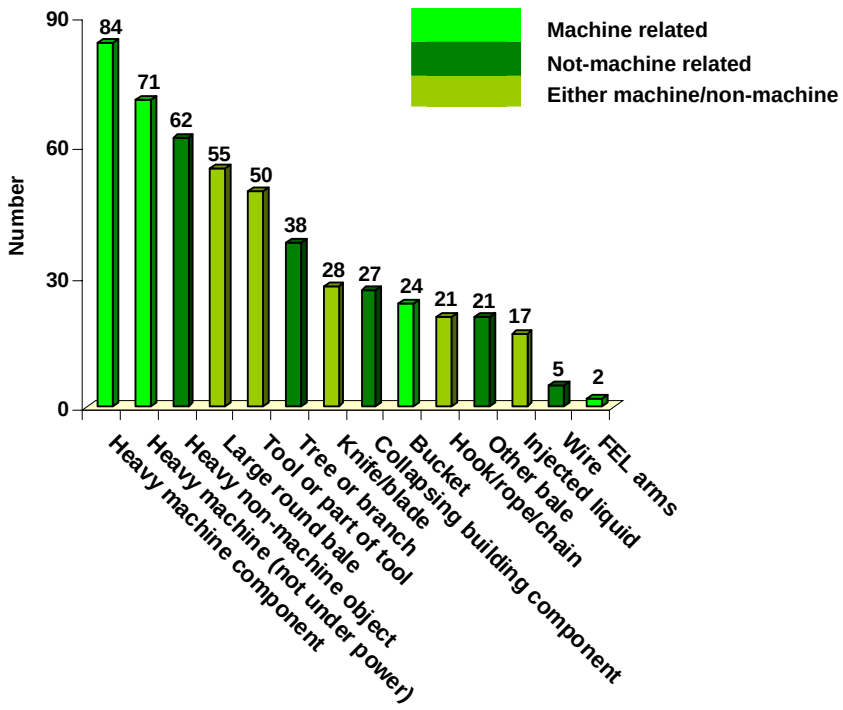
509 of the animal injuries were by direct contact. In three other instances, victims were struck by gates which had been pushed by cows.



- There were also 2 injuries caused by chickens, one each by a buffalo, an ostrich and a goat, two injuries by other animals, and two injuries by unknown animals.
- Animal injuries are underestimated due to case identification problems with the ICD 9 coding system prior to April 1999.

7.13 Hospitalized struck by object and pinned or struck by machine injuries, by type of object or component

'Pinned/struck by machine' ranked fourth as a cause of hospitalized injuries, 'Struck by non-machine object' ranked sixth, and 'Struck by machine object' ranked seventh. Heavy machine components were involved in 16.6% of those injuries. In another 14.1% of the cases, collapsing or slipping heavy machines caused crush injuries. Most of the hospitalized injuries where a person was pinned or struck by a heavy machine occurred during improper hitching procedures. Being struck by a heavy non-machine object (such as a gate or fence panel) caused 12.3% of the injuries and another 10.9% of the injuries were due to victims being struck by large round bales.



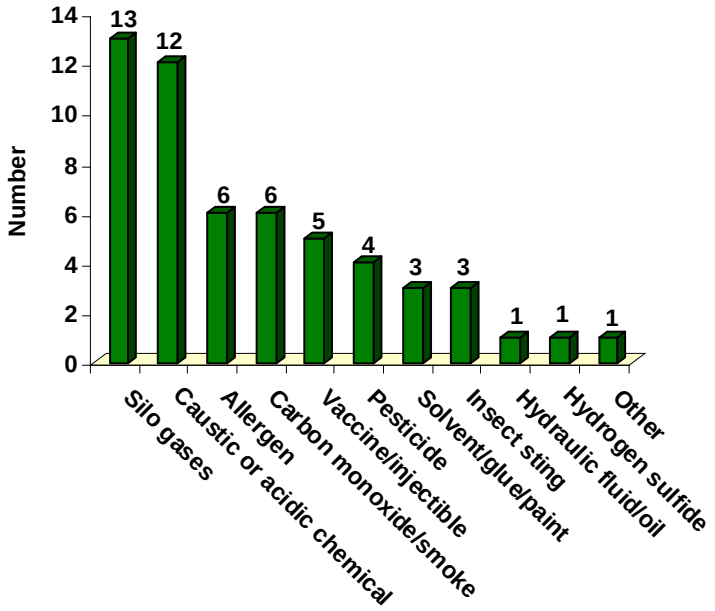
- This figure includes cases were the injured person was struck by a machine-related or non-machine related object, pinned by a collapsing/slipping machine, or struck by a machine component. It does not include runover events or entanglements.
- There were also 18 other non-machine objects, 43 other machine objects, and 7 unknown objects. Non-machine struck by object events are underestimated due to case identification problems with the ICD 9 coding system prior to April 1999.

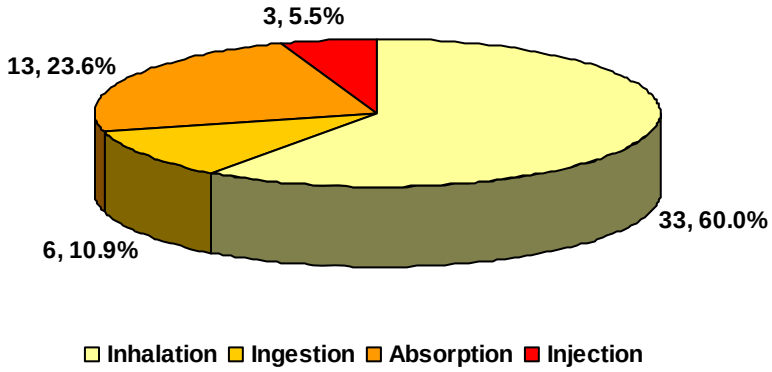
7.14 Hospitalized agricultural toxic substance injuries, by type of substance and means of contact

Exposure to toxic substances ranked twelfth as a cause of injury.

The most common toxic substances cited were silo gases (23.6%), followed by caustic or acidic chemicals (21.8%), allergens and carbon monoxide or smoke (both 10.9%), and vaccine or medication (9.1%). There were only four identified cases of pesticide exposure during the surveillance period.

Inhalation was by far the most common means of contact with toxic substances (60%). The other means of toxic substance contact were ingestion (23.6%), absorption (10.9%) and inadvertent injection of medications intended for animals (5.5%).





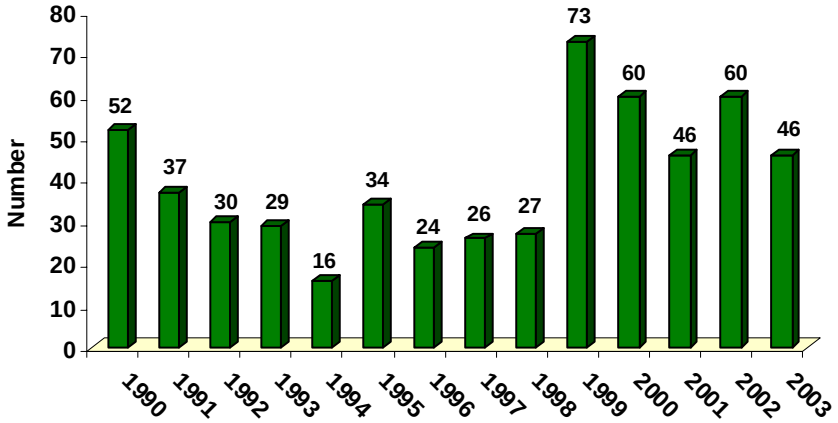
- These injuries are underestimated due to case identification problems with the ICD 9 coding system prior to April 1999.

8 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: CHILDREN AND YOUTH UNDER AGE 16

8.1 Hospitalized agricultural injuries in children and youth, by fiscal year, 1990-2003

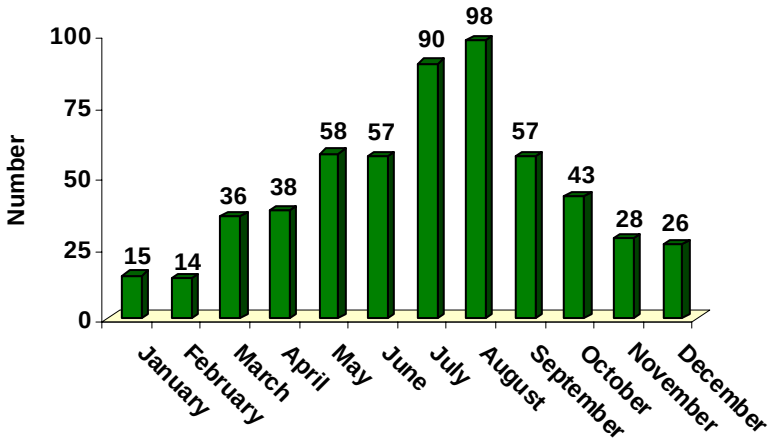
From April 1, 1990 to March 31, 2004, at least 560 children aged fifteen and under were injured seriously enough to be admitted to hospital. (An average of 40 children per year.)

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 agricultural injuries.



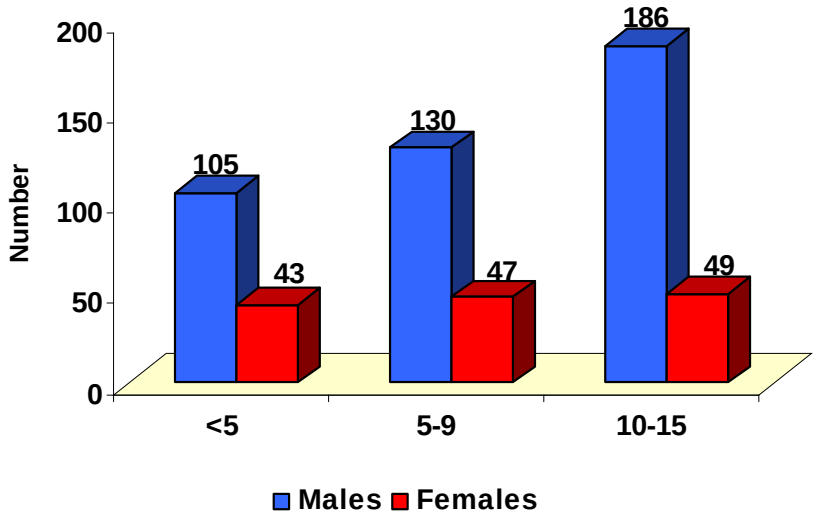
8.2 Hospitalized agricultural injuries in children and youth, by month, 1990-2003

33.6% of all agricultural hospitalizations in children occurred during the school holiday months of July and August. August had the highest proportion of hospitalizations (17.5%). 16.1% of the injuries occurred in July, and over 10% in May, June and September.



8.3 Hospitalized agricultural injuries in children and youth, by age group and gender

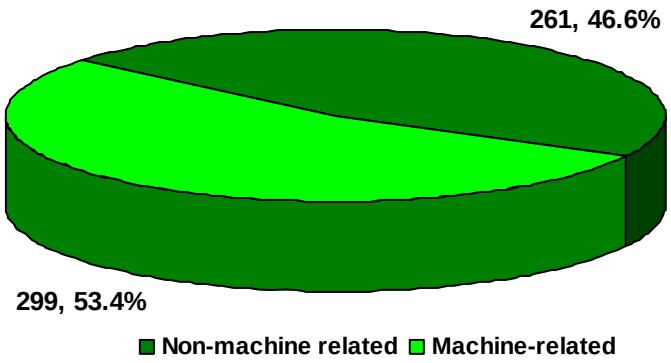
75.2% of the children hospitalized for agricultural injuries were male. The ratio of males to females was highest for the 10 to 15 year old age group (3.8:1), and lowest for children under five years old (2.4:1). There was a higher proportion of hospitalized females among children under five than in any other age group. Fifty-nine of the children injured were aged one or two. Three children were infants under a year old.



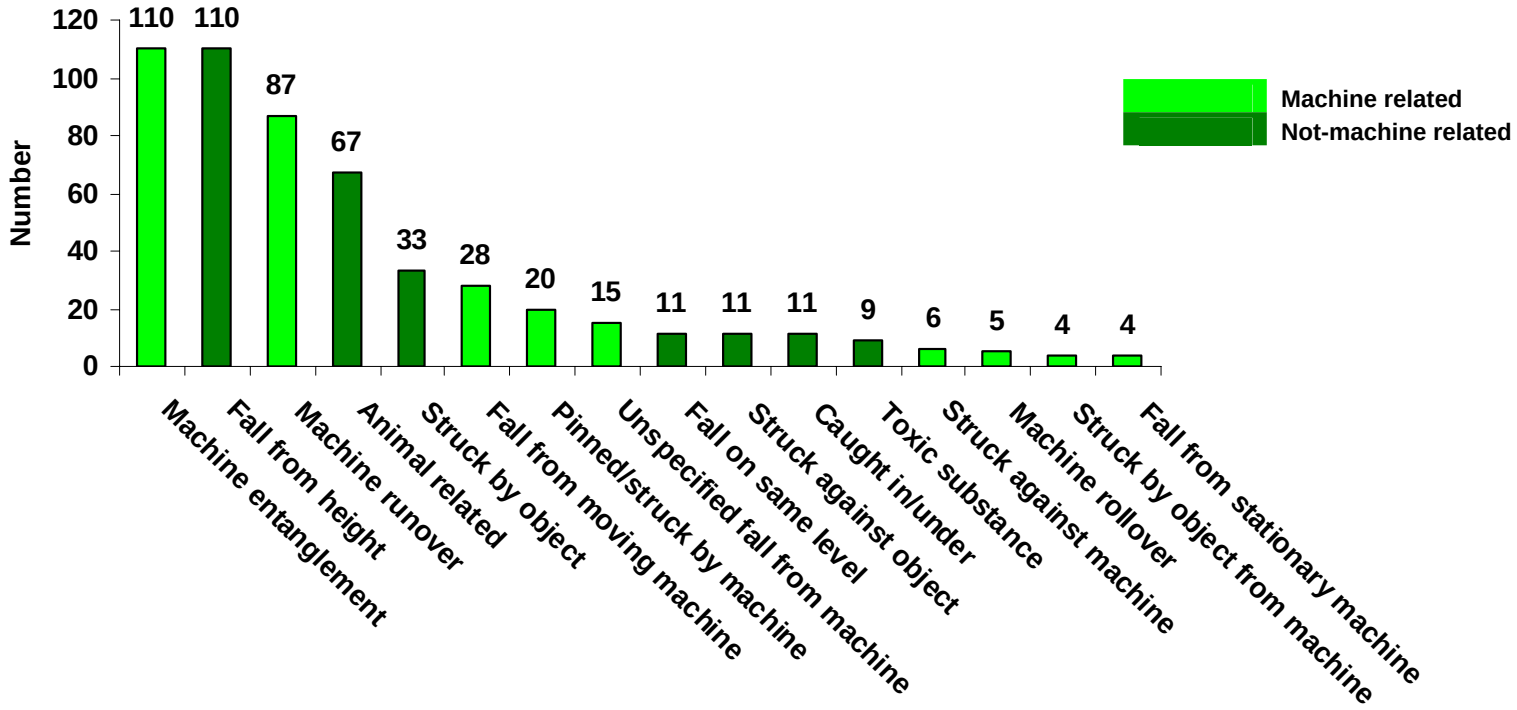
8.4 Hospitalized agricultural injuries in children and youth, by major cause

53.4% of agricultural hospitalizations in children were machine related. These included a large number of machine entanglements and machine runovers. In contrast, the proportion of machine related fatalities among children was 18% greater.

46.6% of agricultural hospitalizations were not machine related. These included numerous falls from height and animal-related injuries.



8.5 Hospitalized agricultural injuries in children and youth, by cause of injury



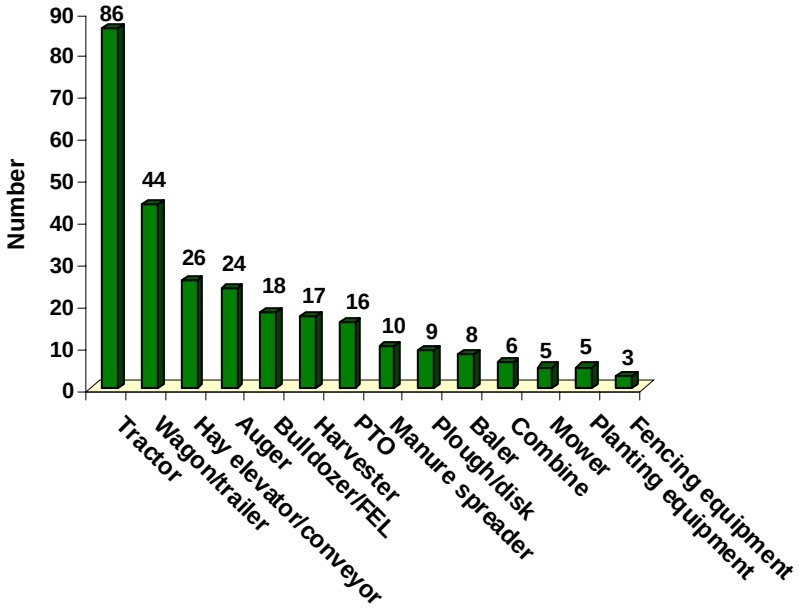
For children aged fifteen and under, machine entanglements and falls from height were the leading causes of hospitalized injuries (19.6% each). A further 15.5% of hospitalized injuries were due to runovers, 12.0% were caused by incidents with animals and, in 5.0% of the cases, a child fell from a moving machine. Runovers and entanglements were important as both causes of fatalities and hospitalized injuries. The predominance of machine entanglements as a cause of hospitalized injuries in children is especially troubling because they frequently result in permanently disabling amputations. Also, children should not be working with or have access to machinery that poses and entanglement hazard. Of the 110 falls from height, 68.2% were from a barn loft. The majority of those cases did not involve agricultural work.

- Non-machine injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- The following cases are not included in the above figure: jump from machine (3), traffic collision (2), off-road machine collision (2), near drowning (2), temperature extremes (2), five other non-machine cases, four other machine cases, and nine unknown machine cases.

8.6 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 (28.8%), followed by wagons and trailers (14.4%), hay elevators/conveyors (8.7%) and augers (8.0%). Children and youth under sixteen should not work with or have access to conveyors and augers, which can pose serious entanglement hazards.

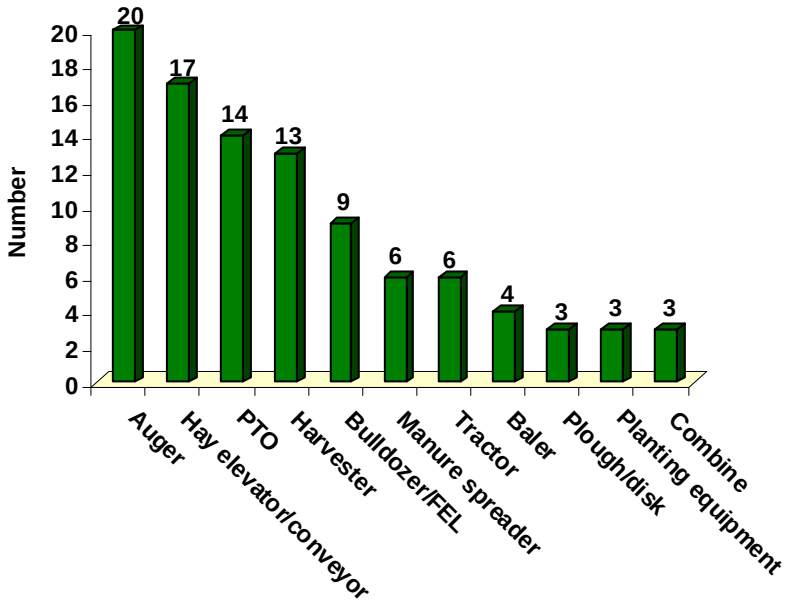
Tractors were more commonly associated with fatalities (54.0%) than with hospitalized injuries.



- Machine type was not known in 2 cases, there were also 2 ORVs, 2 motor vehicles, 1 sprayer and 15 other machines.

8.7 Hospitalized agricultural entanglement injuries in children and youth, by machine type

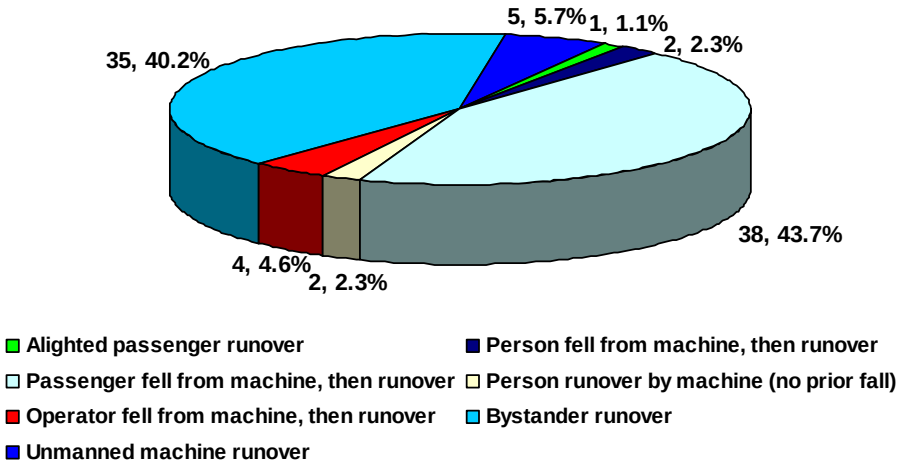
The four machine types most frequently involved in agricultural entanglements among children and youth were augers (18.2%), followed by hay elevators and conveyors (15.5%), PTOs (12.7%) and harvesters (11.8%). 42.7% of the injuries were open wounds, which can include permanently disabling amputations. 22.7% of the injuries were fractures of the upper limb and 10.9% were fractures of the lower limb.



- Machine type was not known in 2 cases, there were also 2 cases of fencing equipment, 1 wagon/trailer, 1 mower and 6 other machines.

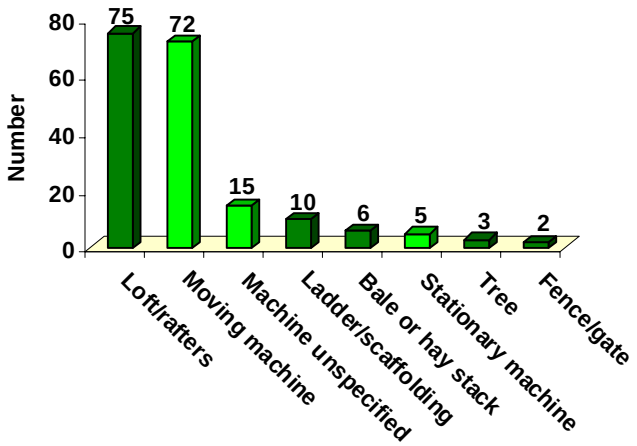
8.8 Hospitalized agricultural Runovers in children and youth, by Runover type

Extra rider runovers were the most common runover type causing hospitalized injuries in children (43.7%). In this type of runover, children are injured when they fall from machines they had been riding on as passengers and are subsequently runover. A further 40.2% of child runover victims were runover as bystanders. Unmanned machine runovers (5.7%) and operator runovers (4.6%) were relatively infrequent among children.



8.9 Hospitalized agricultural machine and non-machine falls from height in children and youth, by fall location

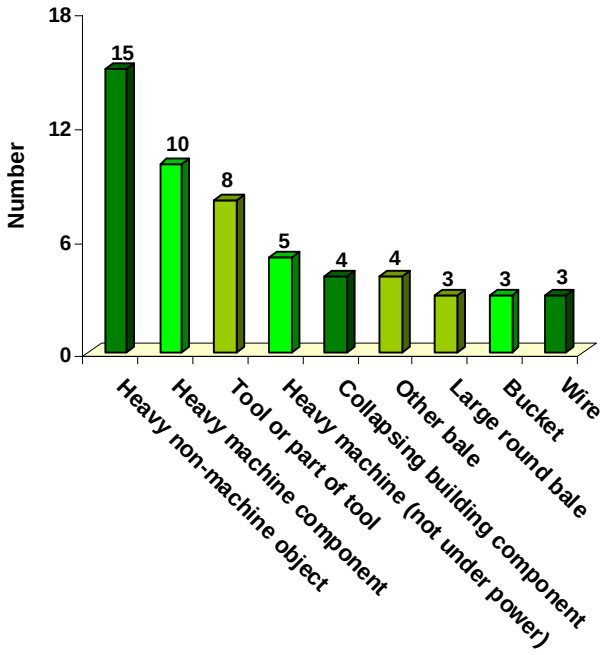
37.1% of the falls were from barn lofts or rafters. A further 35.6% were from moving machines.



- Non-machine falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- There were also 12 other and 2 unknown fall locations.

8.10 Hospitalized agricultural struck by object and pinned or struck by machine injuries in children and youth, by type of object or component

The majority of struck by/pinned by injuries were due to heavy non-machine objects, such as fence panels and gates (35.7%), falling on small children. A further 25% of the injuries were caused by heavy machine components, and 20.0% were due to tools or pieces of tools. 17.5% of the injuries were attributed to bales falling from bale stacks or machines.

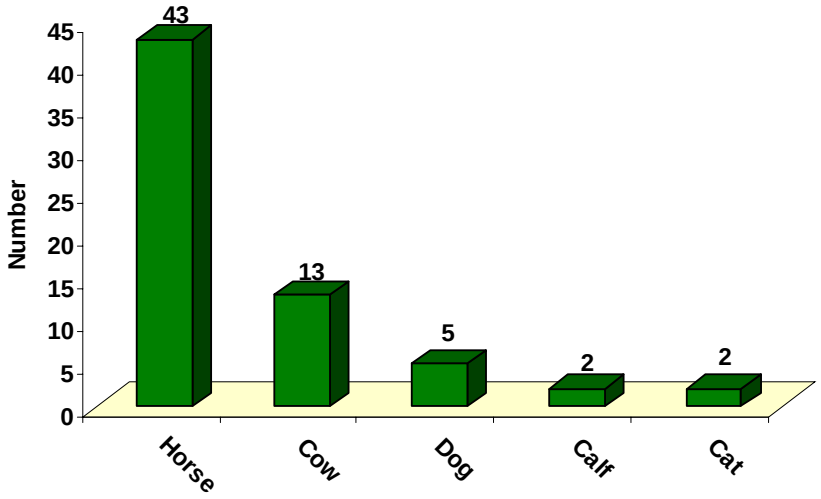


- Non-machine struck by object injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

8.11 Hospitalized agricultural animal injuries in children and youth, by type of animal

63.2% of animal-related injuries were caused by horses and 19.1% were due to cows.

65.1% 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.



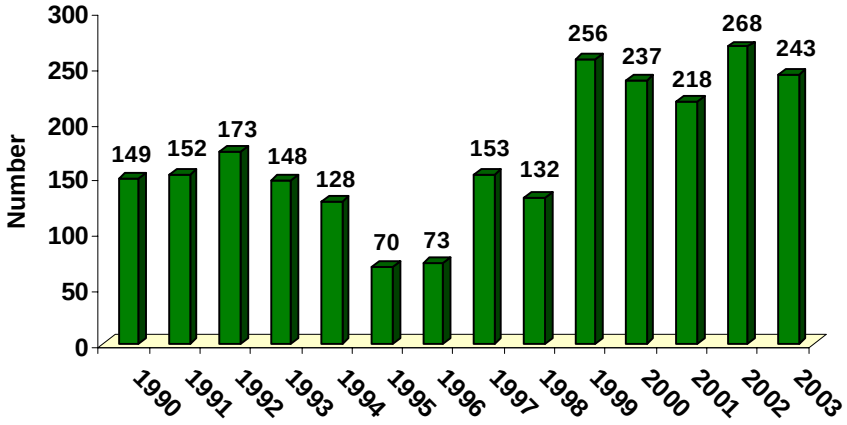
- Animal injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- There was also one sheep, one chicken and one other animal.

9 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: ADULTS AGED 16 TO 64

9.1 Hospitalized agricultural injuries in adults aged 16 to 64, by fiscal year, 1990-2003

From April 1, 1990 to March 31, 2004, 2,400 hospitalized agricultural injuries were identified for Ontario adults aged 16 to 64. (An average of about 171 per year.)

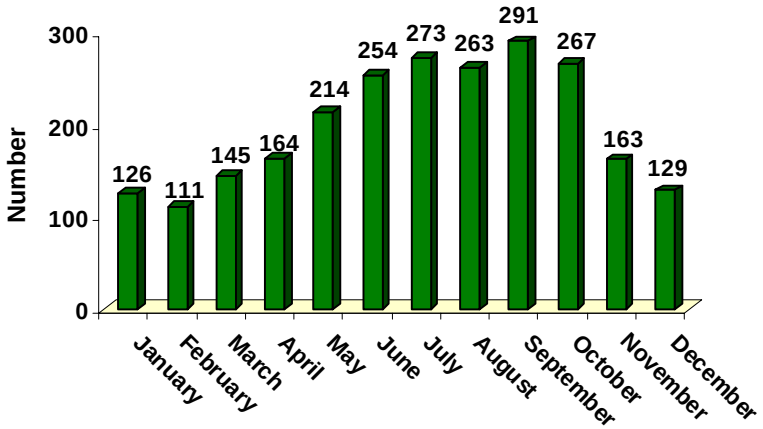
The ICD 10 CA coding system was implemented at most centres in Ontario during the 1999 to 2000 fiscal year, resulting in greater identification of non-machine agricultural injuries.



9.2 Hospitalized agricultural injuries in adults aged 16 to 64, by month, 1990-2003

56.2% of all agricultural hospitalizations in adults aged 16 to 64 occurred from June to October.

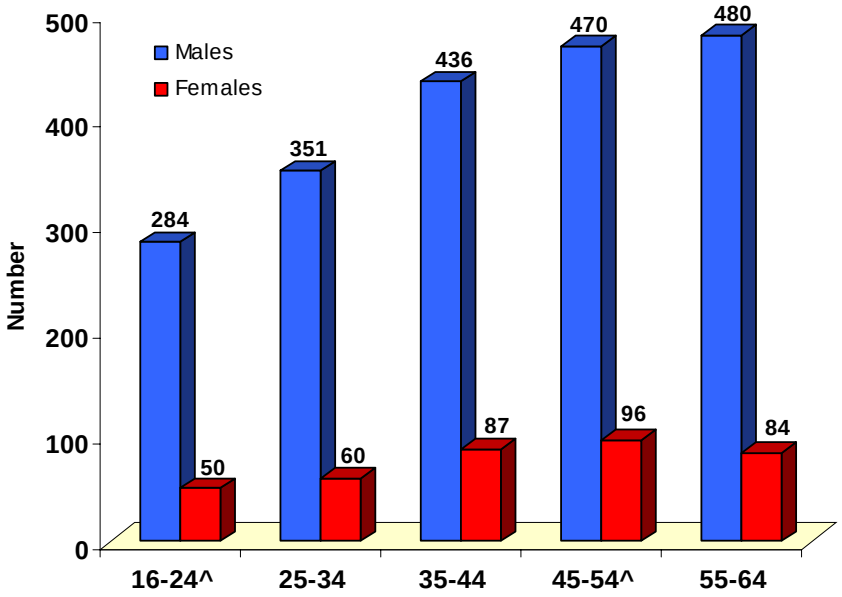
September was the peak month, with 12.1% of all hospitalizations. Over 11% of the injuries occurred in each of the months of July, August and October. Very few younger adults were injured from December to February.



9.3 Hospitalized agricultural injuries in adults aged 16 to 64, by age group and gender

84.3% of the younger adults hospitalized for agricultural injuries were male. The ratio of males to females was highest for the 25 to 34 year age group (5.9:1), and lowest for the 45 to 54 year age group (4.9:1).

The risk for injury appears to increase with increasing age.

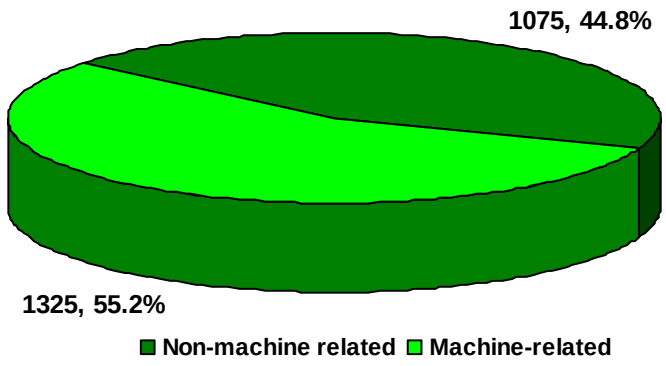


^one gender was missing for these age groups.

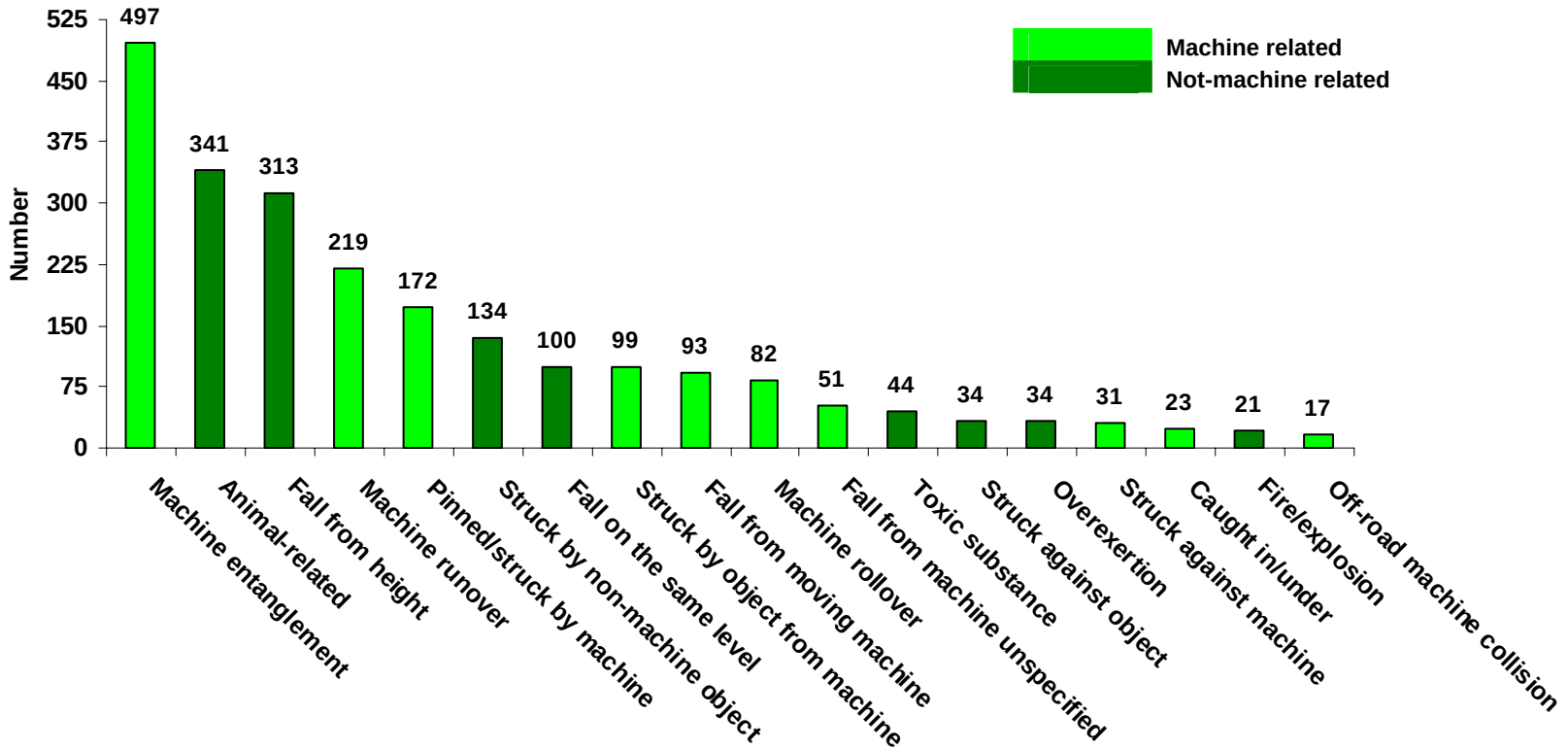
9.4 Hospitalized agricultural injuries in adults aged 16 to 64, by major cause

55.2% of agricultural hospitalizations in adults aged 16 to 64 were machine related, whereas 69.3% of fatalities in that 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. Machine rollovers were not a frequent cause of hospitalization because they are usually lethal.

The agricultural hospitalizations that were not machine related (44.8%) included animal related incidents, being struck by an object, and falls from height.



9.5 Hospitalized agricultural injuries in adults aged 16 to 64, by cause of injury



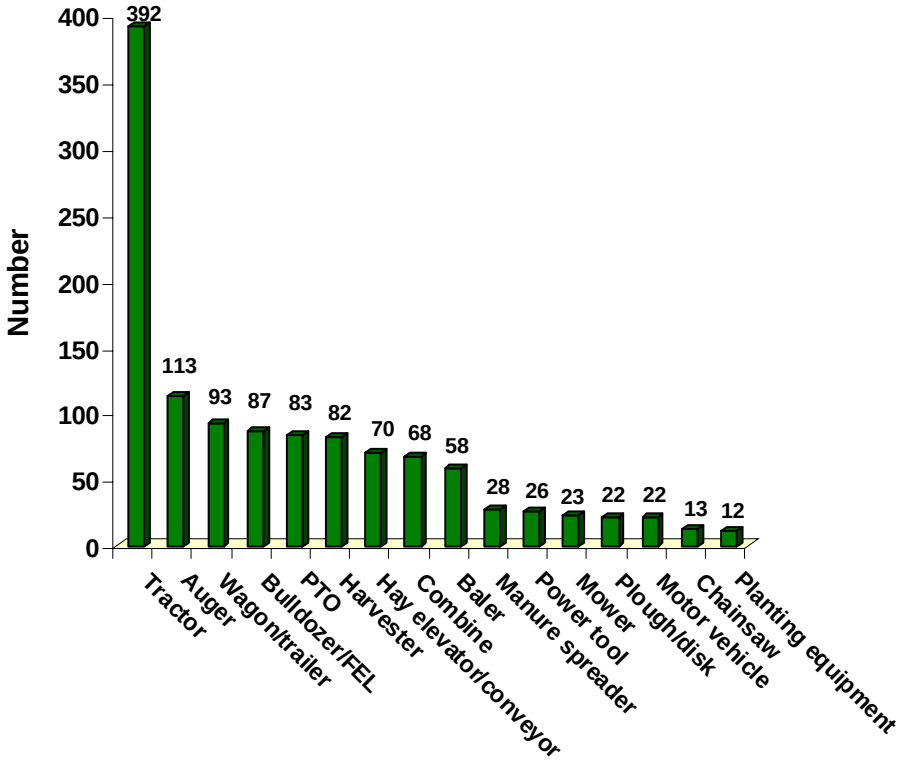
In adults aged 16 to 64, the top five causes of hospitalized injuries were machine entanglements (25.2%), animal-related events (14.2%), falls from height (13.0%). machine runovers (9.1%), and being pinned or struck by a machine (7.2%). In all, 17.2% of all hospitalized injuries in this age group were due to non-machine falls.

- Non-machine injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- The following cases are not included in the above figure: Non machine electrocution (11), traffic collision (10), machine-related overexertion (9), jump from machine (9), temperature extremes (6), jumped to lower level (5), machine fire (5), fall from stationary machine (3), accidental firearm (1), other non-machine (4), unknown non-machine (4), other machine-related (7) and unknown machine-related (21).

9.6 Hospitalized agricultural injuries in adults aged 16 to 64, by machine type

The machines most frequently involved in agricultural hospitalizations among younger adults were tractors (29.6%), although a far higher proportion of tractors were associated with fatal injuries (61.2%).

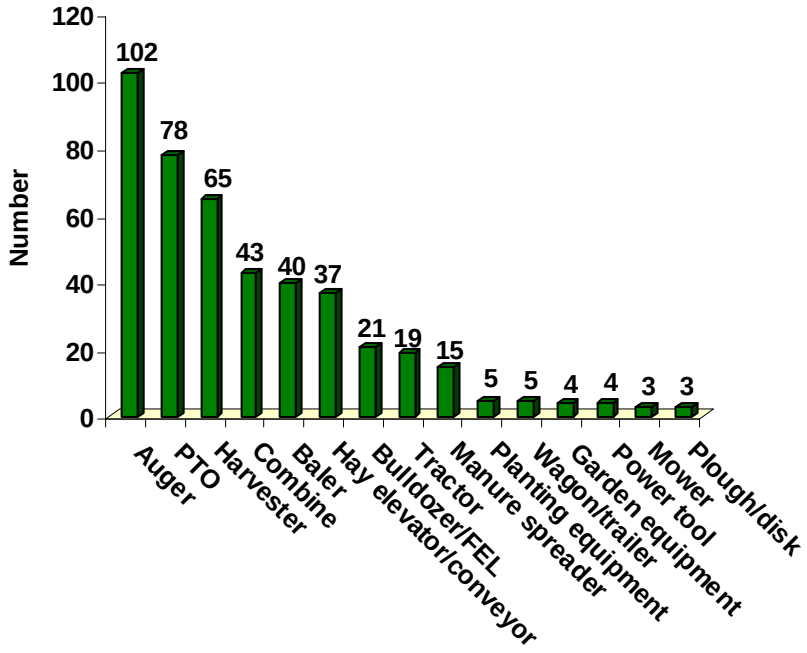
Augers were involved in the next highest percentage of hospitalized machine-related injuries (8.5%), followed by wagons/trailers (7.0%), bulldozer/FELs (6.6%), PTOs (6.3%), harvesters (6.2%), hay elevators or conveyors (5.3%), combines (5.1%) and balers (4.4%).



- Machine type was not known in 36 cases. There were also 8 off-road vehicles, 8 pieces of garden equipment, 2 pieces of spraying equipment, 2 swathers, 1 post pounder and 76 other non-classified machines.

9.7 Hospitalized agricultural machine entanglement injuries in adults aged 16 to 64, by machine type

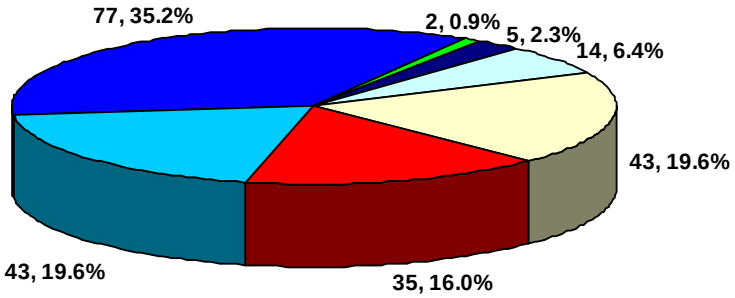
The machines most frequently involved in hospitalized agricultural entanglements among younger adults were augers (20.5%), PTOs (15.7%), harvesters (13.1%), combines (8.7%), balers (8.0%) and hay elevators/conveyors (7.4%).



- Machine type was not known in 36 cases.
- There were also 8 off-road vehicles, 8 pieces of garden equipment, 2 pieces of spraying equipment, 2 swathers, 1 post pounder and 76 other non-classified machines.

9.8 Hospitalized agricultural runovers in adults aged 16 to 64, by runover type

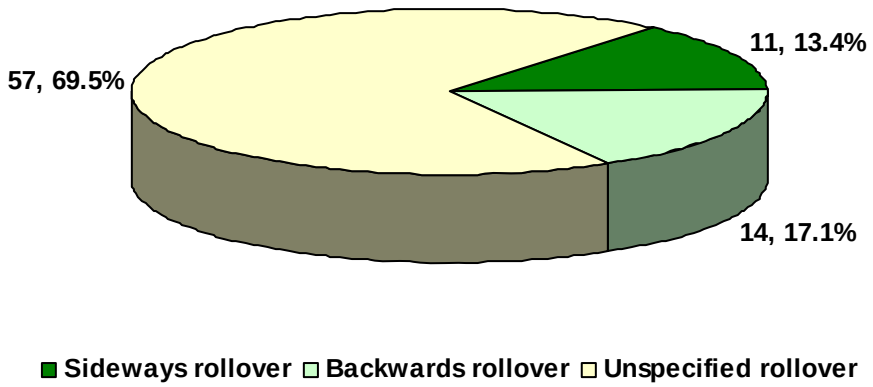
Most adults aged 16 to 64, were runover by unmanned machines (35.2%) which had been bypass started, left running or left unblocked on a slope. Bystander runovers were the second most frequent runover type (19.6%) followed by operator runovers (16.0%), where an operator was struck by a moving machine subsequent to falling from it. Extra rider runovers (6.4%) were not an important cause of injury for this age group.



- In 19.6% of the runovers, there was not enough circumstance text available to determine whether the runover was unmanned or bystander.

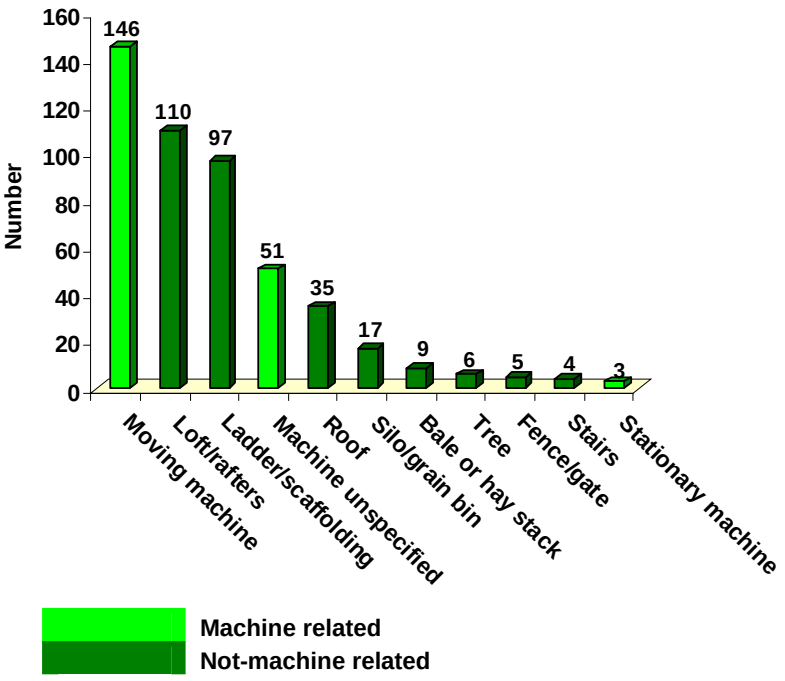
9.9 Hospitalized agricultural rollovers in adults aged 16 to 64, by rollover type

In adults aged 16 to 64, 13.4% of the machine rollovers were identified as sideways in direction and 17.1% were identified as backwards. In 69.5% of the cases, the direction of rollover could not be determined due to insufficient circumstance text.



9.10 Hospitalized agricultural machine and non-machine falls from height in adults aged 16 to 64, by fall location

27.8% of the machine and non-machine falls from height were from moving machines. Another 20.9% were from barn lofts or rafters, 18.4% were from ladders or scaffolding, 6.7% were from roofs, and 3.2% were from silos or grain bins. 9.7% of the cases were falls from machines where there was insufficient circumstance text to determine whether the machine was moving or stationary.

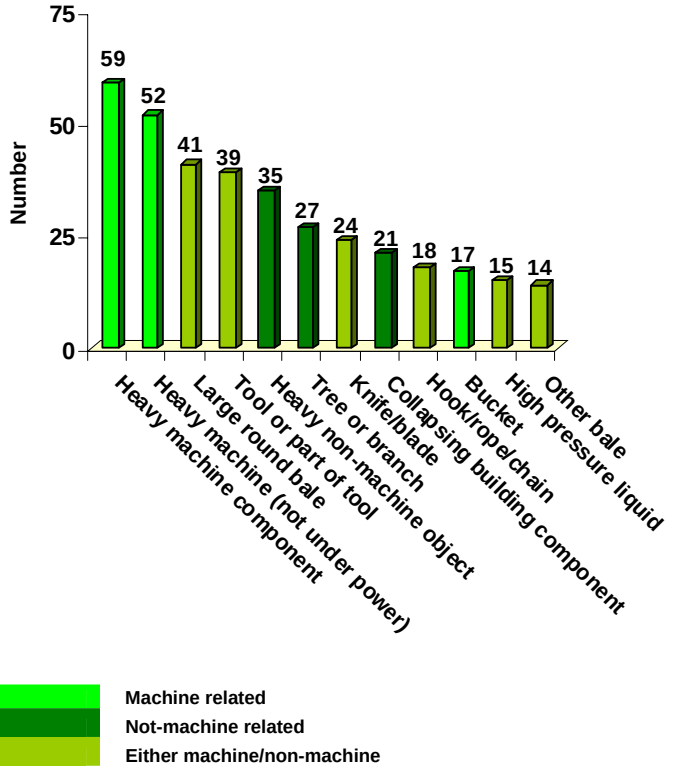


- 33 'other' and 10 unknown fall locations are not shown in the above figure.
- Non-machine falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

9.11 Hospitalized agricultural struck by object and pinned/struck by machine injuries in adults aged 16 to 64, by type of object or component

In all, 14.0% of those injured were struck or pinned by heavy machine components, 12.4 % were pinned by heavy machines, and 9.7% were struck by round bales. Other common objects or components included tools or parts of tools (9.3%), heavy non-machine objects (8.3%), trees or branches (6.4%), knives or blades (5.7%) and collapsing buildings or building components (5.0%).

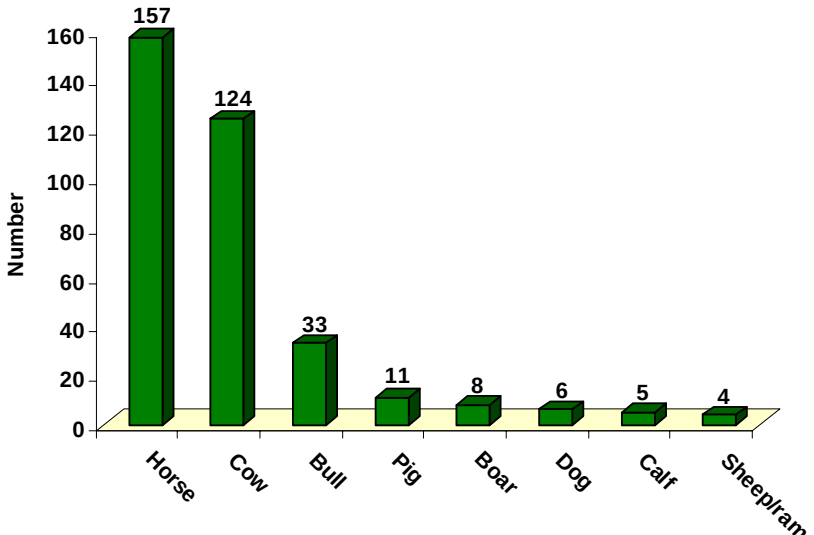
Heavy machine components included booms, frames, transmissions, fans and dryers. Heavy non-machine objects included gates, bins, doors and fence panels.



- There were also 37 other machine objects, 16 non-machine objects and 6 unknown objects.
- Non-machine struck by object injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

9.12 Hospitalized agricultural animal injuries in adults aged 16 to 64, by type of animal

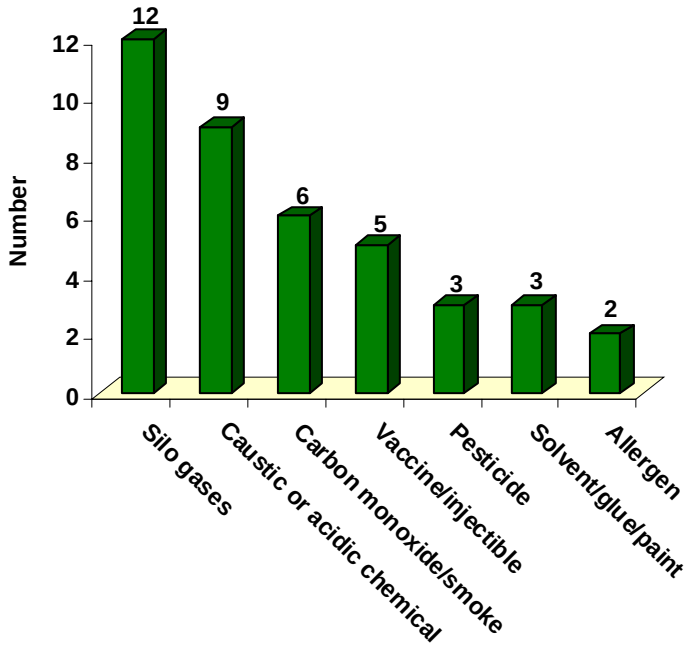
In adults aged 16 to 64, 44.5% of all animal-related hospitalized injuries involved horses. Cows were responsible for another 35.1% of hospitalized animal injuries followed by bulls (9.3%), pigs (3.1%), and boars (2.3%).



- Animal injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- 8 other animal types are not included in the above figure.

9.13 Hospitalized agricultural toxic exposure injuries in adults aged 16 to 64, by type of substance

In general, far fewer hospitalized toxic substance injuries were identified than had been expected. The leading cause of injury was exposure to silo gases (27.3%), followed by exposure to caustic or acidic chemicals (20.5%), inhalation of carbon monoxide or smoke (13.6%), inadvertent injection of vaccines or medications (11.4%), exposure to pesticides (6.8%) and contact with solvents, glue or paint (6.8%).



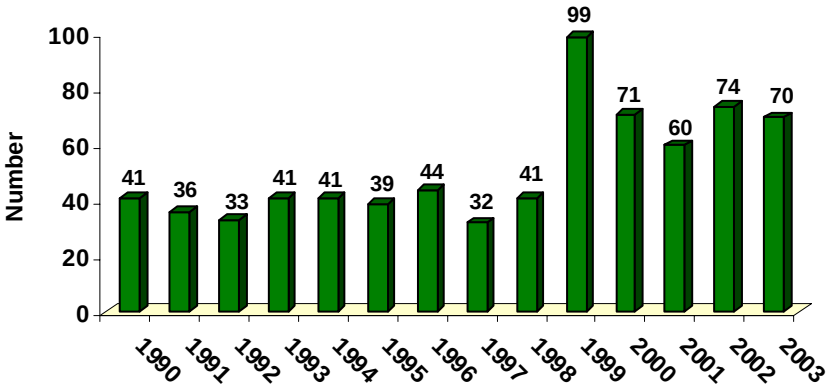
- Toxic substance exposure injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- One instance each of an insect sting, exposure to hydrogen sulfide, exposure to fuel and exposure to one other substance are not included in the above figure.

10 AGRICULTURAL HOSPITALIZATIONS IN ONTARIO: ADULTS AGED 65 AND OVER

10.1 Hospitalized agricultural injuries in adults aged 65 and over, by fiscal year, 1990-2003

From April 1, 1990 to March 31, 2004, 722 hospitalized agricultural injuries were identified for Ontario adults aged 65 and over. (An average of about 52 per year.)

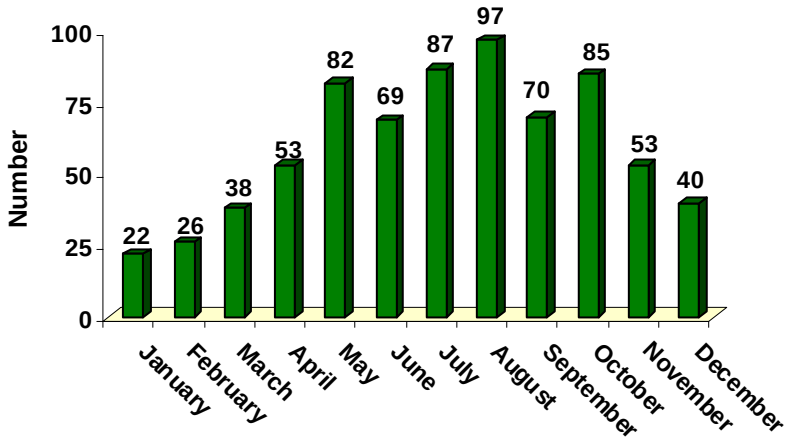
The ICD 10 CA coding system was implemented at most centres in Ontario during the 1999 to 2000 fiscal year, resulting in greater identification of non-machine agricultural injuries.



10.2 Hospitalized agricultural injuries in adults aged 65 and over, by month 1990-2004

67.9% of all agricultural hospitalizations in adults aged 65+ occurred from May to October.

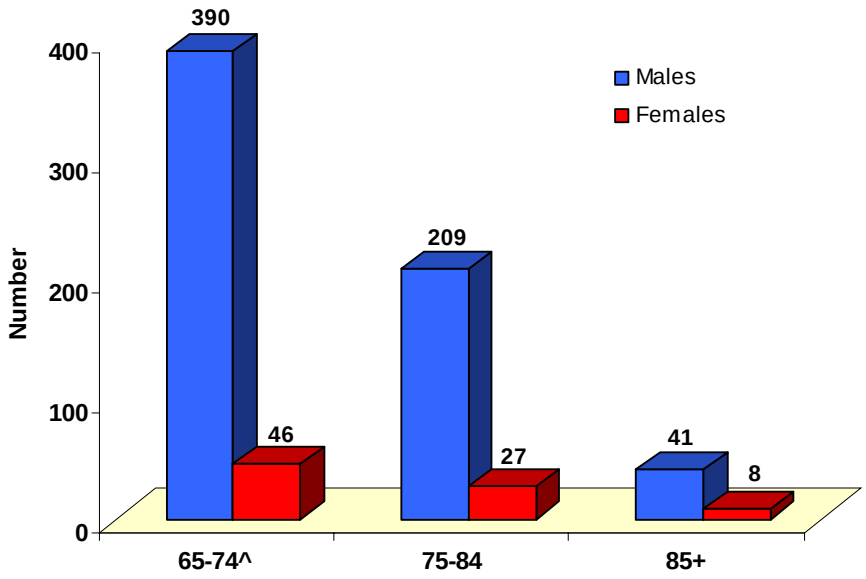
August was the peak month, with 13.4% of all hospitalizations. Over 11% of the injuries occurred in each of the months of May, July and October.



10.3 Hospitalized agricultural injuries in adults aged 65 and over, by age group and gender

88.8% of the older adults who sustained hospitalized agricultural injuries were male. The ratio of males to females was highest for the 65 to 74 age group (8.5:1), and the lowest for the 85+ age group (5.1:1).

In males aged 85 and over, 43.9% of the injuries were falls. For females in the same age group, 75% of the injuries were falls. The lower number of injuries recorded for the higher age ranges reflects the steady decline in the farm population with age (section 7.4).

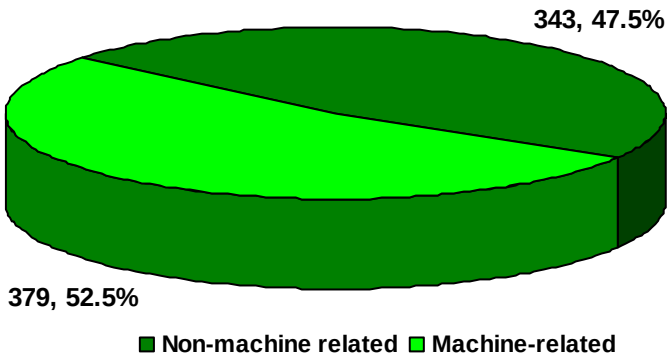


^one gender was missing for this age group.

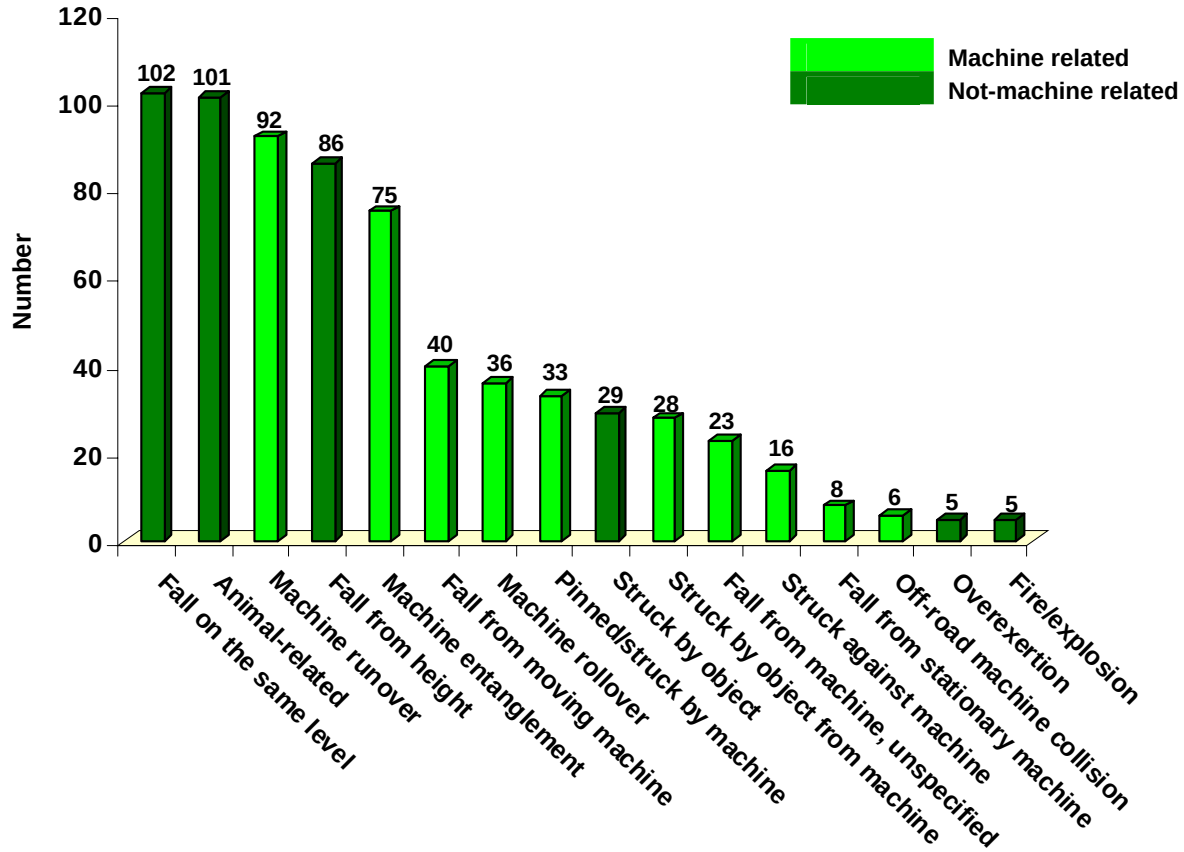
10.4 Hospitalized agricultural injuries in adults aged 65 and over, by major cause

Only 52.5% of hospitalized injuries in older adults were machine related, whereas 80.6% of fatalities were machine related.

The predominant machine-related mechanisms of hospitalized injury were machine runovers and machine entanglements. Non-machine causes of injury included falls and animal-related events.



10.5 Hospitalized agricultural injuries in adults aged 65 and over, by cause of injury

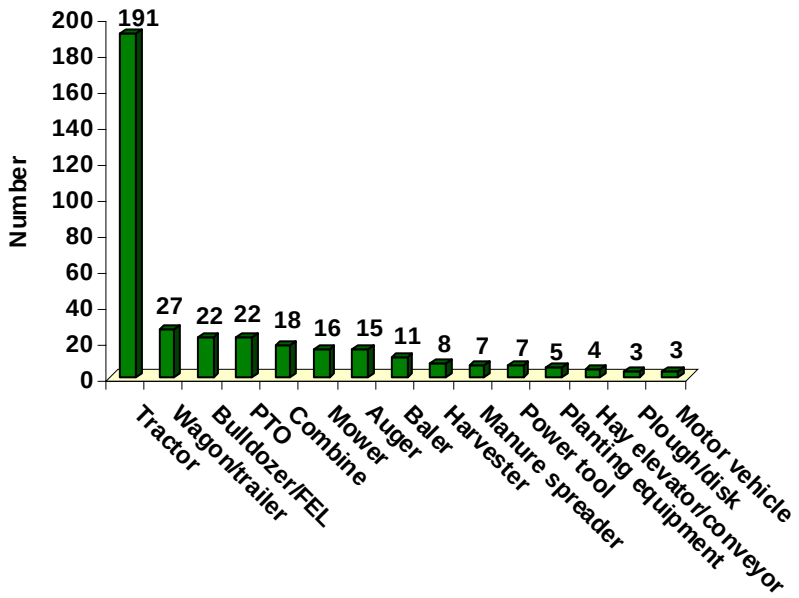


In adults aged 65 and over, 60.4% of all fatalities were due to only two mechanisms of injury, machine runovers and machine rollovers. In contrast, there were several important mechanisms of injury for agricultural hospitalizations in older adults. The leading causes of agricultural hospitalizations in older adults were falls on the same level (14.1%), followed by animal related events (14.0%), machine runovers (12.7%), falls from height (11.9%), machine entanglements (10.4%), falling from a moving machine (5.5%), machine rollovers (5.0%), being pinned or struck by a machine (4.6%) and operator falls from machines (4.3%).

- Non-machine injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- The following cases are not included in the above figure: Struck against object (4), traffic collision (4), machine-related overexertion (3), jumped from machine (3), temperature extremes (3), caught in/under (3), toxic substances (2), other machine related (2), unknown non-machine (3) and unknown machine-related (10).

10.6 Hospitalized agricultural injuries in adults aged 65 and over by machine type

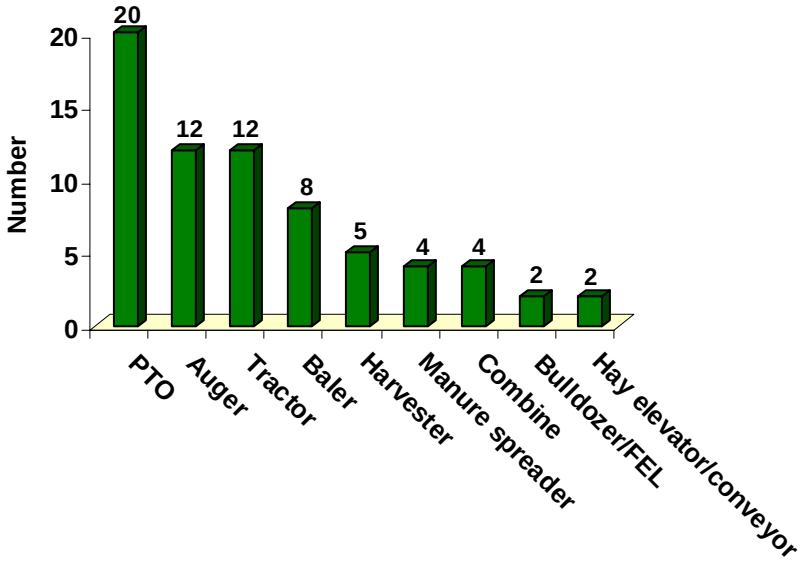
The types of machines most frequently involved in agricultural hospitalizations for adults aged 65 and over were tractors (50.4%), wagons/trailers (7.1%), PTOs (5.8%), bulldozers/FELs (5.8%), combines (4.7%), mowers (4.2%) and augers (4.0%).



- Machine type was not known in 6 cases. There were 14 other machines, including two off-road vehicles.

10.7 Hospitalized agricultural machine entanglement injuries in adults aged 65 and over by machine type

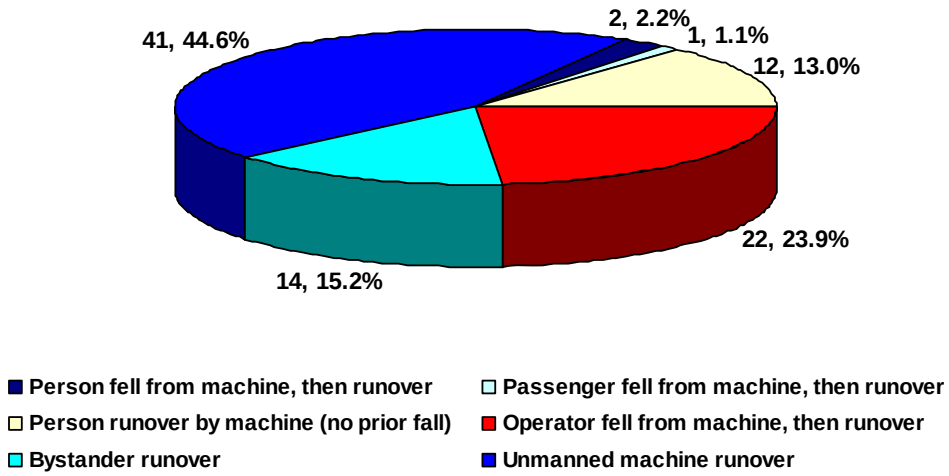
The types of machines most frequently involved in agricultural entanglement injuries among older adults were PTOs (26.7%), augers and tractors (both 16.0%)and balers (10.7%).



- Machine type was not known in 1 case. There were also 5 other machine types.

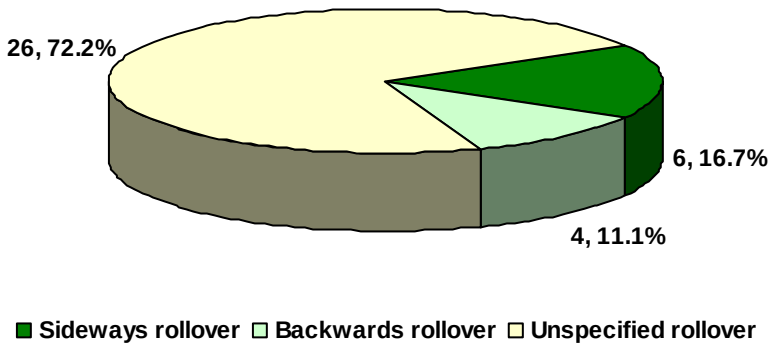
10.8 Hospitalized agricultural runovers in adults aged 65 and over, by runover type

In adults aged 65 and over, most hospitalized runovers involved unmanned machines which had been bypass started, left running, or left unblocked on a slope (44.6%). Operator runovers subsequent to falls from machines (23.9%) were the next most frequent runover mechanism, followed by bystander runovers (15.2%). Extra rider runovers (1.1%) were not a common cause of hospitalized runover injuries among older adults.



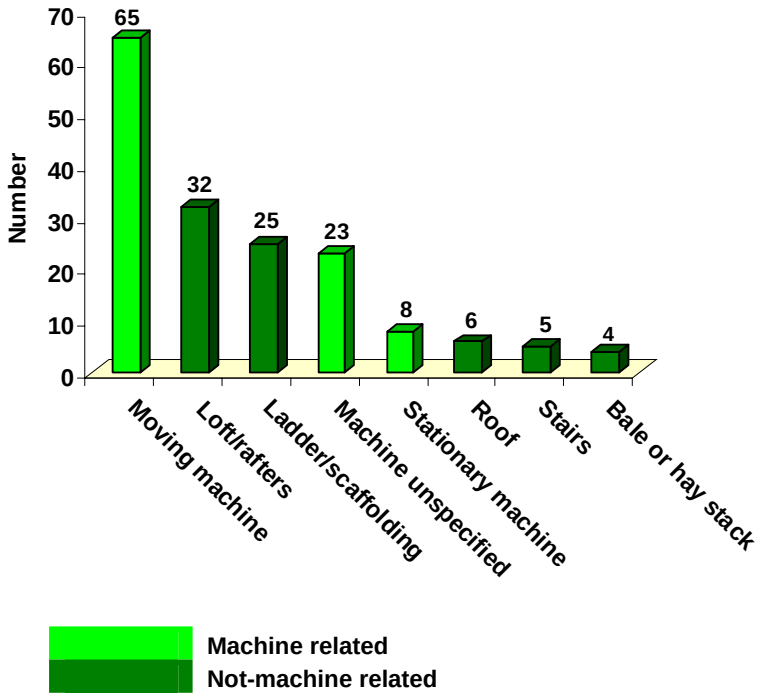
10.9 Hospitalized agricultural rollovers in adults aged 65 and over by rollover type

Machine rollovers ranked first as a cause of death, but only sixth as a cause of hospitalized injuries because they are usually lethal. There was a large proportion of unclassified rollovers because of the limited circumstance descriptions available.



10.10 Hospitalized agricultural machine and non-machine falls from height in adults aged 65 and over, by fall location

35.7% of all falls from height were from moving machines. The most common non-machine fall locations were barn lofts or barn rafters (17.6%) and ladders or scaffolding (13.7%). A further 12.6% of all falls from height were from machines (status unspecified), 4.4% were from stationary machines, 3.3% were from roofs and 2.7% were on stairs.

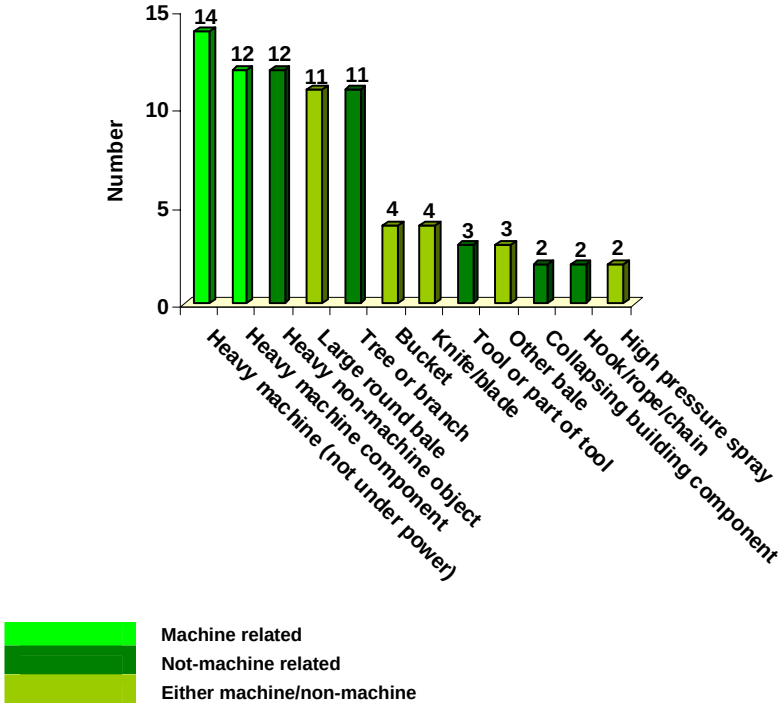


- The following fall locations are not shown in the figure: tree (2), fence gate (2), ramp (1), other or unknown fall location (9).
- Non-machine falls were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

10.11 Hospitalized agricultural struck by object and pinned or struck by machine injuries in adults aged 65 and over, by type of object or component

Most persons were injured by heavy machines slipping or collapsing (15.2%), heavy machine components (13.0%), heavy non-machine objects (13.0%), large round bales (12.0%), and trees or branches (12.0%).

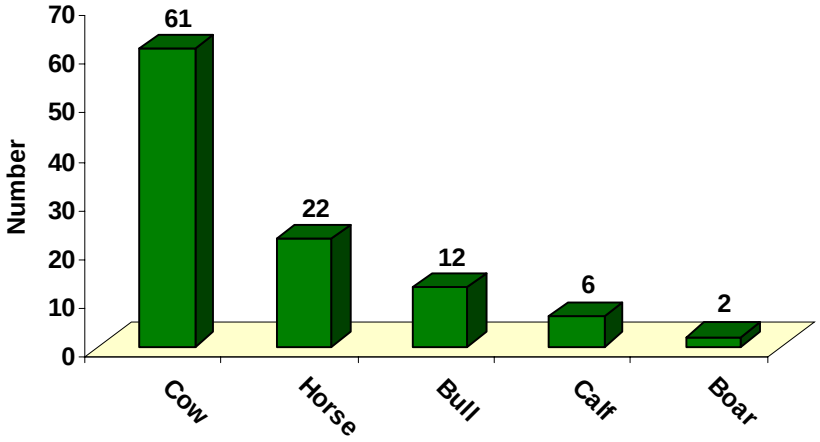
Heavy machine components included booms, frames, transmissions, fans and dryers. Heavy non-machine objects included gates, bins, doors and fence panels.



- There were ten other machine objects and two other non-machine objects.
- Non-machine struck by object injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.

10.12 Hospitalized agricultural animal injuries in adults aged 65 and over, by type of animal

63.2% of the animal-related agricultural injuries in older adults involved cows or calves, 20.8% were due to horses and 11.3% were caused by bulls.



- Animal injuries were underestimated prior to April 1999, due to case identification problems with the ICD 9 coding system.
- Two boars, a dog, a pig and an ostrich are not included in the above figure.

Agricultural Fatalities and Hospitalizations in Ontario 1990-2004

Appendices

Appendix A Decision Rules

Inclusion of deaths and injuries in the CAISP 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 involved agricultural work.

Children at Play

Fatal or hospitalized injuries in children who were playing in the agricultural work place 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 work place; 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, ORV 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

General Terms and Definitions

Agricultural fatalities
CAISP 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 below), 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.

Appendix C CAISP's Agricultural Fatality Data Abstraction Form

CAISP FATAL FARM INJURIES – DATA ABSTRACTION FORM

Please complete all fields. For fields where information is recorded as missing, please enter **99** in the database, with the exception of date fields – these should be left blank.

Coroner's File #: _____-_____ (year / no.)

CAISP ID: _____-_____-_____ (prov. / year / no.)

Agricultural Fatalities: 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 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: ____ / ____ / ____ (mm / dd / yyyy) Birth date missing (circle)? Yes No

Sex (circle): M F Province: _____ County/Regional Municipality: _____

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

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

Circumstances and activity - describe with as much detail as possible the circumstances surrounding the injury event. Please include as many details as possible about 1) activity at the time of the incident, 2) task, and 3) any machinery involved in the incident.

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.

MARCH 2007

B. CAUSE OF INJURY NOT MACHINERY OR VEHICLE RELATED

1 crushed or struck by animal. Specify animal:
_____
2 other type of animal injury. Specify animal:
_____
3 fall from animal. Specify animal:
_____
4 struck by non-machine object
5 struck against non-machine object
6 caught inside, under or between non-machine objects
If 4, 5 or 6, specify object:
_____
7 fall from height. Give specific fall location:
_____
8 fall on same level
9 jumped to lower level
10 overexertion
11 drowning
12 exposure to fire/explosion
13 contact with temperature extremes
14 contact with electric current
16 contact with radiation, caustic, toxic or noxious substance by (circle):
inhalation ingestion absorption injection
Specify agent: _____
18 asphyxiation by grain or soil. Specify:
_____
19 firearm
77 other non machine related. Specify:
_____
88 unknown non machine related
99 not applicable

C. CAUSE OF INJURY MACHINERY OR VEHICLE RELATED

1 sideways rollover
2 backwards rollover
3 unspecified rollover
4 entangled/caught in machinery
5 pinned or struck by machine component or collapsing machine
6 traffic collision on road or highway
7 operator fell from moving machine, not runover, pinned, or struck by it
8 operator fell from moving machine, then runover, pinned, or struck by it
9 passenger fell from moving machine, not runover, pinned, or struck by it
10 passenger fell from moving machine, then runover, pinned, or struck by it
11 alighted operator/other person runover, pinned, or struck by unmanned machine
12 alighted passenger runover, pinned, or struck by moving machine
13 bystander runover, pinned, or struck by moving machine
14 machine-related contact with electrical current
15 machine related fire, explosion or burn
16 machine collision off-road
17 machine-related drowning
18 struck by object falling or propelled from machine
20 runover, pinned, or struck by moving machine - unspecified
77 other machine related. Specify:
_____
88 unknown machine related
99 not applicable
If 5 or 18, specify object/component:
_____

D. TYPE OF MACHINERY

(Circle appropriate number if the injury event was machinery or vehicle related)
1 tractor
2 auger. Specify whether freestanding, attached to machine, or unknown (circle)
3 mower
4 power take off, specify machine PTO attached to:
_____
5 baler
6 farm wagon/trailer
7 combine
8 power tool (not chainsaw)
9 chainsaw
10 welder
11 harvester
12 plough/disk
13 hay elevator
14 manure spreader
15 bulldozer, bob cat, skid steer
16 motor vehicle. Specify:
_____
17 off-road vehicle. Specify:
_____
19 fencing equipment
20 spraying equipment
22 garden equipment
24 planting equipment
25 swather
77 other farm implement/machine. Specify:
_____
88 unknown
99 not applicable

E. IMMEDIATE LOCATION OF INJURY

1 Field (includes dry ditches next to field)
2 Barn
3 Silo/grain bin, (circle)
4 Shed
5 Farmyard
6 Road/highway (includes dry ditches)
7 Driveway (includes dry ditches)
8 Farm house
9 Farm road (includes dry ditches)
10 Woods, orchard
11 Water source; includes water-filled ditch, dugout, manure lagoon, sewage pit, etc. Specify:
_____
12 Corral/outdoor animal enclosure
77 Other location. Specify:
_____
88 Unknown

F. LOCATION OF DEATH

1 Found dead
2 Died *en route*
3 Died in hospital
77 Other location of death. Specify:
_____
88 Unknown

G. RELATIONSHIP OF INJURED PERSON TO FARM OWNER/OPERATOR

1 Operator
2 Spouse of farm operator
3 Child of farm operator
4 Other relative of farm operator. Specify:
_____
5 Hired worker
6 Spouse of hired worker
7 Child of hired worker
8 Other relative of hired worker. Specify:
_____
9 Other non-visiting child
10 Other non-visiting adult
11 Adult visitor or contractor
12 Child visitor
77 Other relationship. Specify:
_____
88 Unknown

H. METHOD OF DISCOVERY

Who found the deceased? (i.e. relationship to deceased)
_____
Was the fatality witnessed? (circle) Y N
(Indicate if information not available)

I. NATURE OF INJURY BY BODY PART
e.g., NI1 crush injury, BP1 chest.
(List from most to least serious injury, where the most serious injury was the cause of death.)

Nature of injury 1:
_____
Body part 1:
_____
Nature of injury 2:
_____
Body part 2:
_____
Nature of injury 3:
_____
Body part 3:
_____

J. WAS AN EXTERNAL CAUSE OF INJURY CODE GIVEN? If so, specify: _____

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

MARCH 2007

CAISP 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 Cause of injury	SECTION 2 – MACHINE/VEHICLE RELATED Part A Cause of injury	Part B Machine type
Animal-related Specify animal: _____ 1 crushed or struck by animal 2 other type of animal injury 3 fall from animal **Struck/caught by non-machine object(s)** Specify object: _____ 4 struck by object 5 struck against object 6 caught inside/under/between objects **Fall/Jump** Specify fall from where: _____ 7 fall from height 8 fall on same level 9 jumped to lower level 10 **Overexertion** 11 **Near drowning** Specify where: _____ 12 **Exposure to fire** 13 **Exposure to temperature Extremes** 14 **Exposure to electric current** 16 **Exposure to toxic substances or allergens** Specify substance: _____ Contact by: (circle) inhalation ingestion absorption injection 19 **firearm-related injury** 77 **other non-machine cause,** specify: _____ 88 **Unknown, not machine related** 99 **Does not apply (machine-related)**	**Machine/vehicle rollover** 1 sideways rollover 2 backwards rollover 3 unspecified rollover 4 **Entangled in machine** **Struck by, against or pinned by** 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 **Traffic collision (farm road or highway)** 14 **Off-road collision with an object, building or machine** **Fall from moving machine, not run over, pinned, or struck** 7 operator 9 passenger **Fall from machine, unspecified** 15 unspecified whether the machine was moving and/or whether the victim was the operator. (Assume age 10 or less are extra riders). **Fall from moving machine, then run over, pinned, or struck** 8 operator 10 passenger 16 person unspecified over age 10 **Run over, pinned, or struck by moving machine (no fall involved)** 11 alighted operator 12 alighted passenger 13 bystander 17 person unspecified 20 **Fall from stationary machine** 21 **Machine-related overexertion** 22 **Jumped from machine** 24 **Machine-related electrocution** 25 **Machine-related fire/explosion** 77 **Other machine cause, specify:** _____ 88 **Unknown machine-related** 99 **Does not apply (no machine)**	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

Canadian Farm Population by Age Group and Province: Statistics Canada, Census of Agriculture 1996

Province	Age Group												
	< 1 yr	1 - 4	5 - 9	10 - 14	15 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80+ yrs	Total
NL	5	10	115	130	200	170	225	405	210	105	85	25	1680
PE	65	335	620	660	725	1040	1110	1080	1095	580	420	80	7810
NS	100	580	1040	1260	975	1335	1690	2200	1960	1245	475	205	13060
NB	110	380	725	1020	995	1030	1320	1890	1290	925	485	185	10350
QC	1225	6205	9820	11315	11460	12380	18195	18485	14690	7165	2780	880	114605
ON	2165	10925	17510	21180	20440	23005	29635	34840	29020	20650	9510	2345	221225
MB	935	4575	7265	8170	7155	7950	11585	13015	9680	6260	2545	700	79835
SK	1295	6645	11335	14855	15055	11635	19860	25255	18180	14260	5930	1245	145560
AB	2250	10570	16835	18700	17540	16670	28085	30020	24065	16205	6185	1370	188510
BC	670	3085	5765	6735	5895	5550	9535	12240	9940	6220	2415	725	68770
CANADA	8810	43315	71035	84025	80455	80775	121230	139425	110135	73620	30825	7755	851405

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

Number of Farms by Province: Statistics Canada, Census of Agriculture 1996

Province	Number
Newfoundland	742
Prince Edward Island	2,217
Nova Scotia	4,453
New Brunswick	3,405
Québec	35,991
Ontario	67,520
Manitoba	24,383
Saskatchewan	56,995
Alberta	59,007
British Columbia	21,835
CANADA	**276,548**

Appendix E References

Agricultural Injuries in Canada for 1990-2000. CAISP, Kingston, Ontario, Canada, 2003.

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